

**REPUBLIC OF INDONESIA  
MINISTRY OF PUBLIC WORKS AND HOUSING  
DIRECTORATE GENERAL OF WATER RESOURCES,  
RESEARCH AND DEVELOPMENT AGENCY,  
HUMAN RESOURCES DEVELOPMENT AGENCY**

**THE PROJECT ON CAPACITY DEVELOPMENT FOR  
RIVER BASIN ORGANIZATIONS IN  
INTEGRATED WATER RESOURCES MANAGEMENT IN  
THE REPUBLIC OF INDONESIA (PHASE II)**

**PROJECT COMPLETION REPORT**

**SUPPLEMENTARY DOCUMENT 3/3**

**DECEMBER 2018**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

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| <b>19-027</b> |



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**The Project on Capacity Development for River Basin Organizations in  
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**Supplementary Document 3/3**

**Annex 6-4 Training Curriculum, Syllabus, Pre/Post Test**

| No. | Titles                                                                                               | Outputs  |
|-----|------------------------------------------------------------------------------------------------------|----------|
| 001 | Training on Dam Operation & Maintenance, in Malang on Feb. 2016                                      | Output 2 |
| 002 | Training on Water Allocation, in Makassar, on Feb. 2016                                              | Output 2 |
| 003 | Training on Flood Management, in Manado on May 2016                                                  | Output 2 |
| 004 | Training on River Facility Maintenance, in Jakarta on August 2016                                    | Output 2 |
| 005 | Training on Maintenance for Water Resources Infrastructure, in Bandung on August 2016                | Output 2 |
| 006 | Training on Water Quality Management in Urban Rivers, in Jakarta on September 2016                   | Output 2 |
| 007 | Training on Operation & Maintenance for Irrigation, in Surabaya on October 2016                      | Output 2 |
| 008 | Training on River Rehabilitation, in Jakarta on November 2016                                        | Output 2 |
| 009 | Training on Assessment of BBWS's Performance for Benchmarking, in Solo on March 2017                 | Output 2 |
| 010 | Training on Sediment Management for Dam, in Yogyakarta on April 2017                                 | Output 2 |
| 011 | Training on Calculation of Water Balance for Water Allocation Planning, in Semarang on August 2017   | Output 2 |
| 012 | Training on Design of River Facility Structures, in Padang on September 2017                         | Output 2 |
| 013 | Training on RBO Performance Benchmarking for BBWS and BWS in West Region, in Palembang on April 2018 | Output 2 |
| 014 | Training on RBO Performance Benchmarking for BBWS and BWS in East Region, in Mataram on April 2018   | Output 2 |

**Annex 6-5 Reviewed Module as Certificated Official Regulation/Standard**

| No. | Titles                                                                                                      | Outputs  |
|-----|-------------------------------------------------------------------------------------------------------------|----------|
| 001 | Ministerial Regulation 17/PRT/M/2017 on Guidelines for the establishment of TKPSDA at the river basin level | Output 3 |
| 002 | Ministerial Regulation 27/PRT/M/2015 on Dam                                                                 | Output 3 |
| 003 | SNI 7847:2012 on Waste Water, Specification on Processing Result Part 1: Mud from Pulp and Paper Factories  | Output 3 |
| 004 | SNI 8065:2016 on analysis method and how to control water seepage for fill type dams                        | Output 3 |
| 005 | SNI 8283:2016 on Depth measurement method uses echo sounding to produce a bathymetry map                    | Output 3 |



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.001

Training on Dam Operation & Maintenance, in Malang on Feb. 2016





## Plan of “Training on Dam Operation & Maintenance”

Human Resources Development Agency of PUPR and Directorate General of Water Resources of PUPR, cooperation with JICA project, “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2”, will carry out a training on “Dam Operation & Maintenance”.

Government of Indonesia has started to build 65 dams in 5 years. Knowing effective ways to operate and maintain these dams will contribute to manage successfully water resources in Indonesia.

JICA RBO project will hold a training on “Dam Operation & Maintenance”.

Date : 2<sup>nd</sup> February 2016 (Tuesday) to 5<sup>th</sup> February 2016 (Friday)  
Time : 08:00 WIB – finish  
Number of Participants : Approximately 30  
Venue : Malang city area

Participants of this training will be able to have following technical knowledge and competence;

- a. Current status of laws, regulations, technical standards/guidelines for dam operation & maintenance by comparing with latest issues of dam operation & maintenance in Japan
- b. Using some examples of Japanese experience of integrated flood control by dams, the participants will learn about practical / proper way for managing low and high water as a dam operator.
- c. Knowledge of necessary items, best methods and suitable timing that is indicated by appropriate government agency for observing a dam that might be deformed by water pressure, dam body settlement (consolidation settlement) and foundation settlement. The course will also cover the data analysis for dam safety
- d. Important check points and methods for daily, periodical and emergency maintenance work for telecommunication, electrical and mechanical facilities.
- e. Basic knowledge of watershed conservation from examples of actual activities for water quality in Indonesia and Japan
- f. Structural and non-structural measures for sediment management
- g. Practical/concrete method and important check points on observation of dam safety and maintenance work of facilities for telecommunication, electricity and mechanical



through training at the sites

We would like to invite a staff from each agency, who is in charge of dam (or Water Resources Infrastructures) operation & maintenance. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Dam Operation & Maintenance

## 1. Time and Duration

From 2nd Feb. 2016 (Tue.) to 5th of Feb. 2016 (Fri.) , for 4 days

## 2. Venue

In Malang city area

- Classroom Lectures: In Malang City (Atria Hotel: Jl. Letjen S. Parman No. 87 - 89 - Malang)

- Field Study: Sutami Dan and Sengguruh Dam

## 3. Expected Participants

Staff from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: Over 3 years on Water Resources Management

- Current Responsibility: Operation / Maintenance of Dam and other Water Resources Infrastructures

## 4. Curriculum

| Day               | No. | Time          | Lecture                                                                           | Lecturer                                                                                                                                                                                                    | Minutes | JP |
|-------------------|-----|---------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>(2nd Feb.) |     | 08:00-        | Registration                                                                      |                                                                                                                                                                                                             |         |    |
|                   |     | 08:45 - 09:15 | Opening Remarks                                                                   | Prof. Dr. Ir. Anita Firmanti Eko Susetyowati, MT, Head of Human Resources Development Agency                                                                                                                |         |    |
|                   |     | 09:15 - 09:45 | Explanation on JICA Project                                                       | Miura Hirohisa, JICA Project Expert                                                                                                                                                                         |         |    |
|                   |     | 09:45 - 10:00 | General Information for Participants                                              | Secretariat Member                                                                                                                                                                                          |         |    |
|                   |     | 10:00 - 10:30 | Pre Test                                                                          | Secretariat Member                                                                                                                                                                                          |         |    |
|                   |     |               | Coffee Break                                                                      |                                                                                                                                                                                                             |         |    |
|                   | 1   | 10:45 - 12:15 | Outline of Dam O/M in Japan                                                       | Miura Hirohisa, JICA Project Expert                                                                                                                                                                         | 90      | 2  |
|                   |     |               | Lunch                                                                             |                                                                                                                                                                                                             |         |    |
|                   | 2   | 13:15 - 14:45 | Current Status of Dam O/M in Indonesia                                            | Ir. Joko Mulyono, ME, Head of Sub-dit of Operation and Maintenance of Dams and Lakes                                                                                                                        | 90      | 2  |
|                   |     |               | Coffee Break                                                                      |                                                                                                                                                                                                             |         |    |
| 2nd<br>(3rd Feb.) | 3   | 15:00 - 16:30 | Maintenance Work of Telecommunication/Electrical and Mechanical Facility in Japan | Mr. Sugiura Masahiro, JICA Short Term Expert (Deputy Director of International Affairs Division, Water Resources Engineering Department, Japan Water DGWR, PUPR Representative of PJT I JICA Project Expert | 90      | 2  |
|                   | 4   | 16:30 - 17:15 | Briefing on Field Study                                                           |                                                                                                                                                                                                             | 45      | 1  |
|                   | 5   | 08:00 - 10:00 | Travel to Sutami Dam                                                              |                                                                                                                                                                                                             | 270     | 6  |
|                   |     | 10:00 - 10:30 | General Explanation on Sutami and Lahor                                           | PJT I                                                                                                                                                                                                       |         |    |
|                   |     | 10:30 - 12:30 | Operation Room on Spillway (Maintenance Work) at Sutami Dam                       | PJT I                                                                                                                                                                                                       |         |    |
|                   |     |               | Crest of Dam Body (Dam Body Safety Observation) at Sutami Dam                     | PJT I                                                                                                                                                                                                       |         |    |
|                   |     |               | Telecommunication Equipment at Lahor Dam                                          | PJT I                                                                                                                                                                                                       |         |    |
|                   |     | 12:30 - 13:30 | Lunch                                                                             |                                                                                                                                                                                                             |         |    |
|                   | 6   | 13:30 - 14:00 | Travel to Sengguruh Dam                                                           |                                                                                                                                                                                                             | 270     | 6  |
|                   |     | 14:00 - 16:00 | Spoil Ship of Sedimentation                                                       | PJT I                                                                                                                                                                                                       |         |    |
|                   |     |               | Stockyard of Sedimentation                                                        | PJT I                                                                                                                                                                                                       |         |    |
|                   |     | 16:00 - 18:00 | Return to Malang                                                                  |                                                                                                                                                                                                             |         |    |
| 3rd<br>(4th Feb.) | 7   | 08:00 - 09:45 | Feedback of Field Study on 2nd Day                                                | DGWR, PUPR PJT I JICA Project Expert                                                                                                                                                                        | 105     | 2  |
|                   |     |               | Coffee Break                                                                      |                                                                                                                                                                                                             |         |    |
|                   | 8   | 10:00 - 11:30 | Dam Safety and Dam Body Observation                                               | Ir. Achmad Zubaedi, Head of Balai Bendungan, DGWR PUPR                                                                                                                                                      | 90      | 2  |
|                   |     |               | Lunch                                                                             |                                                                                                                                                                                                             |         |    |
|                   | 9   | 13:00 - 15:15 | Integrated Flood Control of Dams in Japan                                         | Miura, JICA Project Expert                                                                                                                                                                                  | 135     | 3  |
|                   |     |               | Coffee Break                                                                      |                                                                                                                                                                                                             |         |    |
| 4th<br>(5th Feb.) | 10  | 15:30 - 17:00 | Water Balance of Dam Reservoir and Operation                                      | Drs. Petrus Syariman MT, Hydrological Engineering Researcher, PUSAIR                                                                                                                                        | 90      | 2  |
|                   | 11  | 08:00 - 09:30 | Water Quality Management of Dam Reservoir in Japan                                | Miura, JICA Project Expert                                                                                                                                                                                  | 90      | 2  |
|                   |     |               | Coffee Break                                                                      |                                                                                                                                                                                                             |         |    |
|                   | 12  | 09:45 - 11:15 | Sediment Management in Indonesia                                                  | Ir. Imam Mardjianto, Dipl, HE, Head of Sub-dit of Operation and Maintenance of River and Coastal                                                                                                            | 90      | 2  |
|                   |     |               | Lunch                                                                             |                                                                                                                                                                                                             |         |    |
|                   |     | 13:15 - 13:45 | Post Test                                                                         | Secretariat Member                                                                                                                                                                                          |         |    |
|                   |     | 13:45 - 14:15 | Discussion and Question                                                           | JICA Project Expert, DGWR PUPR and Others                                                                                                                                                                   |         |    |
|                   |     | 14:15 - 14:30 | Evaluation of the training (Filling in Evaluation Sheet)                          | Secretariat Member                                                                                                                                                                                          |         |    |
|                   |     | 14:30 - 14:45 | Closing Remarks                                                                   | Ir. Lolly Martina Martief, MT, Director Directorate of Operation and Maintenance                                                                                                                            |         |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                 |
| Title            | Outline of Dam Operation and Maintenance (O/M) in Japan                                                                                                                                                                                                                                                           |
| Outline          | Dam O/M includes various aspects, flood control, water supply, observation of hydro meteorological data, facility maintenance, etc.<br>Required work as a good engineer / technician for dam O/M will be described and used as a example in the lecture.                                                          |
| Objective        | '-Introduction of framework and actual operation for dam O/M in Japan<br>-Comparing between Japanese and Indonesian case* to find differences in dam operation / maintenance which should be tackled for the improvement<br>*Indonesia case is described in lecture No.2 "Current Status of Dam O/M in Indonesia" |
| Lecturer         | MIURA Hirohisa,<br>JICA long term expert for the project on Capacity Development for RBOs in Integrated Water Resources Management in Indonesia (Phase 2)                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                 |
| Contents         | -Law, Standards, Guideline for Dam O/M<br>-Organizational and Financial System for Dam O/M<br>-Water Balance of Dam Reservoir Capacity (Distribution) for High and Low Water<br>-Observation and Inspection for Dam Safety                                                                                        |
| Textbook, Module | Power Point File "Outline of Dam operation and maintenance in Japan"<br>PowerPoint file, made by lecturer                                                                                                                                                                                                         |
| References       |                                                                                                                                                                                                                                                                                                                   |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                         |
| Title            | Current Status of Dam O/M in Indonesia                                                                                                                                                                                                                                                                                    |
| Outline          | <p>Dam O/M includes various aspects, flood control, water supply, observation of hydro meteorological data, facility maintenance, etc.</p> <p>Required work as a good engineer / technician for dam O/M will be described and used as a example in the lecture.</p>                                                       |
| Objective        | <p>-Introduction of framework and actual operation for dam O/M</p> <p>-Comparing between Japanese and Indonesian case* to find differences in dam operation / maintenance which should be tackled for the improvement</p> <p><small>*Japanese case is described in lecture No.1 "Outline of Dam O/M in Japan"</small></p> |
| Lecturer         | Ir. Joko Mulyono, ME, Head of Sub-dit of Operation and Maintenance of Dams and Lakes                                                                                                                                                                                                                                      |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                         |
| Contents         | <p>-Law, Standards, Guideline for Dam O/M</p> <p>-Organizational and Financial System for Dam O/M</p> <p>-Water Balance of Dam Reservoir Capacity (Distribution) for High and Low Water</p> <p>-Observation and Inspection for Dam Safety</p>                                                                             |
| Textbook, Module | Module No.35 (Dam Operation No.1: Dam and Its Complementary structure)                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                           |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Title            | Maintenance Work of Telecommunication / Electrical and Mechanical Facilities in Japan                                                                                                                                                                                                                                                                                                                                                                       |
| Outline          | Telecommunication / Electric and Mechanical Facilities, water level sensor, rain gauges, data transmission system, emergency generator and gates, are essential for good dam operation. However, it is said that B(B)WSs face lack of telecommunication / electric and mechanical engineers. Describing how the maintenance works for telecommunication / electric and mechanical facilities in Japan helps to improve their knowledge of the facility O/M. |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction telecommunication system and mechanical facilities for dam and maintenance works in Japan</li> <li>-Comparing between Japanese and current case in Indonesia, the participant will learn the importance of the facility maintenance and improve the maintenance works.</li> </ul>                                                                                                                      |
| Lecturer         | JICA Short Term Expert                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of Telecommunication / Electric and Mechanical Facilities for Dam Operation</li> <li>-Outline of Maintenance Work for Telecommunication / Electric and Mechanical Facilities</li> <li>-Actual Maintenance work, method of periodical check and inspection</li> </ul>                                                                                                                                        |
| Textbook, Module | Power Point File "Maintenance work for Telecommunication / Electric and Mechanical Facilities of Dam in Japan" made by lecturer                                                                                                                                                                                                                                                                                                                             |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                  |
| Title            | Briefing on Field Study                                                                                            |
| Outline          | Participants will receive suitable information about Sengguruh dam and Sutami dam before the lecture at the sites. |
| Objective        | -Sharing the information of Sengguruh dam and Sutami dam for before Field Study to have a productive lecture.      |
| Lecturer         | DGWR, PUPR<br>Representatives of PJT I<br>JICA Project Expert                                                      |
| Duration         | 45 minutes (1 JP)                                                                                                  |
| Contents         | -Outline of Sutami Dam, Lahor Dam and Sengguruh dam<br>-Schedule of Lecture at the sites on 2nd day                |
| Textbook, Module |                                                                                                                    |
| References       |                                                                                                                    |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Title            | Field Study at Sutami Dam and Lahor Dam on Dam Safety / Maintenance Work / Operation                                                                                                                                                                                                                                                                                                                                      |
| Outline          | Sutami Dam and Lahor Dam have been safely operated and properly maintained by PJT I. They have periodically conducted 1) Dam body observation (Deformation, Seepage), 2) Maintenance works for telecommunication and mechanical facilities (Water level sensor, gates). And also they have operated for low (Water distribution) and high water (Flood control). These works will be introduced with day to day examples. |
| Objective        | -Understanding practical observation method for dam safety<br>-Learning periodical maintenance work of facilities                                                                                                                                                                                                                                                                                                         |
| Lecturer         | from PJT I                                                                                                                                                                                                                                                                                                                                                                                                                |
| Duration         | 270 minutes (6 JP)                                                                                                                                                                                                                                                                                                                                                                                                        |
| Contents         | -Introduction of outline of Sutami Dam and Lahor Dam<br>-Description and practice of actual observation of 1) Deformation of dam body, 2) Seepage, for dam safety at Sutami Dam<br>-Description and demonstration of maintenance work for facilities of gate at Sutami Dam<br>-Description of maintenance work for facilities of water level sensor, rainfall gauge and telecommunication equipment at Lahor Dam          |
| Textbook, Module | Brochure of Sutami Dam and Lahor Dam                                                                                                                                                                                                                                                                                                                                                                                      |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                         |
| Title            | Field Study at Sengguruh Dam on Sediment Management                                                                                                                                                                                                                                                                                       |
| Outline          | Sengguruh Dam managed by PJT I has been faced with a severe sedimentation problem and pumped up the soil to solve the issue. By visiting the site, the participant will understand real sediment situation / condition and hope to come up with countermeasures and improve the knowledge.                                                |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding practical countermeasure method</li> <li>-Learning necessary survey / analysis for carrying out / management of countermeasures for sedimentation</li> </ul>                                                                                                                        |
| Lecturer         | from PJT I                                                                                                                                                                                                                                                                                                                                |
| Duration         | 270 minutes (6 JP)                                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction on outline of Sengguruh Dam and geological feature of its catchment area</li> <li>-Method of survey and analysis on sediment flow for planning countermeasure</li> <li>-Operational and mechanical system of spoil dredging</li> <li>-Plan of recycle / disposal of spoil</li> </ul> |
| Textbook, Module | Brochure of Sengguruh Dam                                                                                                                                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                                           |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                               |
| Title            | Feedback of Field Study on 2nd Day                                                                                                                                                                                                                                                                              |
| Outline          | Feedback session to present by participants on things learned from site visit at Sengguruh Dam and Sutami Dam for dam operation and maintenance especially how the participant can apply for their duty at their office. Participants are divided into several groups. Presentation will be done by each group. |
| Objective        | -Presentation on suitable and effective dam O/M works to apply their duty including planning / design of dam construction and operation and maintenance                                                                                                                                                         |
| Lecturer         | DGWR, PUPR<br>PJT I<br>JICA Project Expert                                                                                                                                                                                                                                                                      |
| Duration         | 105 minutes (2 JP)                                                                                                                                                                                                                                                                                              |
| Contents         | -Explanation on presentation and divide participants into several group (10 minutes)<br>-Discussion and making presentation material by each group (30 minutes)<br>-Presentation from each group (10 minutes * 6 groups = 60 minutes)                                                                           |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                 |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Dam Safety and Dam Body Observation                                                                                                                                                                                                                                                                                                                                                                              |
| Outline          | Dam body failures sometimes occurs and it causes significant damage at downstream of the dam. Periodically observation and evaluation of dam safety is essential to prevent such incidents from happening. Therefore, observation method and equipment, evaluation, inspection for dam safety will be discussed in the lecture to acquire enough knowledge for participants.                                     |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of basic mechanism of dam body failure to understand importance of dam safety management</li> <li>-Understanding necessary observation items and equipment</li> <li>-Understanding basic knowledge of evaluation on observed data</li> </ul>                                                                                                                |
| Lecturer         | Mr. Achmad Zubaedi, Head of Balai Bendungan, DGWR PUPR                                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Dam Safety Concept and Standard of dam body</li> <li>-Basic Mechanism of Fill Dam Body Failure, Slope Failure and Seepage</li> <li>-Evaluation on Condition of fill dam, especially seepage situation</li> <li>-Equipment for Measurement Structural Condition of Concrete Dam</li> <li>-Equipment for Measurement Foundation (Geographical) Condition of Dam</li> </ul> |
| Textbook, Module | <p>Module No.40 (Dam Operation No. 6: Dam Safety Concept)</p> <p>Module No.41 (Dam Operation No.7: Evaluation on Condition of Seepage at Fill Dam)</p> <p>Module No.43 (Dam Operation No.9: Equipment for Concrete Dam Maintenance)</p> <p>Module No.44 (Dam Operation No.10: Geotechnical Equipment for Dam)</p> <p>Module No.45 (Dam Operation No.11: Soil Mechanic on Dam)</p>                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                 |
| Title            | Integrated Flood Control by Dams in Japan                                                                                                                                                                                                                                                                                                         |
| Outline          | Several dams in a river basin should be coordinated to implement "Best Possible Operation" in order to control rivers in a basin from flooding using dams. Examples from real case in Japan of integrated dams operation will be explained in the lecture for integrated dams operation for the future in Indonesia.                              |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of coordination and operation among several dams for flood control in Japan</li> <li>-Comparing between Japanese and current case in Indonesia, the participant will learn the importance of the coordination system and improve the operation work for integrated dam management</li> </ul> |
| Lecturer         | MIURA Hirohisa,<br>JICA long term expert for the project on Capacity Development for RBOs in Integrated Water Resources Management in Indonesia (Phase 2)                                                                                                                                                                                         |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Organizations Structure for Integrated, Coordinated Dam Operation</li> <li>-Practical Example of Integrated Dams (7 Dam, 1 Barrage and 1 Lake) Flood Control in Typhoon No.18, 2013 in Japan</li> </ul>                                                                                                   |
| Textbook, Module | Power Point "Flood Control for Typhoon No.18 at YODO River Basin in 2013" made by lecturer                                                                                                                                                                                                                                                        |
| References       |                                                                                                                                                                                                                                                                                                                                                   |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Water Balance of Dam Reservoir and Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Outline          | <p>Water Balance of Dam Reservoir Capacity should be calculated and analyzed for adequate implementation of water supply to downstream and flood control. However, a lot of dams are faced huge sedimentation. It is essential to observe current sedimentation volume in Reservoir for adequate calculation of water balance of dam reservoir capacity and planning for water supply and flood control.</p> <p>In this lecture, participants will understand basic knowledge on water balance of dam reservoir capacity and operation. And example of bathymetry survey on sedimentation is also described in the lecture for participants.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding basic knowledge on water balance of dam reservoir and operation</li> <li>-Introduction on bathymetry survey and calculation practice of sedimentation volume</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Lecturer         | Drs. Petrus Syariman MT, Hydrological Engineering Researcher, PUSAIR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Water Balance of Dam Reservoir (Capacity and Distribution)</li> <li>-Reservoir Operation</li> <li>-Introduction on Bathymetry Survey and Calculation Practice of Sedimentation Volume</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                         |
| Textbook, Module | Module No.46 (Dam Operation No.12: Hydrology for Dam Operation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Title            | Water Quality Management of Dam Reservoir in Japan                                                                                                                                                                                                                                                                                                                                                                                                 |
| Outline          | <p>Water quality management should be conducted to monitor and keep the water quality at an acceptable level in a dam reservoir for water supply and environment conservation.</p> <p>The session will focus on water quality management in Japan, periodical patrol, water sampling for analysis and installation / operation of water quality conservation facility to acquire basic knowledge on water quality management of dam reservoir.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of water quality management of dam reservoirs in Japan</li> <li>-Comparing between Japanese and current case in Indonesia, the participant will learn the importance of the water quality management of dam reservoirs in Indonesia.</li> </ul>                                                                                                                                               |
| Lecturer         | <p>MIURA Hirohisa,</p> <p>JICA long term expert for the project on Capacity Development for RBOs in Integrated Water Resources Management in Indonesia (Phase 2)</p>                                                                                                                                                                                                                                                                               |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>-Laws and Regulations on Water Quality</li> <li>-River Water Quality Management</li> <li>-Reservoirs Water Quality Management</li> </ul>                                                                                                                                                                                                                                                                    |
| Textbook, Module | <p>Power Point File "Water Quality Management of Dam Reservoir in Japan" made by lecturer</p> <p>Module No.60 (Water Quality Management No.6: Study and Program Compilation of Water Quality Management Program)</p>                                                                                                                                                                                                                               |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 12                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Title            | Sediment Management in Indonesia                                                                                                                                                                                                                                                                                                                                                                                           |
| Outline          | A number of dams in Indonesia have been faced with sedimentation problem. Countermeasures for sedimentation have been installed and constructed such as Sabo dam, check dam and spoil dredger, etc. Some of these countermeasures will be introduced in the session and it will also cover the analysis/calculation of sediment flow for planning storage capacity of sediment in reservoir and effective countermeasures. |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding existing countermeasures for sedimentation</li> <li>-Learning basic method of analysis and calculation of sediment flow for planning storage capacity of sediment in reservoir and effective countermeasures</li> </ul>                                                                                                                                              |
| Lecturer         | Ir. Imam Mardjianto, Dipl, HE, Head of Sub-dit of Operation and Maintenance of River and Coastal                                                                                                                                                                                                                                                                                                                           |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                          |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction on existing Countermeasures for sedimentation</li> <li>-Description of reservoir location and its catchment area</li> <li>-Method of sampling/analysis sediment for calculation of sediment flow</li> <li>-Topography measurement and bathymetry</li> <li>-Calculation of storage capacity of sediment in reservoir capacity</li> </ul>                               |
| Textbook, Module | Module No.42 (Dam Operation No. 8: Sedimentation of Dam)                                                                                                                                                                                                                                                                                                                                                                   |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                            |



## Pre Post Test Training on Dam Operation & Maintenance

### 1. Legal Framework for Dam Operation & Maintenance (20 points = 4 points \* 5 answers)

1) Fill in laws, regulation and its description on dam operation & maintenance

No. :

Year:

Title:

Description:

No. :

Year:

Title:

Description:

No. :

Year:

Title:

Description:

No. :

Year:

Title:

Description:

No. :

Year:

Title:

Description:



**2. Maintenance Works for Facilities (20 points = 4 points \* 5 answers)**

1) Fill in dam facilities and its important points of maintenance works

Name of Facility:

Important points of maintenance works:

Name of Facility:

Important points of maintenance works:

Name of Facility:

Important points of maintenance works:

Name of Facility:

Important points of maintenance works:

Name of Facility:

Important points of maintenance works:

**3. Dam Body Observation for Dam Safety (30 points = 10 points \* 3 answers)**

1) Fill in required observation items, its purpose, its frequency, its method and data analysis method  
for dam body observation of fill and earth type dam

Observation item:

Purpose of observation:

Observation Frequency:

Observation Method:

Data Analysis Method:

-----



Observation item:

Purpose of observation:

Observation Frequency:

Observation Method:

Data Analysis Method:

-----

Observation item:

Purpose of observation:

Observation Frequency:

Observation Method:

Data Analysis Method:

-----

**4. Water Balance of Dam Reservoir (10 points)**

- 1) Fill in necessary hydro-meteorological data for calculation of inflow into dam reservoir, and its calculation method (formulation)

Necessary data items:

Calculation method:

**5. Sediment Management (20 points = 5 points \* 4 answers)**

- 1) Fill in structural and non-structural measures and its descriptions for mitigation of sedimentation into dam reservoir

Name of measure:

Description:



Name of measure:

Description:

Name of measure:

Description:

Name of measure:

Description:

END



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.002

Training on Water Allocation, in Makassar, on Feb. 2016





## Plan of “Training on Water Allocation”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “Water Allocation”.

Government has issued Regulation No.69/PP/2014, “Water Use Right” and PUPR has issued Ministerial Regulation No. 08/PRT/M/2014, “Guideline on Calculation of Fee for Water Resources Management of Domestic Water, Industrial Water, Hydropower Water, Agriculture Water and Business Water (hereinafter referred to as Water Service Fee). Better coordination with water users for water allocation and distribution are strongly recommended for effective implementation of Water Use Right and Water Service Fee system.

Therefore, JICA RBO project will hold a training on “Water Allocation”.

|                        |                                                                                  |
|------------------------|----------------------------------------------------------------------------------|
| Date                   | : 23 <sup>rd</sup> February 2016 (Tue.) to 26 <sup>th</sup> February 2016 (Fri.) |
| Time                   | : 08:00 WIB – finish                                                             |
| Number of Participants | : Approximately 33                                                               |
| Venue                  | : Makassar City Area                                                             |

Participants of this training will be able to have following technical knowledge and competence;

- a. Current status of laws, regulations, technical standards/guidelines for Water Allocation, Water Use Right (SIPA) and Water Service Fee by comparing with issues on Water Allocation, Water Use Right and Burden Charge of Water users (Water Service Fee) in Japan
- b. Knowledge of methodology of analysis and calculation for Water Balance and technical knowledge of necessary items for Water Balance, such as inflow (afflux) with precipitation, surface and ground inflow, outflow (effluent) with evapotranspiration, surface and ground outflow
- c. Using examples of Japanese system of Water Use Right and Water Service Fee, the participants will learn about practical / proper way for managing Water Allocation as a water resource manager.



- d. Knowledge of necessary items and suitable method for checking and permitting Water Use Right with SIPA (System of water use permit), calculation and coordination with water users on Water Service Fee
- e. Using practical examples of daily and periodical coordination with water users and stakeholders for water distribution management based on water allocation plan and Water Service Fee collection, the participants will learn about practical / proper way for managing water distribution and coordination for Water Service Fee as a water resource manager
- f. Adequate and effective coordination for water users and stakeholders for various issues on Water Allocation
- g. Practical/concrete method of operation and coordination for water distribution, and important check points on intake water management by water users for implementation of evaluation of water allocation, water service fee calculation

We would like to invite a staff from each agency, who is in charge of dam (or Water Resources Infrastructures) operation & maintenance. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Water Allocation

## 1. Time and Duration

From 23rd Feb. 2016 (Tue.) to 26th of Feb. 2016 (Fri.) , for 4 days

## 2. Venue

In Makassar city area

- Classroom Lectures: Best Western Hotel Makassar

- Field Study: Bili Bili Dam / Irrigation Area and PDAM Makassar / Intake Point (WTP)

## 3. Expected Participants

Staff from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: Over 3 years on Water Resources Management

- Current Responsibility: Operation / Maintenance or Management of Water Resources

## 4. Curriculum

| Day                | No. | Time          | Lecture                                                                              | Lecturer                                                                                                                                                                                   | Minutes | JP |
|--------------------|-----|---------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>(23rd Feb.) |     | 08:00-        | Registration                                                                         |                                                                                                                                                                                            |         |    |
|                    |     | 08:45 - 09:30 | Opening Remarks                                                                      | Prof. Dr. Ir. Anita Firmanti Eko<br>Susetyowati, MT, Head of Human<br>Resources Development Agency<br>Mr. Ishigaki Shigeki, JICA Advisor for<br>Disaster Management and Water<br>Resources |         |    |
|                    |     | 09:30 - 09:45 | General Information for Participants                                                 | Secretariat Member                                                                                                                                                                         |         |    |
|                    |     |               | Coffee Break                                                                         |                                                                                                                                                                                            |         |    |
|                    |     | 10:15 - 10:45 | Pre Test                                                                             | Secretariat Member                                                                                                                                                                         |         | 0  |
|                    | 1   | 10:45 - 12:15 | Calculation and Preparation of Water Balance<br>in Indonesia                         | Dr. Eka, Head Sub-dit of Hydrology &<br>Environment of Water Resources,<br>Directorate of Water Resources<br>management                                                                    | 90      | 2  |
|                    |     |               | Lunch                                                                                |                                                                                                                                                                                            |         |    |
|                    | 2   | 13:15 - 14:45 | Water Use Right and Water User Charge for<br>O/M in Japan                            | Mr. Moriyasu Kunihiro, JICA Expert on<br>IWRM                                                                                                                                              | 90      | 2  |
|                    |     |               | Coffee Break                                                                         |                                                                                                                                                                                            |         |    |
|                    | 3   | 15:00 - 16:30 | Water Allocation Planning and Current Status                                         | Sudarsono, ATP, CES, Functional Officers<br>of Water Resources Management,<br>Directorate of Operation & Maintenance                                                                       | 90      | 2  |
| 2nd<br>(24th Feb.) | 4   | 09:00 - 10:30 | SIPA (Water Use Permit System)                                                       | Ir. Saroni Soegiarto, ME, Head Sub-dit of<br>Water Resources Utilization, Directorate of<br>Water Resources Management                                                                     | 90      | 2  |
|                    |     |               | Coffee Break                                                                         |                                                                                                                                                                                            |         |    |
|                    | 5   | 10:45 - 12:15 | Legal Aspect of Water Service Fee System<br>and Coordination                         | Ir. Triyono Tulus Setyawan, M. Eng , Head<br>Sub-dit of Water Resources Institution,<br>Directorate of Water Resources<br>Management                                                       | 90      | 2  |
|                    |     |               | Lunch                                                                                |                                                                                                                                                                                            |         |    |
|                    | 6   | 13:30 - 15:45 | Water User Coordination and Water<br>Distribution Management for Irrigation in Japan | Mr. Ochii Yasuhiro, JICA Short Term<br>Expert (Senior Engineer, Water Resources<br>Engineering Department, Japan Water<br>Agency)                                                          | 135     | 3  |
|                    |     |               | Coffee Break                                                                         |                                                                                                                                                                                            |         |    |
| 3rd<br>(25th Feb.) | 8   | 08:00 - 12:30 | Field Study at Bili-Bili Dam and Irrigation<br>Areas                                 | DGWR, PUPR,<br>Ir. Agus Setiawan, Dipl. HE, Head of<br>BBWS Pompengan Jeneberang,<br>Representative of PDAM Makassar,<br>JICA Project Expert                                               | 270     | 6  |
|                    |     |               | Lunch                                                                                |                                                                                                                                                                                            |         |    |
|                    | 9   | 13:30 - 18:00 | Field Study at PDAM Makassar and Intake<br>Point (WTP)                               | BBWS Pompengan Jeneberang (Bili-Bili<br>Dam Office),<br>PDAM Makassar                                                                                                                      | 270     | 6  |
| 4th<br>(26th Feb.) | 10  | 08:00 - 09:45 | Feedback of Field Study on 2nd Day                                                   | DGWR, PUPR<br>JICA Project Expert                                                                                                                                                          | 105     | 2  |
|                    |     |               | Coffee Break                                                                         |                                                                                                                                                                                            |         |    |
|                    | 11  | 10:00 - 11:30 | Calculation and Collection of Water Service<br>Fee                                   | Raymond Valiant, ST MT, Director for<br>Technical Affairs, PJT I                                                                                                                           | 90      | 2  |
|                    |     |               | Lunch                                                                                |                                                                                                                                                                                            |         |    |
|                    | 12  | 13:00 - 14:30 | Water User Coordination for Water Allocation                                         | Raymond Valiant, ST MT, Director for<br>Technical Affairs, PJT I                                                                                                                           | 90      | 2  |
|                    |     | 14:30 - 15:00 | Post Test                                                                            | Secretariat Member                                                                                                                                                                         |         |    |
|                    |     |               | Coffee Break                                                                         |                                                                                                                                                                                            |         |    |
|                    |     | 15:15 - 15:45 | Discussion and Question                                                              | DGWR, PUPR<br>JICA Project Expert                                                                                                                                                          |         |    |
|                    |     | 15:45 - 16:00 | Evaluation of the training (Filling in Evaluation<br>Sheet)                          | Secretariat Member                                                                                                                                                                         |         |    |
|                    |     | 16:00 - 16:15 | Closing Remarks                                                                      | Dr. Ir. Agus Suprpto Kusmulyono,<br>Director Directorate of Water Resources<br>Management                                                                                                  |         |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                              |
| Title            | Calculation and Preparation of Water Balance in Indonesia                                                                                                                                                                                                                                      |
| Outline          | Water Allocation is based on Water Balance. There are a number of points to cover for analysis and calculation of Water balance. The course will aim to provide sufficient information to the participants to make their own Water Balance.                                                    |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding methodology of analysis and calculation for Water Balance</li> <li>-Acquire basic knowledge on precipitation, evapotranspiration, run-off for Water Balance</li> </ul>                                                                   |
| Lecturer         | Dr. Eka, Head Sub-dit of Hydrology & Environment of Water Resources, Directorate of Water Resources management                                                                                                                                                                                 |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                              |
| Contents         | <ul style="list-style-type: none"> <li>-Methodology of analysis and calculation of Water Balance</li> <li>-How to analysis and calculation of inflow (afflux) with precipitation, surface and ground inflow, outflow (effluent) with evapotranspiration, surface and ground outflow</li> </ul> |
| Textbook, Module |                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                    |
| Title            | Water Use Right and Water User Charge for O/M in Japan                                                                                                                                                                                                                                               |
| Outline          | Knowledge on Water Use Right and Water Service Fee are essential for Water Allocation Planning and Management. Using examples of Water Use Right and Water User Charge in Japan, participant will understand deeply on Water Use Right and Water Service Fee.                                        |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of Water Use Right and User Charge of Water Users System in Japan</li> <li>-Comparing between Japanese and current case in Indonesia, the participant will learn effective points to apply their duty on Water Allocation Management</li> </ul> |
| Lecturer         | Mr. Moriyasu Kunihiro, JICA Expert on IWRM                                                                                                                                                                                                                                                           |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                    |
| Contents         | <ul style="list-style-type: none"> <li>-Water Use Right in Japan</li> <li>-User Charge of Water Users in Japan</li> <li>-Comparing between Indonesian case and Japanese case</li> </ul>                                                                                                              |
| Textbook, Module | Power Point File made by Lecturer<br>Module No.12 (River Basin Water Allocation Management No.1: Water Use Right)<br>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)                                                          |
| References       |                                                                                                                                                                                                                                                                                                      |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Title            | Water Allocation Planning and Current Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Outline          | There are a number of points to cover for an effective Water Allocation Planning. The course will aim to provide sufficient information to the participants to make their own water allocation plan.                                                                                                                                                                                                                                                                                                                                     |
| Objective        | <ul style="list-style-type: none"> <li>-Using example of existing Water Allocation Plan in Indonesia, participants will understand detail of Water Allocation Planning</li> <li>-Understanding Current Status of Law, Regulation on Water Allocation</li> <li>-Acquire basic knowledge on Institutional / Stakeholders Coordination and River Maintenance Flow for Water Allocation Planning</li> </ul>                                                                                                                                  |
| Lecturer         | Sudarsono, ATP, CES, Functional Officers of Water Resources Management, Directorate of Operation & Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Law, Regulation and Guideline on Water Allocation planning</li> <li>-Definition on River Maintenance Flow</li> <li>-Example of existing Water Allocation Plan in Indonesia</li> </ul>                                                                                                                                                                                                                                                                                                            |
| Textbook, Module | <p>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)</p> <p>Module No.14 (River Basin Water Allocation Management No.3: Management of Maintenance Flow)</p> <p>Module No.15 (River Basin Water Allocation Management No.4: Annual Water Allocation Flow)</p> <p>Module No.18 (River Basin Water Allocation Management No.7: Detail of Water Allocation Plan)</p> <p>Module No.19 (River Basin Water Allocation Management No.8: Modeling Water Allocation Plan)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Title            | SIPA (Water Use Permit System)                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Outline          | <p>Water Service Fee will start at B(B)WS for effective WRM. It is related strongly with Water Use Right and SIPA.</p> <p>In this lecture, details of SIPA system and procedure will be explained. Participants will be able to understand SIPA system deeply.</p>                                                                                                                                                                                |
| Objective        | <p>-Understanding detail content of Government Regulation on Water Use Right (No.69/PP/2014)</p> <p>-Using demonstrations, participants will understand procedure and practical method of licensing of Water Use Right</p>                                                                                                                                                                                                                        |
| Lecturer         | Ir. Saroni, Head Sub-dit of Water Resources Utilization, Directorate of Water Resources Management                                                                                                                                                                                                                                                                                                                                                |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Contents         | <p>-Regulation on Water Use Right (No.69/PP/2014)</p> <p>-Procedure of Licensing of Water Use Right</p>                                                                                                                                                                                                                                                                                                                                           |
| Textbook, Module | <p>Module No.12 (River Basin Water Allocation Management No.1: Water Use Right)</p> <p>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)</p> <p>Module No.14 (River Basin Water Allocation Management No.3: Management of Maintenance Flow)</p> <p>Module No.16 (River Basin Water Allocation Management No.5: Monitoring and Evaluation of Water Allocation Management)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                |
| Title            | Legal Aspect of Water Service Fee System and Coordination                                                                                                                                                                                        |
| Outline          | Water Service Fee will start at B(B)WS for effective WRM.<br>In this lecture, legal aspect of Water Service Fee system and procedure of coordination will be explained. Participants will be able to understand Water Service Fee system deeply. |
| Objective        | -Understanding detail content of Ministerial Regulation on Water Service Fee (No.8/PRT/M/2014)<br>-Introduction on procedure of coordination on registration for Water Service Fee                                                               |
| Lecturer         | Ir. Triyono Tulus Setyawan, M. Eng , Head Sub-dit of Water Resources Institution, Directorate of Water Resources Management                                                                                                                      |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                |
| Contents         | -Regulation on Water Service Fee (No.8/PRT/M/2014)<br>-Procedure of Coordination on registration for Water Service Fee                                                                                                                           |
| Textbook, Module | Module No.12 (River Basin Water Allocation Management No.1: Water Use Right)<br>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)                                           |
| References       |                                                                                                                                                                                                                                                  |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Water User Coordination and Water Distribution Management for Irrigation in Japan                                                                                                                                                                                                                                                                                                                                                                                   |
| Outline          | In Japan and Indonesia, managers for water resources infrastructure do their daily operation of water distribution based on Water Allocation Plan and on the demand of water users by coordination of water users. These activities will be focused in this session.                                                                                                                                                                                                |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of practical / daily / periodical coordination with water users and stakeholders for water supply in Japan</li> <li>-Introduction of practical and daily management of water distribution for irrigation, industry and drinking water with water users in Japan</li> <li>-Comparing between Japanese case and current case in Indonesia to find importance and necessary works for water allocation</li> </ul> |
| Lecturer         | Mr. Ochii Yasuhiro, JICA Short Term Expert (Senior Engineer, Water Resources Engineering Department, Japan Water Agency)                                                                                                                                                                                                                                                                                                                                            |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of Irrigation Canal System in Japan</li> <li>-Daily Coordination with Water Users for Water Distribution Management/Operation/Maintenance</li> <li>-Introduction on Project of Irrigation System Improvement for Irrigation Water Rationalization</li> </ul>                                                                                                                                                        |
| Textbook, Module | <p>Power Point File made by lecturer</p> <p>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)</p> <p>Module No.16 (River Basin Water Allocation Management No.5: Monitoring and Evaluation of Water Allocation Management)</p> <p>Module No.17 (River Basin Water Allocation Management No.6: Drought Management)</p>                                                                          |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Syllabus

|                  |                                                                                                                                                                              |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                            |
| Title            | Briefing on Field Study                                                                                                                                                      |
| Outline          | Participants will receive suitable information about Bili-Bili dam, Irrigation area and Water Allocation Plan of Jeneberang River before the lecture at the sites.           |
| Objective        | -Sharing the information of Bili-Bili dam, Irrigation area, PDAM Makassar and Water Allocation Plan of Jeneberang River for before Field Study to have a productive lecture. |
| Lecturer         | from DGWR, PUPR<br>Ir. Agus Setiawan, Dipl. HE, Head of BBWS Pompengan Jeneberang<br>Representative of PDAM Makassar<br>JICA Project Expert                                  |
| Duration         | 45 minutes (1 JP)                                                                                                                                                            |
| Contents         | -Outline of Bili-Bili dam and Irrigation Project<br>-Outline of Water Allocation Plan in Jeneberang River<br>-Schedule of Lecture at the sites on 2nd day                    |
| Textbook, Module |                                                                                                                                                                              |
| References       |                                                                                                                                                                              |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                                                                                                  |
| Title            | Field Study at Bili-Bili Dam and Irrigation Areas                                                                                                                                                                                                                                                                                                                                  |
| Outline          | Bili-Bili Dam managed by BBWS Pompengan Jeneberang has implemented operation for water supply and stakeholders coordination following water allocation plan. P3A also has implemented adequate management of intake and distribution of water. Participants will acquire knowledge using examples of practical operation and management work following water allocation plan.      |
| Objective        | <ul style="list-style-type: none"> <li>-To know practical operation of Bili-Bili Dam on water distribution (supply) for water users (stakeholders) following water allocation plan as a water providers</li> <li>-To acquire example of stakeholders coordination method</li> <li>-To understand management of water intake and distribution for irrigation area by P3A</li> </ul> |
| Lecturer         | from BBWS Pompengan Jeneberang (Bili-Bili Dam Office),<br>from P3A of Irrigation Areas (Dinas Kabupaten GOWA)                                                                                                                                                                                                                                                                      |
| Duration         | 270 minutes (6 JP)                                                                                                                                                                                                                                                                                                                                                                 |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction of outline of Bili-Bili Dam and its Water Allocation and operation for Water Distribution</li> <li>-Coordination with Stakeholders, P3A</li> <li>-Management of water intake and distribution for irrigation area</li> </ul>                                                                                                  |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                                    |

## Syllabus

|                  |                                                                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                   |
| Title            | Field Study at PDAM Makassar and Intake Point (WTP)                                                                                                                                                                 |
| Outline          | PDAM Makassar has managed intake distribution for drinking water for a water consumers. Participants will acquire knowledge using examples of practical management work of water user in business sector.           |
| Objective        | <ul style="list-style-type: none"> <li>-To understand management of water intake and distribution for drinking water by PDAM Makassar City</li> <li>-To know procedure and technology of water treatment</li> </ul> |
| Lecturer         | from BBWS Pompengan Jeneberang (Bili-Bili Dam Office),<br>from PDAM Makassar                                                                                                                                        |
| Duration         | 270 minutes (6 JP)                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>-Management and operation of water supply system for drinking water by PDAM Makassar</li> <li>-Introduction of procedure and technology of water treatment</li> </ul>        |
| Textbook, Module |                                                                                                                                                                                                                     |
| References       |                                                                                                                                                                                                                     |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Feedback of Field Study on 2nd Day                                                                                                                                                                                                                                                                                                                                |
| Outline          | Feedback session to present by participants on things learned from site visit at Bili Bili Dam, Bili Bili Irrigation area and Water Treatment Plant of PDAM Makassar City for Water Allocation especially how the participant can apply for their duty at their office.<br>Participants are divided into several groups. Presentation will be done by each group. |
| Objective        | -Presentation on suitable and effective water allocation works to apply their duty including planning / operation / coordination with stakeholders                                                                                                                                                                                                                |
| Lecturer         | JICA Experts, DGWR PUPR                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 105 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                |
| Contents         | -Explanation on presentation and divide participants into several group (10 minutes)<br>-Discussion and making presentation material by each group (30 minutes)<br>-Presentation from each group (10 minutes * 6 groups = 60 minutes)                                                                                                                             |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                   |
| References       |                                                                                                                                                                                                                                                                                                                                                                   |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Calculation and Collection of Water Service Fee                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Outline          | PJT I and II already have implemented collecting water service fee from water users for water resource O/M. Management area by PJT I has been expanded and PJT I starts coordination with stakeholders and water users on water allocation and collecting water service fee in river basins that are regulated as new management area by PJT I. Experiences of PJT I on calculation and collection of Water Service Fee are shared and transfer to participants in this lecture. |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of practical procedure of calculation and collection on water service fee</li> <li>-Using demonstration, participants will understand deeply method of calculation and collection of Water Service Fee</li> </ul>                                                                                                                                                                                                           |
| Lecturer         | Raymond Valianrt, ST MT, Director for Technical Affairs, PJT I                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Regulation on Water Service Fee Calculation and Collection (No.8/PRT/M/2014)</li> <li>-Example and demonstration of Water Service Fee Calculation</li> <li>-Practical Procedure of Water Service Fee Collection from Water Users in Business Field</li> </ul>                                                                                                                                                                            |
| Textbook, Module | <p>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)</p> <p>Module No.16 (River Basin Water Allocation Management No.5: Monitoring and Evaluation of Water Allocation Management)</p> <p>Module No.17 (River Basin Water Allocation Management No.6: Drought Management)</p>                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Title            | Water User Coordination for Water Allocation                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Outline          | PJT I and II already have implemented collecting water service fee from water users for water resource O/M. Management area by PJT I has been expanded and PJT I starts coordination with stakeholders and water users on water allocation and collecting water service fee in river basins that are regulated as new management area by PJT I. Experiences of PJT I on Water User Coordination of Water Allocation are shared and transfer to participants in this lecture. |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of practical procedure and difficulty of coordination with water users on water allocation</li> <li>-Participants will refer to practical experiences of PJT I for their duty on water allocation</li> </ul>                                                                                                                                                                                                            |
| Lecturer         | Raymond Valianrt, ST MT, Director for Technical Affairs, PJT I                                                                                                                                                                                                                                                                                                                                                                                                               |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Coordination of Water Users on Water Allocation with BBWS</li> <li>-Practical Procedure on Periodical Water User Coordination for Water Allocation</li> </ul>                                                                                                                                                                                                                                                                        |
| Textbook, Module | <p>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)</p> <p>Module No.16 (River Basin Water Allocation Management No.5: Monitoring and Evaluation of Water Allocation Management)</p> <p>Module No.17 (River Basin Water Allocation Management No.6: Drought Management)</p>                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



## Pretest Training on Water Allocation

### 1. Legal Framework for Water Allocation (20 Points = 5 points \* 4 Answers)

Fill in laws, regulation and its description on Water Allocation (including SIPA and Water Service Fee).

No. : UU No.11

Year: 1974

Title: Water Resources

Description: \_\_\_\_\_  
\_\_\_\_\_

No. : PP No.22

Year: 1982

Title: Water Resources Management (Tata Pengaturan Air)

Description: \_\_\_\_\_  
\_\_\_\_\_

No. : PP No.69

Year: 2014

Title: Water Use Right (Hak Guna Air)

Description: \_\_\_\_\_  
\_\_\_\_\_

No. : PP No.121

Year: 2015

Title: Water Resources Exploitation (Pengusahaan Sumber Daya Air)

Description: \_\_\_\_\_  
\_\_\_\_\_

No. : PRT/M No.06

Year: 2015

Title: Exploitation and Maintenance of Water Resources and Irrigation structure (Eksplorasi dan  
Pemeliharaan Sumber Air dan Bangunan Pengairan)

Description: \_\_\_\_\_  
\_\_\_\_\_



No. : PRT/M No.09

Year: 2015

Title: Water Resources Utilization (Penggunaan Sumber Daya Air)

Description:

No. : PRT/M No.18

Year: 2015

Title: Frame for Fee of Exploitation and Maintenance of water resources (Iuran Eksploitasi dan Pemeliharaan Bangunan Pengairan)

Description:

No. : PRT/M No.50

Year: 2015

Title: Permission of Water Resources Use (Izin Penggunaan Sumber Daya Air)

Description:

No. : PRT/M No.01

Year: 2016

Title: Licensing Procedure for Water Resources Exploitation and Use (Tata Cara Perizinan Pengusahaan Sumber Daya Air dan Penggunaan Sumber Daya Air)

Description:

## 2. Water Balance Calculation (10 points)

Fill in necessary data for calculation of Water Balance, and its calculation method.

Necessary data items: **For Water Availability Calculation;** Precipitation, Streamflow (Discharge),  
Evapotranspiration and Change of storage quantity

**For Water Demands Calculation;**

**Irrigation demand** (Irrigation Area, Crop Intensity, Standard Water Consumption), **Drinking Water Demand** (Population, Standard Water Requirement l/person/day), **Industrial Water** (Category of factory scale, Products), **Aquaculture Water Demand** (Standard of Water Needs, Aquaculture Pond Area), **Livestock Water Demand** (Kind of livestock, Number of livestock, Standard of water needs), **Hydropower Water Demand**



(Requirement of power output, Generator Capacity, head, Type of Power  
Generation), River Maintenance Flow Volume

Calculation method: Water Use Identification Survey – Water Balance Schematic – Water Availability  
Calculation – Water Demand Calculation – Water Balance Calculation – Water  
balance Report  
Simple formulation for analysis of Water Balance;  $P = D + E + \Delta s$   
P: Precipitation, D: Discharge, E: Evapotranspiration,  $\Delta s$ : Change of Storage  
Quantity

### 3. Water Allocation Planning (15 points = 3 points \*5 Answers)

Fill in principals for planning of water allocation, and the descriptions.

Principal: Justice, Fairness

Description:

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Principal: Environmental Protection / Conservation

Description:

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Principal: Priority of Development

Description:

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Principal: Balance between Water Supply and Demand

Description:

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Principal: Promotion of Effective Water Use

Description:

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**4. SIPA (Water Use Permission) (20 points = 5 points \* 4 answers)**

Fill in procedure for SIPA, and the description on each step.

**Step 1**

Title of step: Request of technical recommendation from applicant to B(B)WS

Description: Applicant makes application document on water use permission and submit it to B(B)WS  
to receive technical recommendation.

**Step 2**

Title of step: Giving technical recommendation from B(B)WS to applicant

Description: B(B)WS make technical recommendation on application document on water use  
permission to applicant.

**Step 3**

Title of step: Applying by online or manual

Description: Applicant submit applying document with information on name and address of applicant,  
purpose of water use, location of intake and place of use, proof of payment.

**Step 4**

Title of step: Initial evaluation

Description: Initial evaluation is conducted for checking; applicant is eligible or not eligible for water  
use.

**Step 5**

Title of step: Verification

Description: Verification for application is conducted to make technical suggestion; technical  
recommendation for rejection (disapproval) or technical possibility for giving permission  
(approval).

**Step 6**

Title of step: Decision for application

Description: Minister of PUPR or Director General of Water Resources issues approval or disapproval  
for application on water use to applicant as an official ordinance.

**5. Water Service Fee System (20 Points = 5 points \* 4 answers)**

Fill in necessary data for calculation of Water Service Fee, and the calculation method in each water  
user.



### For Industry Water User

Necessary data items: Total Required Cost for Water Resources Management (Rp),

Economic Benefit Value (%),

Total Volume of Water Use for Industrial Business Activity (m3)

Calculation method: Total Required Cost for WRM (Rp) \* Economic Benefit Value (%) / Total Water

Use (m3) = Water Service Fee (Rp/m3)

### For Drinking Water User

Necessary data items: Total Required Cost for Water Resources Management (Rp),

Economic Benefit Value (%),

Total Volume of Water Use (m3)

Calculation method: Total Required Cost for WRM (Rp) \* Economic Benefit Value (%) / Total Water

Use (m3) = Water Service Fee (Rp/m3)

### For Hydropower Water User

Necessary data items: Total Required Cost for Water Resources Management (Rp),

Economic Benefit Value (%),

Total Volume of Electricity Power Generation (kWh)

Calculation method: Total Required Cost for WRM (Rp) \* Economic Benefit Value (%) / Total Power

generation (kWh) = Water Service Fee (Rp/kWh)

\*PLTA < 10MW: Water Service Fee Rate for each region is applied

\*PLTA > 10MW: Extra Cost for WRM is applied

### For Agriculture Water User

Necessary data items: Total Required Cost for Water Resources Management (Rp),

Economic Benefit Value (%),

The Area of Agriculture Field (ha)

Calculation method: Total Required Cost for WRM (Rp) \* Economic Benefit Value (%) / The Area of

Agriculture Field (ha) = Water Service Fee (Rp/ha)



**6. Water User Coordination (15 points = 3 points \* 5 answers)**

Fill in important items for Water User Coordination, and the descriptions.

Important item:

Description:

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Important item:

Description:

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Important item:

Description:

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Important item:

Description:

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Important item:

Description:

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END



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.003

Training on Flood Management, in Manado on May 2016





## Plan of “Training on Flood Management”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training on “Flood Management”.

5-year strategy and plan of PUPR describes on “Development of Water Destructive Power Control” as one of the programs for “Improvement of National Water Security Level”. Knowing effective way to plan and operate structural and non-structural measures for flood control will distribute to manage flood management successfully in Indonesia.

Date : 10<sup>th</sup> May 2016 (Tue.) to 13<sup>th</sup> May 2016 (Fri.)  
Time : 08:00 WIB – finish  
Number of Participants : Approximately 30  
Venue : Manado City, North Sulawesi Province

Participants of this training will be able to have following technical knowledge and competence;

- a. Current status of laws, regulations, technical standards / guidelines for flood control in Indonesia
- b. Knowledge of methodology of establishing criteria of flood warning and technical knowledge of analysis and simulation of flood, such as flood water discharge volume with precipitation
- c. Using examples of comprehensive flood control infrastructures in Japan, the participant will learn about practical / proper planning of structural measures for flood control as a water resource manager.
- d. Practical operation planning for flood management using example of “Timeline (Disaster Management Behavior Plan)” as the latest approach to handle flooding in Japan and Operation Plan for Flood Management in Indonesia that was made by JICA Technical Cooperation Project, “Enhancement of the Disaster Management Capacity of BMPB and BPBD in Indonesia”



- e. With “Flood Management Master Plan in Tondano River Basin in North Sulawesi Province”, the participant will learn about practical / proper way for comprehensive planning of structural and non-structural measures for flood control as a water resource manager
- f. Adequate and effective coordination for operation of flood management with related organizations at the Field Study
- g. Advanced / simple and half-automatic observation method of river water level by demonstration of AR technology at the Field Study
- h. Understanding the importance and necessity for planning structural and non-structural measures for flood management through at the Field Study and Feedback Session

We would like to invite one staff from each agency, who is in charge of Flood Management. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Flood Management

## 1. Time and Duration

From 10th May. 2016 (Tue.) to 13th May. 2016 (Fri.) , for 4 days

## 2. Venue

In Manado City

- Classroom Lectures: Hotel in Manado city

- Field Study: BNBD Province Sulawesi North, Inundation Area by Flood in 2013 and 2014,

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: 3 years or more on Water Resources Management

- Current Responsibility: Management / Operation of Flood

## 4. Curriculum

| Day | No. | Time          | Lecture                                                                                                                                 | Lecturer                                                                                                                                                                                     | Minutes | jp |
|-----|-----|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st |     | 08:00 -       | Registration                                                                                                                            |                                                                                                                                                                                              |         |    |
|     |     | 08:45 - 09:30 | Opening Ceremony                                                                                                                        | Prof. Dr. Ir. Anita Firmanti Eko Susetyowati, MT, Head of Human Resources Development Agency<br>Mr. Suzuki, JICA Project Coordinator                                                         |         |    |
|     |     | 09:30 - 09:45 | General Information for Participants                                                                                                    | Secretariat Member                                                                                                                                                                           |         |    |
|     |     |               | Coffee Break                                                                                                                            |                                                                                                                                                                                              |         |    |
|     |     | 10:00 - 10:30 | Pre Test                                                                                                                                | Secretariat Member                                                                                                                                                                           |         |    |
|     | 1-1 | 10:30 - 12:00 | Current Status and Basic Knowledge of Flood Management in Indonesia (1)                                                                 | Ir. Birendrajana, MT, Head of Sub-dit of Planning, Directorate of River and Coastal                                                                                                          | 90      | 2  |
|     |     |               | Lunch                                                                                                                                   |                                                                                                                                                                                              |         |    |
|     | 1-2 | 13:30 - 14:15 | Current Status and Basic Knowledge of Flood Management in Indonesia (2)                                                                 | Ir. Birendrajana, MT, Head of Sub-dit of Planning, Directorate of River and Coastal                                                                                                          | 45      | 1  |
|     | 2-1 | 14:15 - 15:45 | Early Flood Warning System (1)                                                                                                          | Dr. Eka Nugraha Abdi, ST, MPPM, PDS, Sub-dit of Hydrology and Environment, Directorate of Water Resources Management                                                                         | 90      | 2  |
|     |     |               | Coffee Break                                                                                                                            |                                                                                                                                                                                              |         |    |
| 2nd | 3   | 08:00 - 09:30 | Comprehensive Structural Measures against Flood in Japan                                                                                | Mr. Miura, JICA Project Expert                                                                                                                                                               | 90      | 2  |
|     |     |               | Coffee Break                                                                                                                            |                                                                                                                                                                                              |         |    |
|     | 4   | 09:45 - 12:00 | Regional Disaster Management Planning in Japan -Focusing on Flood-                                                                      | Mr. Shinya, JICA Policy Advisor on Disaster Management                                                                                                                                       | 135     | 3  |
|     |     |               | Lunch                                                                                                                                   |                                                                                                                                                                                              |         |    |
|     | 5   | 13:00 - 14:30 | Master Planning of Flood Management -Example of Tondano River Basin-                                                                    | Yachiyo Engineering Co. LTD                                                                                                                                                                  | 90      | 2  |
|     |     |               | Coffee Break                                                                                                                            |                                                                                                                                                                                              |         |    |
| 3rd | 6   | 14:45 - 16:15 | Example of Structural Measures for Flood Control in Tondano River Basin                                                                 | Yachiyo Engineering Co. LTD                                                                                                                                                                  | 90      | 2  |
|     | 7   | 16:15 - 17:00 | Briefing on Field Study                                                                                                                 | BWS Sulawesi I<br>BPBD North Sulawesi Province<br>Mr. Shinya, JICA Policy Advisor on Disaster Management<br>Yachiyo Engineering Co. LTD,<br>PT. Fujitsu Indonesia<br>JICA Project Expert     | 45      | 1  |
|     | 8   | 09:00 - 12:00 | Field Study at BPBD Province Sulawesi North (JICA Project for Enhancement of Disaster Management Capacity of BNPB and BPBD)             | BPBD North Sulawesi Province,<br>Mr. Shinya, JICA Policy Advisor on Disaster Management                                                                                                      | 180     | 4  |
|     |     | 09:00 - 09:30 | Trip to BPBD office                                                                                                                     |                                                                                                                                                                                              |         |    |
|     |     | 09:30 - 12:00 | Explanation of JICA project, and Flood Hazard and Risk Map                                                                              |                                                                                                                                                                                              |         |    |
|     |     |               | Lunch                                                                                                                                   |                                                                                                                                                                                              |         |    |
| 4th | 9   | 13:00 - 17:30 | Field Study at inundated areas at Tondano, Tikara and Sario River, and Demonstration of AR technology for River Water Level Observation | BWS Sulawesi I,<br>Yachiyo Engineering Co. LTD,<br>PT. Fujitsu Indonesia                                                                                                                     | 270     | 6  |
|     |     | 13:00 - 14:30 | Inundated Area by Flood 2014 at Tondano River                                                                                           |                                                                                                                                                                                              |         |    |
|     |     | 14:30 - 16:00 | Demonstration of AR technology River Water Level Observation                                                                            |                                                                                                                                                                                              |         |    |
|     |     | 16:00 - 17:30 | Inundated Area by Flood 2014 at Tikara and Sario River                                                                                  |                                                                                                                                                                                              |         |    |
|     | 10  | 08:00 - 09:30 | Feedback of Field Study (1) Group Discussion                                                                                            | JICA Project Expert                                                                                                                                                                          | 90      | 2  |
|     |     |               | Coffee Break                                                                                                                            |                                                                                                                                                                                              |         |    |
| 4th | 11  | 09:45 - 11:15 | Feedback of Field Study (2) Group Presentation                                                                                          | BWS Sulawesi I,<br>BPBD North Sulawesi Province,<br>Mr. Shinya, JICA Policy Advisor on Disaster Management,<br>Yachiyo Engineering Co. LTD,<br>PT. Fujitsu Indonesia,<br>JICA Project Expert | 90      | 2  |
|     |     |               | Lunch                                                                                                                                   |                                                                                                                                                                                              |         |    |
|     |     | 13:00 - 13:30 | Post Test                                                                                                                               | Secretariat Member                                                                                                                                                                           |         |    |
|     |     | 13:30 - 13:45 | Questionnaire of the training (Filling in Questionnaire Sheet)                                                                          | Secretariat Member                                                                                                                                                                           |         |    |
|     |     | 13:45 - 14:30 | Closing Ceremony                                                                                                                        | DGWR - PUPR                                                                                                                                                                                  |         |    |

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## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Title            | Current Status and Basic Knowledge of Flood Management in Indonesia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Outline          | <p>Flood Management includes various aspects, planning/designing/constructing infrastructures (dike, weir, flood diversion canal, dam and so on) for flood control as structural measures, observation/monitoring hydro meteorological data and planning/operation for flood risk management and etc. as non-structural measures.</p> <p>Required work as a good engineer / technician for flood management will be described and used as a example in the lecture.</p>                                                                                                      |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of legal aspect, law/governmental regulation/ministerial regulation/technical guidelines for flood management</li> <li>-Understanding framework and coordination with related organization for flood management</li> <li>-Knowing lesson learnt from historical floods</li> <li>-Knowing effective structural and non-structural measures for flood management</li> </ul>                                                                                                                                               |
| Lecturer         | Ir. Birendrajana, MT, Head of Sub-dit of Planning, Directorate of River and Coastal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Duration         | 90 minutes (2 JP) + 45 minutes (1 JP) = 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <ul style="list-style-type: none"> <li>-Law, Regulation, Standards, Guideline for Flood Management</li> <li>-Coordination Works among Various Players for Flood Management</li> <li>-Experience and Lesson Learnt of Historical Flood Disaster</li> <li>-Effective/Progressive Structural Measures for Flood Control</li> <li>-Effective/Progressive Non-Structural Measures for Flood Control</li> </ul>                                                                                                                                                                    |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.20 (Integrated Flood Management No.1: Database of Facility for Flood Mitigation)</p> <p>Module No.21 (Integrated Flood Management No.2: Contents of Guidelines, Manuals and Regulations on Flood Management)</p> <p>Module No.23 (Integrated Flood Management No.4: Introduction and Concept of Integrated Flood Management)</p> <p>Module No.24 (Integrated Flood Management No.5: Integrated Watershed Management)</p> <p>Module No.25 (Integrated Flood Management No.6: Management Plan of Flood in Watershed)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Syllabus

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                          |
| Title            | Early Flood Warning System                                                                                                                                                                                                                                                                                                                                                 |
| Outline          | Knowledge on criteria of river water level for flood warning, runoff simulation and coordination with related organizations are essential for Management of Flood Warning. Participant will understand deeply on Flood Warning System.                                                                                                                                     |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding criteria of flood warning river water level</li> <li>-Introduction of Flood Potential Forecasting for Early Flood Warning</li> <li>-Understanding technical knowledge of runoff simulation for flood warning</li> <li>-Introduction of necessary coordination with related organization for flood warning</li> </ul> |
| Lecturer         | Dr. Eka Nugraha Abdi, ST, MPPM, PDS, Sub-dit of Hydrology and Environment, Directorate of Water Resources Management                                                                                                                                                                                                                                                       |
| Duration         | 90 minutes (2 JP) + 45 minutes (1 JP) = 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                 |
| Contents         | <ul style="list-style-type: none"> <li>-Criteria of River Water Level for Flood Warning</li> <li>-Flood Potential Forecasting</li> <li>-Basic Methodology of Runoff (river water level) Simulation for Flood Forecasting</li> <li>-Coordination among Related Organizations for Flood Warning</li> </ul>                                                                   |
| Textbook, Module | Power Point File made by Lecturer<br><br>Module No.5 (Hydrology No.5: Forecasting and Early Flood Warning)<br>Module No.22 (Integrated Flood Management No.3: Database of Hydrology for Flood Management)                                                                                                                                                                  |
| References       |                                                                                                                                                                                                                                                                                                                                                                            |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                        |
| Title            | Comprehensive Structural Measures against Flood in Japan                                                                                                                                                                                                                                                                 |
| Outline          | There are a number of points to cover for an effective structural measures for flood control. The course will aim to provide sufficient information on comprehensive structural measures in Japan to the participants to make their own flood management works.                                                          |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of concept on Integrated Water Resources Management, especially flood management</li> <li>-Using example of comprehensive structural measures for flood in Japan, participants will get idea for effective structural measures for flood</li> </ul>                 |
| Lecturer         | Ir. MIURA Hirohisa, ME, JICA Project Expert                                                                                                                                                                                                                                                                              |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Flood Management in concept of Integrated Water Resources Management</li> <li>-Examples of Comprehensive Structural Measures for Flood in Japan</li> <li>-Examples of Flood Control Operation by Dams, One of the Structural Measures</li> </ul>                                 |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.116 (IWRM No.1: Application of Integrated Water Resources Management (IWRM))</p> <p>Module No.105 (Operation of Water Gates No.8: Operation and Maintenance of Gate for Flood Control)</p> <p>Module No.46 (Dam Operation No. 12: Hydrology for dam operation)</p> |
| References       |                                                                                                                                                                                                                                                                                                                          |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                      |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Regional Disaster Management Planning in Japan -Focusing on Flood-                                                                                                                                                                                                                                                                                                   |
| Outline          | Knowledge of planning for <del>practical</del> the operation of flood management is one of the essential knowledge for BBWS and BWS for their duty implementation for flood management. Participant will acquire how to produce a practical plan for flood management by using example of "Timeline (Disaster Management Action Plan)" as a latest approach in Japan |
| Objective        | <ul style="list-style-type: none"> <li>-To know the method of making it clear for each responsibility / action of related organizations on flood management</li> <li>-To understand required actions and responses for flood management as a water resources manager</li> </ul>                                                                                      |
| Lecturer         | Mr. Shinya, JICA Policy Advisor on Disaster Management                                                                                                                                                                                                                                                                                                               |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <ul style="list-style-type: none"> <li>-Concept and outline of regional disaster management plan and "Timeline" on flood management</li> <li>-Examples of "Timeline"</li> </ul>                                                                                                                                                                                      |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                      |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                  |
| Title            | Master Planning of Flood Management -Example of Tondano River Basin-                                                                                                                                                                                                                                                               |
| Outline          | BWS Sulawesi I and JICA have been implementing the project "JICA Loan No.; IP-551, Urban Flood Control System Improvement in Selected Cities". The project includes creation of master plan of flood management in Tondano River Basin. The Participant will understand important methods and parts for flood management planning. |
| Objective        | -To understand important methods and parts for master planning on flood management<br>-To know effective structural and non-structural measures for flood management using example of Tondano River Basin plan                                                                                                                     |
| Lecturer         | Yachiyo Engineering Co. LTD                                                                                                                                                                                                                                                                                                        |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                  |
| Contents         | -Outline of Master Plan of Flood Management in Tondano River Basin<br>-Examples of effective structural and non-structural measures for flood management in Tondano River Basin<br>-Important methods and parts for master planning for flood management                                                                           |
| Textbook, Module | Power Point File made by Lecturer<br><br>Module No.23 (Integrated Flood Management No.4: Introduction and Concept of Integrated Flood Management)<br>Module No.24 (Integrated Flood Management No.5: Integrated Watershed Management)<br>Module No.25 (Integrated Flood Management No.6: Management Plan of Flood in Watershed)    |
| References       |                                                                                                                                                                                                                                                                                                                                    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                          |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                        |
| Title            | Example of Structural Measures for Flood Control in Tondano River Basin                                                                                                                                                                                                                                                  |
| Outline          | BWS Sulawesi I and JICA have been implementing the project "JICA Loan No.; IP-551, Urban Flood Control System Improvement in Selected Cities". The project includes several kinds of structural measures for flood control. The Participant will understand practical examples of structural measures for flood control. |
| Objective        | <ul style="list-style-type: none"> <li>-To know several kinds of effective / practical structural measures for flood control</li> <li>-To acquire information on effective structural measures for flood control as examples in Tondano River Basin plan</li> </ul>                                                      |
| Lecturer         | Yachiyo Engineering Co. LTD                                                                                                                                                                                                                                                                                              |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of Structural Measures for Flood Control in Tondano River Basin</li> <li>-Effectiveness of Structural Measures for flood control under construction by JICA Loan Project</li> </ul>                                                                                      |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                        |
| References       |                                                                                                                                                                                                                                                                                                                          |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Briefing on Field Study                                                                                                                                                                                                                                                                                                                                             |
| Outline          | Participants will receive suitable information about<br>1)Outline of JICA Technical Cooperation Project "Enhancement of Disaster Management Capacity of BNPB and BPBD",<br>2)Situation of Historical Flood in Jan. 2014 in Manado City Area and,<br>3)River Water Level Observation by AR technology,<br>prior to the lecture at the sites.                         |
| Objective        | -Sharing the information of<br>1)Outputs of JICA Technical Cooperation Project "Enhancement of Disaster Management Capacity of BNPB and BPBD" at BPBD North Sulawesi Province,<br>2)Flood Situation in Jan. 2014 at several sites and,<br>3)River Water Level Observation by AR technology,<br>before Field Study to have a productive <del>lecture</del> visit.    |
| Lecturer         | BWS Sulawesi I<br>BPBD North Sulawesi Province<br>Mr. Shinya, JICA Policy Advisor on Disaster Management<br>Yachiyo Engineering Co. LTD,<br>PT. Fujitsu Indonesia<br>JICA Project Expert                                                                                                                                                                            |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | -Schedule and Route of Field Study<br>-Outline of JICA Technical Cooperation Project "Enhancement of Disaster Management Capacity of BNPB and BPBD" at BPBD North Sulawesi Province<br>-Outline of inundated situation in Jan. 2014 at several sites of Tondano / Tikara / Sario River in Manado City<br>-Outline of River Water Level Observation by AR technology |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                     |
| References       |                                                                                                                                                                                                                                                                                                                                                                     |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                            |
| Title            | Field Study at BPBD Province Sulawesi North (JICA Project for Enhancement of Disaster Management Capacity of BNPB and BPBD)                                                                                                                                                                                  |
| Outline          | BPBD North Sulawesi Province and JICA had implemented the project for Enhancement of Disaster Management Capacity of BNPB and BPBD. The project created Flood Hazard Map and Guidelines, Regional Disaster Management Plan. Those outputs are useful for implementation of flood management at BBWS and BWS. |
| Objective        | <ul style="list-style-type: none"> <li>-To know practical way of making of Flood Hazard Map</li> <li>-To acquire a way of using of Flood Hazard Map for Flood Management Works</li> <li>-To understand essential part for making flood management / operation plan</li> </ul>                                |
| Lecturer         | BPBD North Sulawesi Province,<br>Mr. Shinya, JICA Policy Advisor on Disaster Management                                                                                                                                                                                                                      |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                           |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction of JICA Project for Enhancement of Disaster Management Capacity of BNPB and BPBD</li> <li>-Flood Hazard Mapping and Guideline</li> <li>-Regional Disaster Management Plan, focusing on Flood Management Part</li> </ul>                                 |
| Textbook, Module |                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                              |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Field Study at inundated areas at Tondano, Tikara and Sario River, and Demonstration of AR technology for River Water Level Observation                                                                                                                                                                                                                                                                                                                                                             |
| Outline          | <p>Manado City area was suffered by a historical flood in Jan. 2014. We can still see "Flood Marks" on wall of <del>some</del> houses in the city. These marks are very useful and essential information for planning structural and non-structural measures.</p> <p>BWS Sulawesi I and JICA also had done a test implementation of advanced river water level observation method by AR technology.</p> <p>Those information are useful for implementation of flood management at BBWS and BWS.</p> |
| Objective        | <p>-To understand actual inundated depth, flow volume and damages by the flood in 2014 for group discussion and presentation on effective structural and non-structural measures</p> <p>-To know advanced / effective river water level observation by AR technology (using smartphone with special application) as one of good examples for river water level monitoring</p>                                                                                                                       |
| Lecturer         | BWS Sulawesi I,<br>Yachiyo Engineering Co. LTD,<br>PT. Fujitsu Indonesia                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Duration         | 270 minutes (6 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Contents         | <p>-Field Visit to inundated areas caused by the flood 2014 at Tondano River</p> <p>-Demonstration of AR technology river water level observation</p> <p>-Field Visit to inundated areas caused by the flood 2014 at Tikara and Sario River</p>                                                                                                                                                                                                                                                     |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                           |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                        |
| Title            | Feedback of Field Study (1) Group Discussion                                                                                                                                                                                                                                                                                              |
| Outline          | <p>Feedback session to discuss among participants and instructors on things learned from field study for flood management especially how the participant can apply for their duty at their office.</p> <p>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group.</p> |
| Objective        | <p>-Discussion and preparation of presentation on suitable and effective structural and non-structural measures for flood for Manado city area</p> <p>-Through discussion and presentation, participants will learn importance and necessity for planning structural and non-structural measures for flood and flood management</p>       |
| Lecturer         | JICA Project Expert                                                                                                                                                                                                                                                                                                                       |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                         |
| Contents         | <p>-Explanation on presentation and divide participants into several group</p> <p>-Discussion and making presentation material by each group</p>                                                                                                                                                                                          |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                           |
| References       |                                                                                                                                                                                                                                                                                                                                           |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                         |
| Title            | Feedback of Field Study (2) Group Presentation                                                                                                                                                                                                                                                                             |
| Outline          | <p>Feedback session to discuss among participants and instructors on things learned from field study for flood management especially how the participant can apply for their duty at their office.</p> <p>Participants are divided into several groups. Preparation for group presentation will be done by each group.</p> |
| Objective        | <p>-Presentation on suitable and effective structural and non-structural measures for flood for Manado city area</p> <p>-Through presentation and discussion, participants will learn importance and necessity for planning structural and non-structural measures for flood and flood management</p>                      |
| Lecturer         | <p>BWS Sulawesi I,<br/> BPBD North Sulawesi Province,<br/> Mr. Shinya, JICA Policy Advisor on Disaster Management,<br/> Yachiyo Engineering Co. LTD,<br/> PT. Fujitsu Indonesia,<br/> JICA Project Expert</p>                                                                                                              |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                          |
| Contents         | <p>-Presentation from each group (10 minutes * 6 groups = 60 minutes)</p> <p>-Comments from Instructors (30 minutes)</p>                                                                                                                                                                                                   |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                            |



## Pretest

### Training on Flood Management

#### 1. Legal Framework for Flood Management (30 Points = 6 points \* 5 Answers)

Fill in laws, regulation and its description on Flood Management

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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## 2. Flood Warning System (28 Points = 7 points \* 4 Answers)

Fill in procedure of early flood warning, and the description on each step.

### Step 1

Title of step:

Description:

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### Step 2

Title of step:

Description:

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---

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### Step 3

Title of step:

Description:

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---

---

### Step 4

Title of step:

Description:

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### 3. Structural and Non-Structural Measures for Flood (24 Points = 4 points \* 6 Answers)

Choose suitable Structural (River Measures/Basin Measures) and Non-Structural Measures from box below, and fill in descriptions (purpose, effect and others) on each measures.

Early Flood Warning, Dam/Reservoir, Irrigation Canal, Disaster Management/Operation Planning, Riverbank/Embankment, Water Allocation Planning, River Channel Improvement, SIPA (Water Use Permit), Flood Hazard/Risk Mapping, Flood Fighting Activity, Hydropower Station, Floodway (Diversion Channel), Retarding Basin, Retention Pond, Forest Conservation, Rainwater Storage/infiltration Facility, Awareness Raising of Local Residents, Land Use Management, Groundwater Management, Resettlement of Houses in River Area

#### Structural Measures (River Measures)

Name of Measures: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Name of Measures: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

#### Structural Measures (Basin Measures)

Name of Measures: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Name of Measures: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



### Non-Structural Measures

Name of Measures: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Name of Measures: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### 4. Disaster Management Planning (18 Points = 3 points \* 6 Answers)

Choose suitable six (6) topics that should be included into Disaster Management Plan. (Indicated by UU No.24 / 2007, TENTANG PENANGGULANGAN BENCANA)

- a. pengenalan dan pengkajian ancaman bencana
- b. location of related offices for disaster management
- c. pemahaman tentang kerentanan masyarakat
- d. analisis kemungkinan dampak bencana
- e. monthly forecasting of disasters
- f. technical standard of structural measures
- g. pilihan tindakan pengurangan risiko bencana
- h. penentuan mekanisme kesiapan dan penanggulangan dampak bencana
- i. annual budget allocation for disaster management
- j. alokasi tugas, kewenangan, dan sumber daya yang tersedia.

END

## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.004

Training on River Facility Maintenance, in Jakarta on August 2016





## Plan of “Training on River Facility Maintenance”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “River Facility Maintenance”.

5-year strategic plan of PUPR 2015 – 2019 mentions “River to be operated and maintained” at activity 15 “Operation and Maintenance of Water Resources” by BBWS/BWS. Better maintenance works for river and river facility are strongly recommended for better operation and maintenance for water resources management by BBWS/BWS.

In relation to this, JICA RBO project will hold a training on “River Facility Maintenance”.

|                        |                                                                             |
|------------------------|-----------------------------------------------------------------------------|
| Date                   | : 9 <sup>th</sup> August 2016 (Tue.) to 12 <sup>th</sup> August 2016 (Fri.) |
| Time                   | : 08:00 WIB – finish                                                        |
| Number of Participants | : Approximately 30                                                          |
| Venue                  | : DIKLAT III Jakarta                                                        |

Participants of this training will gain following technical knowledge and competence;

- a. Current status of laws, regulations, technical standards/guidelines for river facility maintenance
- b. Knowledge of database and inventory of river facility for better maintenance planning and works
- c. Practical / proper way for river facility maintenance as a water resource manager (regulator) with patrol / inspection of river and facility in Japan
- d. Importance of inventory for better maintenance works with facility inventory in Japan
- e. Practical / proper way for managing river facility maintenance planning and works with examples of periodical maintenance of river facility by BBWS Ciliwung Cisadane
- f. Practical / concrete method of maintenance and inspection works of weirs and flood way at field study



We would like to invite a staff from each agency, who is in charge of dam (or Water Resources Infrastructures) operation & maintenance. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on River Facility Maintenance

## 1. Time and Duration

From 9th Aug. 2016 (Tue.) to 12th Aug. 2016 (Thu.) , for 4 days

## 2. Venue

In Jakarta

- Classroom Lectures: Training Center of HRDA in Jakarta

- Field Study: River Facilities at Ciliwung River

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: 3 years or more on Water Resources Management

- Current Responsibility: Operation / Maintenance or Management of River Facility

## 4. Curriculum

| Day              | No. | Time          | Lecture                                                                    | Lecturer                                                                                                                                                                    | Minutes | JP |
|------------------|-----|---------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>9th Aug.  |     | 08:00 -       | Registration                                                               |                                                                                                                                                                             |         |    |
|                  |     | 08:45 - 09:30 | Opening Remarks                                                            | Prof. Dr. Ir. Anita Firmanti Eko<br>Susetyowati, MT, Head of Human<br>Resources Development Agency<br>Mr. Suzuki, JICA Project<br>Coordinator                               |         |    |
|                  |     | 09:30 - 09:45 | General Information for Participants                                       | Secretariat Member                                                                                                                                                          |         |    |
|                  |     |               | Coffee Break                                                               |                                                                                                                                                                             |         |    |
|                  |     | 10:00 - 10:30 | Pre Test                                                                   | Secretariat Member                                                                                                                                                          |         |    |
|                  | 1   | 10:30 - 12:00 | Legal Aspect and Current Status of<br>Maintenance Works for River Facility | Mr. Hendra Ahyadi, ST, MT, Head<br>of Sub-dit of Operation &<br>Maintenance Planning, Directorate<br>of Operation & Maintenance                                             | 90      | 2  |
|                  |     |               | Lunch                                                                      |                                                                                                                                                                             |         |    |
|                  | 2   | 13:15 - 15:30 | Database of River Facility                                                 | Dr. Ismail Widadi, ST, M.Sc, Head<br>of Subdit of Water Resources Data<br>and Information System, Directorate<br>of Water Resources Network<br>Development                  | 135     | 3  |
|                  |     |               | Coffee Break                                                               |                                                                                                                                                                             |         |    |
|                  | 3   | 15:45 - 18:00 | Inventory of River Facility for Maintenance                                | Mr. Hendra Ahyadi, ST, MT, Head<br>of Sub-dit of Operation &<br>Maintenance Planning, Directorate<br>of Operation & Maintenance                                             | 135     | 3  |
| 2nd<br>10th Aug. | 4   | 08:00 - 09:30 | Maintenance Works of River and Facility in<br>Japan                        | Mr. MORIYASU Kunihiro, JICA<br>Short Term Expert                                                                                                                            | 90      | 2  |
|                  |     |               | Coffee Break                                                               |                                                                                                                                                                             |         |    |
|                  | 5   | 09:45 - 12:00 | River Facility Inventory for maintenance works                             | Mr. MORIYASU Kunihiro, JICA<br>Short Term Expert                                                                                                                            | 135     | 3  |
|                  |     |               | Lunch                                                                      |                                                                                                                                                                             |         |    |
|                  | 6   | 13:30 - 15:00 | Practical Maintenance Works (1) focusing on<br>Weir                        | BBWS Ciliwung Cisadane                                                                                                                                                      | 90      | 2  |
|                  |     |               | Coffee Break                                                               |                                                                                                                                                                             |         |    |
|                  | 7   | 15:15 - 16:45 | Practical Maintenance Works (2) focusing on<br>Flood Way and Revetment     | BBWS Ciliwung Cisadane                                                                                                                                                      | 90      | 2  |
|                  | 8   | 16:45 - 17:30 | Briefing on Field Study                                                    | BBWS Ciliwung Cisadane<br>Ir. MIURA Hirohisa, ME, JICA<br>Project Technical Expert.                                                                                         | 45      | 1  |
| 3rd<br>11th Aug. | 9   | 08:15 - 12:00 | Field Study at Katulampa Weir, upstream area                               | BBWS Ciliwung Cisadane<br>PU Province West Java                                                                                                                             | 225     | 5  |
|                  |     |               | Lunch                                                                      |                                                                                                                                                                             |         |    |
|                  | 10  | 13:00 -17:30  | Field Study at Manggarai Weir and East Flood<br>Way, downstream            | BBWS Ciliwung Cisadane<br>PU. DKI                                                                                                                                           | 270     | 6  |
| 4th<br>12th Aug. | 11  | 08:00 - 09:30 | Feedback of Field Study (1) Group Discussion                               | Ir. MIURA Hirohisa, ME, JICA<br>Project Technical Expert                                                                                                                    | 90      | 2  |
|                  |     |               | Coffee Break                                                               |                                                                                                                                                                             |         |    |
|                  | 12  | 09:45 - 11:15 | Feedback of Field Study (2) Group Presentation                             | BBWS Ciliwung Cisadane<br>PU. DKI<br>PU Province West Java<br>Mr. MORIYASU Kunihiro, JICA<br>Short Term Expert<br>Ir. MIURA Hirohisa, ME, JICA<br>Project Technical Expert. | 90      | 2  |
|                  |     |               | Lunch                                                                      |                                                                                                                                                                             |         |    |
|                  |     | 13:30 - 14:00 | Post Test                                                                  | Secretariat Member                                                                                                                                                          |         |    |
|                  |     | 14:00 - 14:15 | Questionnaire of the training (Filling in<br>Questionnaire Sheet)          | Secretariat Member                                                                                                                                                          |         |    |
|                  |     | 14:15 - 15:00 | Closing Ceremony                                                           | DGWR - PUPR                                                                                                                                                                 |         |    |
|                  |     |               |                                                                            |                                                                                                                                                                             | 33      |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Legal Aspect and Current Status of Maintenance Works for River Facility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Outline          | River Facility includes various infrastructures and equipment, dam / ground sill / levee / revetment / weir / water gate / sluice / pump station and so on.<br>Required knowledge and work as a good engineer / technician / officer for river facility maintenance will be discussed and used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing legal aspect, law / governmental regulation / ministerial regulation / technical guidelines for river facility maintenance</li> <li>-Understanding expected function on O/M works at PUPR</li> <li>-Understanding responsibility for maintenance works at B(B)WS of PUPR</li> <li>-Knowing maintenance plan (daily / periodical check, repairing / renewal of facility, cost calculation, etc.)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Lecturer         | Mr. Hendra Ahyadi, ST, MT, Head of Sub-dit of Operation & Maintenance Planning, Directorate of Operation & Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Contents         | <ul style="list-style-type: none"> <li>-Law, Regulation, Standards, Guideline for River Facility Maintenance</li> <li>-Maintenance work plan in 5-year plan of SDA PUPR</li> <li>-Responsibility of PUPR at B(B)WS of PUPR</li> <li>-Planning maintenance work on daily / periodical check, repairing / renewal of facility</li> <li>-Planning budget for maintenance works with viewpoint of asset management</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.47 (River Operation &amp; Maintenance No.1: Operation and Maintenance of River)</p> <p>Module No.51 (River Operation &amp; Maintenance No.5: Cost of River OP)</p> <p>Module No.98 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.1: General Description on Operation and Maintenance of Hydromechanics Equipment)</p> <p>Module No.99 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.2: Operation and Maintenance of Movable Weir)</p> <p>Module No.103 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.6: Compilation of SOP on Operation and Maintenance for Water-intake facility)</p> <p>Module No.104 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.7: Cost Calculation of Operation and Maintenance)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Database of River Facility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Outline          | Database for facilities are essential for making an inventory of river facilities for a better maintenance work. Knowledge on creating / managing database is indispensable as a engineer / technician / officer in the field of Operation & Maintenance. The participant will understand deeply on database of river facility information.                                                                                                                                                                                                   |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding necessary information for database</li> <li>-Knowing current and future database for river facility maintenance</li> <li>-Introduction of reflection and contribution of database to inventory of river facilities</li> </ul>                                                                                                                                                                                                                                                           |
| Lecturer         | Dr. Ismail Widadi, ST, M.Sc, Head of Subdit of Water Resources Data and Information System, Directorate of Water Resources Network Development                                                                                                                                                                                                                                                                                                                                                                                                |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Purpose and necessity of database for river facility</li> <li>-Necessary information of each facility for database</li> </ul>                                                                                                                                                                                                                                                                                                                                                                         |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.53 (River Operation &amp; Maintenance No.7: Database for River OP)</p> <p>Module No.54 (River Operation &amp; Maintenance No.8: Inventory of River Conditions and Facilities)</p> <p>Module No.102 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.5: Inventory of Hydromechanics Equipment)</p> <p>Module No.107 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.10: Report and Evaluation of Operation and Maintenance)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Inventory of River Facility for Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Outline          | Database and inventory of facilities are essential for implementation of a better maintenance work. Knowledge on creating / managing inventory is indispensable as a engineer / technician / officer in the field of Operation & Maintenance. The participant will understand deeply on inventory of river facility.                                                                                                                                                                                                                          |
| Objective        | <ul style="list-style-type: none"> <li>-Knowing purpose and necessity of inventory for a maintenance work</li> <li>-Understanding necessary information for inventory</li> <li>-Introducing reflection / contribution of inventory to maintenance planning, such as repairing / renewal planning, periodical check planning</li> </ul>                                                                                                                                                                                                        |
| Lecturer         | Mr. Hendra Ahyadi, ST, MT, Head of Sub-dit of Operation & Maintenance Planning, Directorate of Operation & Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Purpose and necessity of inventory for maintenance works</li> <li>-Necessary information of each facility for inventory</li> <li>-Reflection from inventory to maintenance plan (repairing / renewal planning, periodical check plan)</li> </ul>                                                                                                                                                                                                                                                      |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.53 (River Operation &amp; Maintenance No.7: Database for River OP)</p> <p>Module No.54 (River Operation &amp; Maintenance No.8: Inventory of River Conditions and Facilities)</p> <p>Module No.102 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.5: Inventory of Hydromechanics Equipment)</p> <p>Module No.107 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.10: Report and Evaluation of Operation and Maintenance)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                       |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                     |
| Title            | Maintenance Works of River and Facility in Japan                                                                                                                                                                                                                                                                      |
| Outline          | Planning / implementing maintenance work is important duty for BBWS and BWS. BBWS and BWS in Japan conduct daily and periodical maintenance and inspection of river and facilities. The participant is expected to acquire how to produce a practical plan and implementation of maintenance and inspection of river. |
| Objective        | -To know practical methods of patrol of river by BBWS and BWS in Japan<br>-To acquire important regulations for river area management                                                                                                                                                                                 |
| Lecturer         | Mr. MORIYASU Kunihiro, JICA Short Term Expert                                                                                                                                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                     |
| Contents         | -Check points of periodical river patrol (river facility condition, illegal act in river area, and so on)<br>-Introduction of regulation for river area management                                                                                                                                                    |
| Textbook, Module | Power Point File made by Lecture                                                                                                                                                                                                                                                                                      |
| References       |                                                                                                                                                                                                                                                                                                                       |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                           |
| Title            | River Facility Inventory for maintenance works                                                                                                                                                                                                                                                                                                                                                              |
| Outline          | Inventory of facilities are essential for implementation of a better maintenance work and planning. Knowledge on creating / managing inventory is indispensable as a engineer / technician / officer in the field of Operation & Maintenance. The participant will learn the inventory system for river facility in Japan.                                                                                  |
| Objective        | <ul style="list-style-type: none"> <li>-To know check points of maintenance / inspection of river facility (Dam, Weir, Levee, revetment, sluice gate, hydrological stations)</li> <li>-To understand river facility inventory</li> <li>-To introduce practical repairing works of river facility in Japan</li> <li>-To introduce latest measures / policy on river facility maintenance in Japan</li> </ul> |
| Lecturer         | Mr. MORIYASU Kunihiro, JICA Short Term Expert                                                                                                                                                                                                                                                                                                                                                               |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                          |
| Contents         | <ul style="list-style-type: none"> <li>-Check points of maintenance / inspection of river facility (Dam, Weir, Levee, revetment, sluice gate, hydrological stations)</li> <li>-River Facility Inventory</li> <li>-Practical repairing works of river facility</li> <li>-Introducing latest measures and policies for river facility maintenance in Japan</li> </ul>                                         |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                           |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                             |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Practical Maintenance Works (1) focusing on Weir                                                                                                                                                                                                                                                                                                                                     |
| Outline          | Planning / implementing maintenance work is important duty for BBWS and BWS. BBWS Ciliwung Cisadane has maintained various river facilities, including weir as utilization infrastructure of water resources and control infrastructure for being damaged by power of the water. Participant will learn how to produce a practical plan and implementation of maintenance for weirs. |
| Objective        | <ul style="list-style-type: none"> <li>-To know maintenance / inspection plan and implementation for weir and facilities, such as structure, gates, etc.</li> <li>-To learn about the information and data for maintenance of weir, database / inventory of facility, maintenance / repairing records, guidelines / manuals</li> </ul>                                               |
| Lecturer         | BBWS Ciliwung Cisadane                                                                                                                                                                                                                                                                                                                                                               |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                    |
| Contents         | <ul style="list-style-type: none"> <li>-Maintenance plan for weir and facilities (weir structure, gates)</li> <li>-Implementation of maintenance work for weir and facilities (Human resources, guideline / manuals, database / inventory of facility, etc.)</li> </ul>                                                                                                              |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                                      |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                       |
| Title            | Practical Maintenance Works (2) focusing on Flood Way and Revetment                                                                                                                                                                                                                                                                                                     |
| Outline          | Planning / implementing maintenance work is important duty for BBWS and BWS. BBWS Ciliwung Cisadane has maintained various river facilities, including flood way and revetment as control infrastructure for being damaged by power of the water. Participant will learn how to produce a practical plan and implementation of maintenance for flood way and revetment. |
| Objective        | <ul style="list-style-type: none"> <li>-To know maintenance / inspection plan and implementation for flood way and revetment</li> <li>-To learn about the information and data for maintenance of flood way and revetment, database / inventory of facility, maintenance / repairing records, guidelines / manuals</li> </ul>                                           |
| Lecturer         | BBWS Ciliwung Cisadane                                                                                                                                                                                                                                                                                                                                                  |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                       |
| Contents         | <ul style="list-style-type: none"> <li>-Maintenance plan for flood way and revetment</li> <li>-Implementation of maintenance work for flood way and revetment (Human resources, guideline / manuals, database / inventory of facility, etc.)</li> </ul>                                                                                                                 |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                       |
| References       |                                                                                                                                                                                                                                                                                                                                                                         |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                 |
| Title            | Briefing on Field Study                                                                                                                                                                                                                                                                           |
| Outline          | Participants will learn about<br>1) Outline of Katulampa Weir,<br>2) Manggarai Weir<br>3) East Flood Way,<br>prior to the field study.                                                                                                                                                            |
| Objective        | -Sharing the information of<br>1) Outline of Katulampa Weir, including maintenance works<br>2) Outline of Manggarai Weir, including maintenance works<br>3) Outline of East Flood Way, including maintenance works<br>4) Schedule and route<br>before the field study to have a productive visit. |
| Lecturer         | BBWS Ciliwung Cisadane<br>Ir. MIURA Hirohisa, ME, JICA Project Technical Expert,                                                                                                                                                                                                                  |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                                                                                                 |
| Contents         | -Schedule and Route of the field study<br>-Outline of Katulampa Weir, including maintenance works<br>-Outline of Manggarai Weir, including maintenance works<br>-Outline of East Flood Way, including maintenance works                                                                           |
| Textbook, Module |                                                                                                                                                                                                                                                                                                   |
| References       |                                                                                                                                                                                                                                                                                                   |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Field Study at Katulampa Weir, upstream area                                                                                                                                                                                                                                                                                                                                    |
| Outline          | Katulampa weir is a core facility as utilization infrastructure of water resources and control infrastructure for being damaged by power of the water at upstream of Ciliwung River. BBWS Ciliwung Cisadane and PU Province West Java have maintained Katulampa weir for better water resources management. The maintenance work of the facility will be introduced as examples |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding practical inspection method for weir structure safety</li> <li>-Learning periodical maintenance work of facilities and equipment</li> </ul>                                                                                                                                                                               |
| Lecturer         | BBWS Ciliwung Cisadane, PU Province West Java                                                                                                                                                                                                                                                                                                                                   |
| Duration         | 225 minutes (5 JP) including travel time                                                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction of outline of Katulampa Weir</li> <li>-Description and practice of actual inspection of weir structure safety</li> <li>-Description and demonstration of maintenance work for facilities and equipment, such as gates, winches</li> </ul>                                                                                  |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                                                                                 |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                             |
| Title            | Field Study at Manggarai Weir and East Flood Way, downstream                                                                                                                                                                                                                                                                                   |
| Outline          | Manggarai Weir and Flood Way at Ciliwung River Basin are important facilities as control infrastructure for being damaged by power of the water for Jakarta. BBWS Ciliwung Cisadane and PU DKI have maintained Manggarai Weir and Flood Way for better water resources management. The maintenance work will be introduced with examples.      |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding practical inspection method for structure of weir and flood way for safety</li> <li>-Learning periodical maintenance work of flood way and revetment</li> </ul>                                                                                                                          |
| Lecturer         | BBWS Ciliwung Cisadane, PU. DKI                                                                                                                                                                                                                                                                                                                |
| Duration         | 270 minutes (6 JP) including travel time                                                                                                                                                                                                                                                                                                       |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction of outline of Manggarai Weir and East Flood Way</li> <li>-Description and practice of actual inspection of structure of weir and flood way for safety</li> <li>-Description and demonstration of maintenance work for east flood way, such as concrete structure and revetment</li> </ul> |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                            |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                                         |
| Title            | Feedback of Field Study (1) Group Discussion                                                                                                                                                                                                                                                                                               |
| Outline          | <p>Feedback session to discuss among participants and instructors on things learned from field study for maintenance works especially how the participant can apply for their duty at their office.</p> <p>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group.</p> |
| Objective        | <p>-Discussion and preparation of presentation on necessary and suitable maintenance works for weir, flood way and revetment</p> <p>-Through discussion and presentation, participants will understand importance and necessity periodical maintenance works, infrastructure and facility management (asset management)</p>                |
| Lecturer         | Ir. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                                                                                                                                                                                                                                      |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                          |
| Contents         | <p>-Explanation on presentation and divide participants into several group</p> <p>-Discussion and making presentation material by each group</p>                                                                                                                                                                                           |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                                            |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                            |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 12                                                                                                                                                                                                                                                                                                                                         |
| Title            | Feedback of Field Study (2) Group Presentation                                                                                                                                                                                                                                                                                             |
| Outline          | <p>Feedback session to discuss among participants and instructors on things learned from field study for maintenance works especially how the participant can apply for their duty at their office.</p> <p>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group.</p> |
| Objective        | <p>-Presentation on necessary and suitable maintenance works for weir, flood way and revetment</p> <p>-Through discussion and presentation, participants will understand importance and necessity periodical maintenance works, River facility management</p>                                                                              |
| Lecturer         | <p>BBWS Ciliwung Cisadane</p> <p>Ir. MIURA Hirohisa, ME, JICA Project Technical Expert</p>                                                                                                                                                                                                                                                 |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                          |
| Contents         | <p>-Presentation from each group (10 minutes * 6 groups = 60 minutes)</p> <p>-Comments from Instructors (30 minutes)</p>                                                                                                                                                                                                                   |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                                            |



## Pretest

### Training on River Facility Maintenance

#### 1. Legal Framework for River Facility Maintenance (24 Points = 6 points \* 4 Answers)

Fill in laws, regulation and its description on River Facility Maintenance

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



## 2. Database and Inventory (12 Points = 2 points \* 6 answers)

Choose suitable order of procedure from below (a. to f.) for river infrastructures database by B(B)WS office

Answers

Step 1: e

Step 2: a

Step 3: c

Step 4: d

Step 5: b

Step 6: f

- a. Menginventarisasi prasarana (asset) sungai
- b. Melakukan updating data kondisi dan fungsi prasarana sungai minimal 1 tahun sekali
- c. Mengidentifikasi kondisi dan fungsi tiap prasarana sungai sesuai format inspeksi
- d. Menginput/memasukkan data hasil inspeksi ke dalam system
- e. Menyusun skema sungai di wilayah kerja Balai
- f. Koordinasi dan sinergi antara petugas OP dan SISDA

## 3. Maintenance and Management of Rivers

(1) Choose suitable one description on "Maintenance" from sentences below

Answer: a (10 points)

- a. act of keeping something in good condition by checking it regularly
- b. act of repairing something to keep it in good condition
- c. to return a building or an area to its previous good condition
- d. to restore something that is broken or damaged to good condition

(2) Choose suitable one description on "Repair" from sentences below

Answer: a (10 points)

- a. to restore something that is broken or damaged to good condition
- b. to return a building or an area to its previous good condition
- c. act of monitoring and inspecting property
- d. act of keeping something in good condition by checking it regularly



(3) Choose suitable one description on “Rehabilitation” from sentences below

Answer:  b  (10 points)

- a. to restore something that is broken or damaged to good condition
- b. to return a building or an area to its previous good condition
- c. act of keeping something in good condition by checking and repairing it regularly
- d. act of repairing something to keep it in good condition

(4) Choose suitable items that are restricted in river area and river conservation area from below.

(some of items can be selected for both answers)

Answer: River area : a, d, e, f, g , River conservation area: b, f

(2 points \*7 answers =14 points)

- a. River Water Use
- b. Construction or reconstruction of a structure such as houses, underground pipes, electric pole, traffic signs, etc
- c. Access of people to river area
- d. Land Occupancy
- e. Construction, reconstruction & remove of structures
- f. Alternation of land shape such as excavation and filling
- g. Taking sand & stone

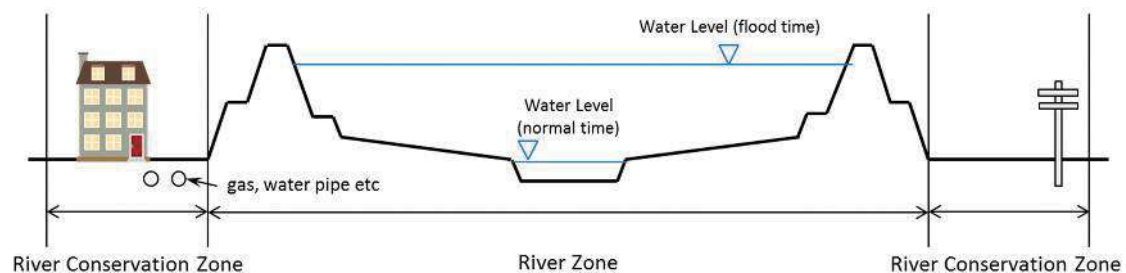


Figure of river area and river conservation area



- (5) Choose suitable items of phenomena showing degradation of functions, and items that should be checked by patrolling and inspection for bank / levee

Answer (phenomena showing degradation of functions on bank / levee): b, d, e, f

**(2 points \* 4 answers = 8 points)**

- a. Break
- b. Settlement
- c. Leakage
- d. Erosion
- e. Piping / Seepage
- f. Slope slippage

Answer (items that be checked by patrolling and inspection for bank / levee): a, b, d, e, f, h

**(2 points \* 6 answers = 12 points)**

- a. Water leakage
- b. Cracks
- c. Sedimentation
- d. Holes
- e. Slippage
- f. Roughness on the surface
- g. Scouring
- h. Gully erosion

END



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.005

Training on Maintenance for Water Resources Infrastructure, in Bandung on  
August 2016





## Plan of “Training on Maintenance for Water Resources Infrastructure”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “Maintenance for Water Resources Infrastructure”.

5-year strategic plan of PUPR 2015 – 2019 mentions “Reservoir and other water infrastructure to be operated and maintained” activity 15 “Operation and Maintenance of Water Resources” by BBWS/BWS. Better maintenance works for water resource infrastructures are strongly recommended for better operation and maintenance for water resources by BBWS/BWS.

In relation to this, JICA RBO project will hold a training on “Maintenance for Water Resources Infrastructure”.

|                        |                                                                                |
|------------------------|--------------------------------------------------------------------------------|
| Date                   | : 30 <sup>th</sup> August 2016 (Tue.) to 2 <sup>nd</sup> September 2016 (Fri.) |
| Time                   | : 08:00 WIB – finish                                                           |
| Number of Participants | : Approximately 30                                                             |
| Venue                  | : DIKLAT IV Bandung                                                            |

Participants of this training will be able to have following technical knowledge and competence;

- a. Current status of laws, regulations, technical standards/guidelines for water resources infrastructure maintenance
- b. Knowledge of database and inventory of water resources infrastructure for adequate maintenance planning and works
- c. Practical / proper way for maintenance with consideration of asset management as a water resource manager with the examples in Japan
- d. Practical / proper way for managing water resources maintenance planning and works with practical examples of periodical maintenance of water resources infrastructures by BBWS Citarum
- e. Maintenance and inspection for hydrological stations for proper water resources management



- f. Practical / concrete method of maintenance and inspection works of small scale dam, watershed and hydrology network at field study

We would like to invite a staff from each agency, who is in charge of dam (or Water Resources Infrastructures) operation & maintenance. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Water Resources Infrastructure Maintenance

## 1. Time and Duration

From 30th Aug. 2016 (Tue.) to 2nd Sep. 2016 (Fri.) , for 4 days

## 2. Venue

In Bandung

- Classroom Lectures: Sutan Raya Hotel (Jl. Raya Soreang No. 10 Km. 17, Soreang, Bandung)
- Field Study: Cileunca Dam, Cipanunjang Dam and Hydrological Laboratory of PUSAIR

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher
- Year of Experience: 3 years or more on Water Resources Management
- Current Responsibility: Operation / Maintenance or Management of Water Resources

## 4. Curriculum

| Day              | No. | Time          | Lecture                                                                                  | Lecturer                                                                                                                                                           | Minutes | JP |
|------------------|-----|---------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>30th Aug. |     | 08:00 -       | Registration                                                                             |                                                                                                                                                                    |         |    |
|                  |     | 08:45 - 09:30 | Opening Remarks                                                                          | Prof. Dr. Ir. Anita Firmanti Eko Susetyowati, MT, Head of Human Resources Development Agency<br>Mr. Suzuki, JICA RBO Project Coordinator                           |         |    |
|                  |     | 09:30 - 09:45 | General Information for Participants                                                     | Secretariat Member                                                                                                                                                 |         |    |
|                  |     |               | Coffee Break                                                                             |                                                                                                                                                                    |         |    |
|                  |     | 10:00 - 10:30 | Pre Test                                                                                 | Secretariat Member                                                                                                                                                 |         |    |
|                  | 1   | 10:30 - 12:00 | Legal Aspect and Current Status of Maintenance Works for Water Resources Infrastructures | Ir. Muhammad Asdin Thalib, MT, Head of Sub-dit of Planning of O/M, Directorate of O/M                                                                              | 90      | 2  |
|                  |     |               | Lunch                                                                                    |                                                                                                                                                                    |         |    |
|                  | 2   | 13:15 - 15:30 | Database of Water Resources Infrastructure and Facility                                  | Dr. Ismail Widadi, ST, M.Sc, Head of Subdit of Water Resources Data and Information System, Directorate of Water Resources Network Development                     | 135     | 3  |
|                  |     |               | Coffee Break                                                                             |                                                                                                                                                                    |         |    |
|                  | 3   | 15:45 - 18:00 | Inventory of Water Resources Infrastructure and Facility for Maintenance                 | Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                    | 135     | 3  |
| 2nd<br>31st Aug. | 4   | 08:00 - 09:30 | Asset Management of Water Resources Infrastructures                                      | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                                                                                          | 90      | 2  |
|                  |     |               | Coffee Break                                                                             |                                                                                                                                                                    |         |    |
|                  | 5   | 09:45 - 12:00 | Maintenance Works of Dam in Japan                                                        | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                                                                                          | 135     | 3  |
|                  |     |               | Lunch                                                                                    |                                                                                                                                                                    |         |    |
|                  | 6   | 13:30 - 15:00 | Practical Maintenance Works (1) focusing on small scale dam                              | BBWS Citarum (Mr. M Ruchimat, Staff of Functional Group)                                                                                                           | 90      | 2  |
|                  |     |               | Coffee Break                                                                             |                                                                                                                                                                    |         |    |
|                  | 7   | 15:15 - 16:45 | Practical Maintenance Works (2) focusing on Hydrology Network                            | PUSAIR (Mr. Heruyoko, Balai Hydrology and Water Management)                                                                                                        | 90      | 2  |
| 3rd<br>1st Sep.  | 8   | 16:45 - 17:30 | Briefing on Field Study                                                                  | BBWS Citarum, Indonesia Power<br>PUSAIR<br>Mr. MIURA Hirohisa, ME, Tenaga Ahli Proyek JICA RBO<br>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO                   | 45      | 1  |
|                  | 9   | 07:30 - 12:00 | Field Study at Cileunca & Cipanunjang Dam                                                | BBWS Citarum (Mr. M Ruchimat, Jafung)<br>Indonesia Power,<br>Mr. MIURA Hirohisa, ME, Tenaga Ahli Proyek JICA RBO<br>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO | 270     | 6  |
|                  |     | 07:30 - 08:30 | Travel to Bendungan Pulo (Cileunca)                                                      |                                                                                                                                                                    |         |    |
|                  |     | 08:30 - 09:00 | Field Study at Bendungan Pulo                                                            |                                                                                                                                                                    |         |    |
|                  |     | 09:00 - 09:10 | Travel to Bendungan Palayangan                                                           |                                                                                                                                                                    |         |    |
|                  |     | 09:10 - 09:40 | Field Study at Bendungan Palayangan                                                      |                                                                                                                                                                    |         |    |
|                  |     | 09:40 - 10:00 | Travel to Bendungan Cipanunjang                                                          |                                                                                                                                                                    |         |    |
|                  |     | 10:00 - 11:00 | Field Study at Bendungan Cipanunjang                                                     |                                                                                                                                                                    |         |    |
|                  |     | 11:00 - 11:30 | Travel to Lunch Venue (RM Asti)                                                          |                                                                                                                                                                    |         |    |
|                  |     | 11:30 - 13:00 | Lunch                                                                                    |                                                                                                                                                                    |         |    |
|                  | 10  | 13:00 - 13:20 | Travel to PLTA Cikalong                                                                  | BBWS Citarum (Mr. M Ruchimat, Jafung)<br>PUSAIR (Heruyoko, Kasie Layanan, Balai Hidrologi dan Tata Air)                                                            | 270     | 6  |
|                  |     | 13:20 - 13:50 | Field Study at PLTA Cikalong                                                             |                                                                                                                                                                    |         |    |
|                  |     | 13:50 - 15:30 | Travel to Lab. Hydrology Ciparay                                                         |                                                                                                                                                                    |         |    |
|                  |     | 13:50 - 17:30 | Field Study at Lab. Hydrology Ciparay                                                    |                                                                                                                                                                    |         |    |
|                  |     | 15:00 - 16:30 | Lab. Hydrology Ciparay                                                                   |                                                                                                                                                                    |         |    |
|                  |     | 16:30 - 17:30 | Meteorological Observation Station                                                       |                                                                                                                                                                    |         |    |
|                  |     | 17:30 - 18:30 | Travel to Balai DIKLAT                                                                   |                                                                                                                                                                    |         |    |
|                  |     | 19:00 - 21:00 | Preparation for Group Presentation                                                       |                                                                                                                                                                    |         |    |
| 4th<br>2nd Sep.  |     | 08:00 - 08:30 | Post Test                                                                                | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                                                                                          |         |    |
|                  |     |               | Coffee Break                                                                             |                                                                                                                                                                    |         |    |
|                  | 11  | 08:30 - 11:30 | Feedback of Field Study, Group Presentation                                              | BBWS Citarum, Indonesia Power, PUSAIR, Mr. MIURA Hirohisa, ME, Tenaga Ahli Proyek JICA RBO<br>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO                       | 180     | 4  |
|                  |     |               | Lunch                                                                                    |                                                                                                                                                                    |         |    |
|                  |     | 13:30 - 13:45 | Questionnaire of the training                                                            | Secretariat Member                                                                                                                                                 |         |    |
|                  |     | 13:45 - 14:15 | Closing Ceremony                                                                         | DGWR - PUPR                                                                                                                                                        |         |    |
|                  |     |               |                                                                                          |                                                                                                                                                                    | 34      |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Legal Aspect and Current Status of Maintenance Works for Water Resources Infrastructures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Outline          | <p>Water Resources Infrastructure includes various infrastructures and facility, 1) Conservation Infrastructure of Water Resources, 2) Utilization infrastructure of Water Resources, 3) Control Infrastructure of damage Power of Water, and 4) Supporting Infrastructure and Hydrology Network.</p> <p>Required knowledge and work as a good engineer / technician / officer for water resources infrastructure maintenance will be described and used as a example in the lecture.</p>                                                                                                                                                                                                                                                                                                                                                                                                     |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of legal aspect, law / governmental regulation / ministerial regulation / technical guidelines for river facility maintenance</li> <li>-Understanding prospect on O/M works at PUPR</li> <li>-Understanding responsibility for maintenance works at B(B)WS of PUPR</li> <li>-Knowing maintenance plan (daily / periodical check, repairing / renewal of facility, cost calculation, etc.)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Lecturer         | Ir. Muhammad Asdin Thalib, MT, Head of Sub-dit of Planning of Operation & Maintenance, Directorate of Operation & Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Contents         | <ul style="list-style-type: none"> <li>-Law, Regulation, Standards, Guideline for Maintenance</li> <li>-Maintenance work plan in 5-year plan of SDA PUPR</li> <li>-Responsibility of PUPR at B(B)WS of PUPR</li> <li>-Planning maintenance work on daily / periodical check, repairing / renewal of facility</li> <li>-Planning budget for maintenance works with viewpoint of asset management</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.47 (River Operation &amp; Maintenance No.1: Operation and Maintenance of River)</p> <p>Module No.51 (River Operation &amp; Maintenance No.5: Cost of River OP)</p> <p>Module No.98 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.1: General Description on Operation and Maintenance of Hydromechanics Equipment)</p> <p>Module No.99 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.2: Operation and Maintenance of Movable Weir)</p> <p>Module No.103 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.6: Compilation of SOP on Operation and Maintenance for Water-intake facility)</p> <p>Module No.104 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.7: Cost Calculation of Operation and Maintenance)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Database of Water Resources Infrastructure and Facility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Outline          | Database of infrastructures and facilities are essential for making an inventory of water resources infrastructures and facilities for adequate maintenance works. Knowledge on creating / managing database is indispensable as a engineer / technician / officer in the field of Operation & Maintenance. Participant will understand deeply on database of water resources infrastructure information.                                                                                                                                     |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding necessary information for database</li> <li>-Knowing current and future database for water resources management</li> <li>-Introduction of reflection and contribution of database / inventory to maintenance planning, such as repairing / renewal planning, periodical check planning</li> </ul>                                                                                                                                                                                       |
| Lecturer         | Dr. Ismail Widadi, ST, M.Sc, Head of Subdit of Water Resources Data and Information System, Directorate of Water Resources Network Development                                                                                                                                                                                                                                                                                                                                                                                                |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Purpose and necessity of database for water resources management</li> <li>-Necessary information of each infrastructure and facility for database</li> </ul>                                                                                                                                                                                                                                                                                                                                          |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.53 (River Operation &amp; Maintenance No.7: Database for River OP)</p> <p>Module No.54 (River Operation &amp; Maintenance No.8: Inventory of River Conditions and Facilities)</p> <p>Module No.102 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.5: Inventory of Hydromechanics Equipment)</p> <p>Module No.107 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.10: Report and Evaluation of Operation and Maintenance)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Inventory of Water Resources Infrastructure and Facility for Maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Outline          | Database and inventory of infrastructures and facilities are essential for implementation of adequate maintenance works. Knowledge on creating / managing database and inventory is indispensable as a engineer / technician / officer in the field of Operation & Maintenance. Participant will understand deeply on database and inventory of water resources infrastructure.                                                                                                                                                               |
| Objective        | <ul style="list-style-type: none"> <li>-Knowing purpose and necessity of inventory for maintenance works</li> <li>-Understanding necessary information for inventory</li> <li>-Introduction of reflection / contribution of inventory to maintenance planning, such as repairing / renewal planning, periodical check planning</li> </ul>                                                                                                                                                                                                     |
| Lecturer         | Mr. Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Purpose and necessity of inventory for maintenance works</li> <li>-Necessary information of each facility / infrastructure for inventory</li> <li>-Reflection from inventory to maintenance plan (repairing / renewal planning, periodical check plan)</li> </ul>                                                                                                                                                                                                                                     |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.53 (River Operation &amp; Maintenance No.7: Database for River OP)</p> <p>Module No.54 (River Operation &amp; Maintenance No.8: Inventory of River Conditions and Facilities)</p> <p>Module No.102 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.5: Inventory of Hydromechanics Equipment)</p> <p>Module No.107 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.10: Report and Evaluation of Operation and Maintenance)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Title            | Asset Management of Water Resources Infrastructures                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Outline          | <p>The lecture will aim to provide sufficient information on concept of asset management and maintenance plan for water resources infrastructures / facilities to the participants to make their own maintenance works.</p> <p>*Concept of asset management is adopted for public facilities includes water resources infrastructure and facility. The asset management is comprehensive evaluation by 1) functional level, 2) performance level, 3) risk level and 4) cost. it is relevant to maintenance works.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction on concept of asset management</li> <li>-Knowing maintenance planning, including daily check / periodical maintenance and inspection / repairing and renewal</li> </ul>                                                                                                                                                                                                                                                                                          |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA RBO Project Expert                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Contents         | <ul style="list-style-type: none"> <li>-Concept of asset management</li> <li>-Examples of Maintenance guideline and plan for facilities</li> </ul>                                                                                                                                                                                                                                                                                                                                                                    |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Title            | Maintenance Works of Dam in Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Outline          | <p>In this lecture, a practical example of maintenance plan and work at dams in Japan is introduced as a reference for participants to implement maintenance planning and works.</p> <p>Maintenance of water resources infrastructure and facility is required considering on "asset management" including 1) functional level, 2) performance level, 3) risk level and 4) cost. BBWSs and BWSs should know how to produce a practical plan and maintenance work of water resources infrastructures and facilities.</p> |
| Objective        | <p>-To Introduce concept of maintenance plan and work, considering facility's function level, performance level, risk level and cost</p> <p>-To learn practical daily check and periodical maintenance / inspection at dam</p>                                                                                                                                                                                                                                                                                          |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Contents         | <p>-Concept and outline of maintenance plan of facilities at dam</p> <p>-Examples of practical maintenance work at dam, such as daily check, periodical maintenance / inspection and database / inventory</p>                                                                                                                                                                                                                                                                                                           |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Maintenance Works (1) focusing on Small Scale Dam and Watershed                                                                                                                                                                                                                                                                                                                                                  |
| Outline          | Planning / implementing maintenance work is duty for BBWS and BWS as a regulator. BBWS Citarum has maintained various water resources infrastructures and facilities, including dams as utilization infrastructure of water resources and control infrastructure for being damaged by power of the water. Participant will learn how to produce a plan and implementation of maintenance for dams and watershed. |
| Objective        | <ul style="list-style-type: none"> <li>-To know maintenance / inspection plan and implementation for dam facility and watershed, such as dam body, gates, etc.</li> <li>-To acquire necessary information and data for maintenance of dam, database / inventory of facility, maintenance / repairing records, guidelines / manuals</li> </ul>                                                                    |
| Lecturer         | BBWS Citarum (Mr. M Ruchimat, Staff of Functional Group)                                                                                                                                                                                                                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Maintenance plan for dam facilities (dam body, gates) and watershed</li> <li>-Management of maintenance work by operator as a regulator</li> <li>-Implementation of maintenance work for dam and facilities (Human resources, guideline / manuals, database / inventory of facility, etc.)</li> </ul>                                                                    |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Title            | Practical Maintenance Works (2) focusing on Hydrology Network                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Outline          | <p>Planning / implementing maintenance work is important duty for BBWS and BWS. BBWSs and BWSs have maintained various water resources infrastructures and facilities, including hydrological observation station and telemetry as supporting infrastructures and hydrology network.</p> <p>PUSAIR is a leading organization for management of hydrological network. Participant will learn how to produce a practical plan and implementation of maintenance for hydrology network.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-To know maintenance / inspection plan and implementation for hydrological stations and telemetry, such as river water level stations, rainfall stations, etc.</li> <li>-To learn about data for maintenance, database / inventory of facility, maintenance / repairing records, guidelines / manuals</li> </ul>                                                                                                                                  |
| Lecturer         | PUSAIR (Mr. Heruyoko, Balai Hydrology and Water Management)                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of hydrological network, such as "TECH4WATER"</li> <li>-Maintenance plan for hydrological stations and telemetry (River water level, rainfall)</li> <li>-Implementation of maintenance work for hydrological stations and telemetry (Human resources, guideline / manuals, database / inventory of facility, etc.)</li> </ul>                                                                                                            |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                     |
| Title            | Briefing on Field Study                                                                                                                                                                                                               |
| Outline          | Participants will learn about<br>1) Outline of Cileunca and Cipanunjang dam,<br>2) Hydrological network,<br>prior to the field study.                                                                                                 |
| Objective        | -Sharing the information of<br>1) Outline of Cileunca and Cipanunjang Dam, including maintenance works<br>2) Outline Hydrological network and stations<br>3) Schedule and route<br>before the field study to have a productive visit. |
| Lecturer         | BBWS Citarum, Indonesia Power<br>PUSAIR<br>Mr. MIURA Hirohisa, ME, Tenaga Ahli Proyek JICA RBO<br>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO                                                                                      |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                                     |
| Contents         | -Schedule and Route of Field Study<br>-Outline of Cileunca and Cipanunjang Dam, including maintenance works<br>-Outline Hydrological network and stations                                                                             |
| Textbook, Module | Explanation materials made by MIURA                                                                                                                                                                                                   |
| References       |                                                                                                                                                                                                                                       |

## Syllabus

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Field Study at Cileunca & Cipanunjang Dam                                                                                                                                                                                                                                                                                                                                                                            |
| Outline          | Constructed in 1920's, Cileunca and Cipanunjang dam has been used as water resources infrastructure for over 80 years. That shows the dam and watershed has been maintained well. The maintenance work of the facility and watershed will be introduced as examples                                                                                                                                                  |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding a way of practical observation for dam safety</li> <li>-Learning periodical maintenance work of facilities and instruments</li> <li>-Knowing examples of maintenance works for watershed (environment conservation)</li> </ul>                                                                                                                                 |
| Lecturer         | BBWS Citarum (Mr. M Ruchimat, Jafung)<br>Indonesia Power,<br>Mr. MIURA Hirohisa, ME, Tenaga Ahli Proyek JICA RBO<br>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO                                                                                                                                                                                                                                                   |
| Duration         | 270 minutes (6 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                             |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction of outline of Cileunca and <i>Cipanunjang Dam</i></li> <li>-Description and practice of actual observation of 1) Deformation of dam body, 2) Seepage, for dam safety at <i>Cipanunjang Dam</i></li> <li>-Description and demonstration of maintenance work for facilities instruments</li> <li>-Description on watershed maintenance for environment</li> </ul> |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                        |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Field Study at Telemetry Stations of Water Level, Rainfall                                                                                                                                                                                                                                                                                                            |
| Outline          | Telemetry stations for hydrology, such as water level, rainfall, etc., are important facility and instrument for proper water resources management for "Supporting Infrastructure and Hydrology Network". Adequate maintenance work is indispensable for continuous observation. The maintenance work will be introduced with examples at several stations by PUSAIR. |
| Objective        | -To understand practical maintenance / inspection work on sensor of water level, rainfall gauge, observation circumstance, telemetry equipment and station house                                                                                                                                                                                                      |
| Lecturer         | BBWS Citarum (Mr. M Ruchimat, Jafung)<br>PUSAIR (Heruyoko, Kasie Layanan, Balai Hidrologi dan Tata Air)                                                                                                                                                                                                                                                               |
| Duration         | 270 minutes (6 JP) including travel time                                                                                                                                                                                                                                                                                                                              |
| Contents         | -Field Visit to water level station to learn practical maintenance / inspection work on sensor of water level, observation circumstance, telemetry equipment and station house<br>-Field Visit to rainfall station to know practical maintenance / inspection work on rainfall gauge, observation circumstance, telemetry equipment and station                       |
| Textbook, Module | Power point made by Lecturer                                                                                                                                                                                                                                                                                                                                          |
| References       |                                                                                                                                                                                                                                                                                                                                                                       |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Feedback of Field Study, Group Presentation                                                                                                                                                                                                                                                                                                                           |
| Outline          | <p>Feedback session to discuss among participants and instructors on things learned from field study for maintenance works especially how the participant can apply for their duty at their office.</p> <p>Participants are divided into several groups. Preparation for group presentation will be done by each group.</p>                                           |
| Objective        | <p>-Discussion and preparation of presentation on necessary and suitable maintenance works for Cileunca and Cipanunjang dam and hydrology observation stations</p> <p>-Through discussion and presentation, participants will understand importance and necessity daily / periodical maintenance works, infrastructure and facility management (asset management)</p> |
| Lecturer         | <p>BBWS Citarum, Indonesia Power, PUSAIR,</p> <p>Mr. MIURA Hirohisa, ME, Tenaga Ahli Proyek JICA RBO</p> <p>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO</p>                                                                                                                                                                                                        |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                                                                                    |
| Contents         | <p>-Presentation from each group (20 minutes * 6 groups = 120 minutes)</p> <p>-Comments from Instructors (60 minutes)</p>                                                                                                                                                                                                                                             |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                       |
| References       |                                                                                                                                                                                                                                                                                                                                                                       |



## Pretest

### Training on River Facility Maintenance

#### 1. Legal Framework for River Facility Maintenance (24 Points = 6 points \* 4 Answers)

Fill in laws, regulation and its description on River Facility Maintenance

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



## 2. Database and Inventory (12 Points = 2 points \* 6 answers)

Choose suitable order of procedure from blows (a. to f.) for river infrastructures database by B(B)WS office

### Answers

Step 1: e

Step 2: a

Step 3: c

Step 4: d

Step 5: b

Step 6: f

- a. Menginventarisasi prasarana (asset) sungai
- b. Melakukan updating data kondisi dan fungsi prasarana sungai minimal 1 tahun sekali
- c. Mengidentifikasi kondisi dan fungsi tiap prasarana sungai sesuai format inspeksi
- d. Menginput/memasukkan data hasil inspeksi ke dalam system
- e. Menyusun skema sungai di wilayah kerja Balai
- f. Koordinasi dan sinergi antara petugas OP dan SISDA

## 3. Asset Management of Water Resources Infrastructure

(1) Choose most suitable description on “Asset Management for Infrastructure” from sentences below

Answer: c (10 points)

- a. keeping infrastructure/facility in good condition by checking it regularly
- b. Repairing infrastructure/facility to keep it in good condition
- c. Managing, monitoring and maintaining infrastructure/facility to provide a best possible service
- d. to restore infrastructure/facility that is broken or damaged to good condition

(2) Choose not suitable description on “Merits of Asset Management” from sentences below

Answer: d (10 points)

- a. Improvement of accountability for water users, residents and citizen
- b. Improvement of ensuring necessary budget for infrastructure maintenance
- c. Enhancement of proper infrastructure maintenance, such as life cycle cost reduction
- d. Development of capacity for human resources on maintenance works



- (3) Choose four (4) suitable evaluation items for planning long-term infrastructure/facility maintenance from viewpoint of “Asset Management” from sentences below

Answer: b, c, d, f (8 points = 2 points\* 4 answers)

- a. Human Resources Level: ability, number of engineer for infrastructure/facility maintenance
- b. Risk Level: impact by infrastructure/facility failure and accident
- c. Performance Level: minimum requirement of service/function by infrastructure/facility
- d. Cost Level: maintenance/renewal/rehabilitation cost of infrastructure/facility
- e. Leadership Level: capacity, ability of leader of office/unit/team for infrastructure/facility management
- f. Functional Level: age, history of failure/accident, current condition of infrastructure/facility
- g. Stakeholder Coordination Level: frequency of meeting/discussion with stakeholders on infrastructure/facility management

- (4) Choose suitable items for “Preventive Maintenance” and “Corrective Maintenance” from below.

*\*Preventive Maintenance: is taking appropriate measures before any failure of the facility becomes fatal*

*\*Corrective Maintenance: is service or repairing of a facility when any failure of facility is identified as fatal*

Answer: Preventive Maintenance: b, c, e , Corrective Maintenance: a, d

(2 points \*5 answers =10 points)

- a. Urgent maintenance (Urgent/emergency repairing works)
- b. Monitored maintenance (Constant patrol/inspection of aged/not good condition facility)
- c. Age-based maintenance (Special Inspection following service life of facility)
- d. Usual corrective maintenance (parts change, rehabilitation and renewal following plan/guidance)
- e. Periodic maintenance (daily/weekly patrol, monthly/annual inspection)

#### 4. Maintenance work of Dam

Graphs below (a), (b) ,(c), (d), (e) show variation trends of rockfill dam body seepage as time proceeds (Horizontal Axis: time, Vertical Axis: value of seepage). Choose suitable order from dangerous condition to most stable condition of dam body.



**Answers (2 points \*5 answers =10 points)**

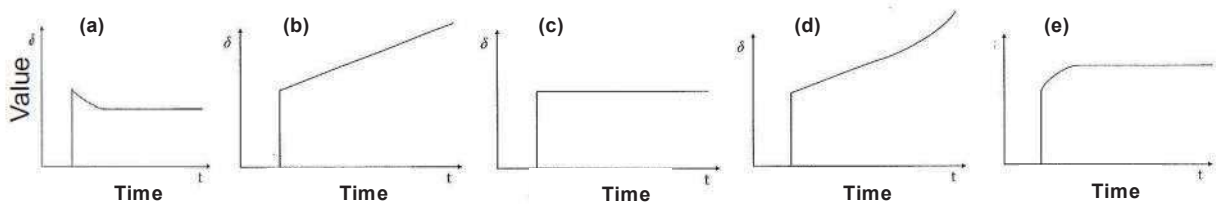
Dangerous : d

Caution : b

Safe : e

Stable : c

Most Stable : a



**5. Arrangement of Maintenance Works for Dam**

Institutions below are stakeholders for water resources management in Citarum River Basin. Choose suitable institutions of “Regulator”, “Operator”, and “Water User” in case of dam (purpose for irrigation and hydropower) maintenance from bellows.

**Answer (2 points \*8 answers =16 points)**

Regulator: a, d, f, g

Operator: b, c, g

Water User: e

- a. BBWS Citarum
- b. Indonesia Power/PLN
- c. PJT II
- d. BMKG
- e. Farmer
- f. Dinas PSDA/BPSDA province
- g. Puslitbang SDA/Balitbang
- h. Unit Pembangkit/PLN

END

## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.006

Training on Water Quality Management in Urban Rivers, in Jakarta on September  
2016





## Plan of “Training on Water Quality Management in Urban Rivers”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “Water Quality Management in Urban Rivers”.

5-year strategic plan of PUPR 2015 – 2019 mentions “Hydrology data and water quality to be managed” at activity 16 “DEVELOPING INTEGRATED WATER RESOURCES MANAGEMENT” by BBWS/BWS. Many urban rivers have been facing to difficulty of water pollution control. Better water quality management in rivers are strongly recommended for better management of water resources by BBWS/BWS.

In relation to this, JICA RBO project will hold a training on “Water Quality Management in Urban Rivers”.

|                        |                                                                                    |
|------------------------|------------------------------------------------------------------------------------|
| Date                   | : 27 <sup>th</sup> September 2016 (Tue.) to 30 <sup>th</sup> September 2016 (Fri.) |
| Time                   | : 08:00 WIB – finish                                                               |
| Number of Participants | : Approximately 33                                                                 |
| Venue                  | : DIKLAT III Jakarta                                                               |

Participants of this training will gain following technical knowledge and competence;

- a. Current status and laws, regulations, technical standards/guidelines for river water quality monitoring and management
- b. Knowledge of water quality monitoring and coordination with institutions and communities for river water quality management as a river administrator
- c. Effective / proper way for effluent control and wastewater treatment by local government
- d. Current status and laws on water environment conservation in Japan
- e. Using examples of technical guideline and activity by river management office in Japan, the participants will learn about practical / proper way for monitoring and management of water quality



- f. Using experiences of water quality monitoring and coordination with related institutions for water quality management in Indonesia, the participants will understand importance and adequate way of coordination with stakeholders for river water quality management
- g. Practical operation and maintenance of water treatment plants to improve drainage water quality at field study

We would like to invite a staff from each agency, who is in charge of water quality management. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Water Quality Management in Urban Rivers

## 1. Time and Duration

From 27th Sep. 2016 (Tue.) to 30th Sep. 2016 (Thu.) , for 4 days

## 2. Venue

In Jakarta

- Classroom Lectures: Balai DIKILAT III Jakarta
- Field Study: Waduk Setia Budi, Waduk Melati

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher
- Year of Experience: 3 years or more on Water Resources Management
- Current Responsibility: Hydrology and/or Environment

## 4. Curriculum

| Day                 | No. | Time          | Lecture                                                                  | Lecturer                                                                                                                                    | Minutes | JP |
|---------------------|-----|---------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>27th<br>Sep. |     | 08:00 -       | Registration                                                             |                                                                                                                                             |         |    |
|                     |     | 08:45 - 09:30 | Opening Remarks                                                          | Prof. Dr. Ir. Anita Firmanti Eko Susetyowati, MT, Head of Human Resources Development Agency<br>Mr. Suzuki, JICA Project Coordinator        |         |    |
|                     |     | 09:30 - 09:45 | General Information for Participants                                     | Secretariat Member                                                                                                                          |         |    |
|                     |     |               | Coffee Break                                                             |                                                                                                                                             |         |    |
|                     |     | 10:00 - 10:30 | Pre Test                                                                 | Secretariat Member                                                                                                                          |         |    |
|                     | 1   | 10:30 - 12:00 | Water Pollution Control Policy in Indonesia                              | Ir. SPM Budisusanti, Msc., Director of Water Pollution Control, Ministry of Environment                                                     | 90      | 2  |
|                     |     |               | Lunch                                                                    |                                                                                                                                             |         |    |
|                     | 2   | 13:15 - 15:30 | Water Quality Monitoring and Management by River Administrator           | Dr. Eka Nugraha Abdi, ST, MPPM, PDS, Head of Subdit of Hydrology & Environmental Water Resources, Directorate of Water Resources Management | 135     | 3  |
|                     |     |               | Coffee Break                                                             |                                                                                                                                             |         |    |
|                     | 3   | 15:45 - 18:00 | Effluent control and Wastewater Treatment in Jakarta                     | DINAS Tata Air, DKI Jakarta                                                                                                                 | 135     | 3  |
| 2nd<br>28th<br>Sep. | 4   | 08:00 - 09:30 | Water Pollution Control Policy and Management in Japan                   | Mr. NISHI Shu, JICA Expert on Sewage Policy, CIPTA KARYA, PUPR                                                                              | 90      | 2  |
|                     |     |               | Coffee Break                                                             |                                                                                                                                             |         |    |
|                     | 5   | 09:45 - 12:00 | River Water Quality Management Policy in Japan                           | Mr. HAYAKAWA Jun, JICA Expert on IWRM, PUPR                                                                                                 | 135     | 3  |
|                     |     |               | Lunch                                                                    |                                                                                                                                             |         |    |
|                     | 6   | 13:30 - 15:00 | Water quality monitoring and response against water quality problem      | PJT II                                                                                                                                      | 90      | 2  |
|                     |     |               | Coffee Break                                                             |                                                                                                                                             |         |    |
|                     | 7   | 15:15 - 16:45 | Water quality management at Ciliwung River                               | BBWS Ciliwung Cisadane                                                                                                                      | 90      | 2  |
| 3rd<br>29th<br>Sep. | 8   | 16:45 - 17:30 | Briefing on Field Study                                                  | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert, Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                      | 45      | 1  |
|                     | 9   | 09:00 - 17:30 | Field Study at Water treatments, Waduk Setia Budi and Waduk Kebun Melati |                                                                                                                                             | 450     | 10 |
|                     |     | 09:00 - 10:00 | Travel to Waduk Setia Budi                                               | DINAS Tata Air, DKI Jakarta PD PAL Jaya,                                                                                                    |         |    |
|                     |     | 10:00 - 12:00 | Site Visit Waduk Setia Budi                                              | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,                                                                                      |         |    |
|                     |     | 12:00 - 13:00 | Lunch                                                                    | Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                             |         |    |
|                     |     | 13:00 - 13:30 | Travel to Waduk Melati                                                   |                                                                                                                                             |         |    |
|                     |     | 13:30 - 14:30 | Site Visit Waduk Melati                                                  |                                                                                                                                             |         |    |
| 4th<br>30th<br>Sep. |     | 14:30 - 17:30 | Back to Balai DIKLAT                                                     |                                                                                                                                             |         |    |
|                     |     | 08:00 - 08:30 | Post Test                                                                | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert, PD PAL Raya                                                                          |         |    |
|                     | 10  | 08:30 - 11:30 | Feedback of Lectures and Field Study, Group Presentation                 | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert, Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                      | 180     | 4  |
|                     |     |               | Lunch                                                                    |                                                                                                                                             |         |    |
|                     |     | 13:30 - 13:45 | Questionnaire of the training                                            | Secretariat Member                                                                                                                          |         |    |
|                     |     | 13:45 - 14:30 | Closing Ceremony                                                         | DGWR - PUPR                                                                                                                                 | 32      |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                       |
| Title            | Water Pollution Control Policy in Indonesia                                                                                                                                                                                                                                                                                                                                             |
| Outline          | River water quality management is now one of essential duty of B(B)WS, especially urban rivers. B(B)WS's responsibility for water quality management is mainly monitoring of water quality in rivers. Therefore, background of B(B)WS's responsibility for water quality management is introduced in this lecture.                                                                      |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing legal aspect, law / governmental regulation / ministerial regulation / technical guidelines, and 5-year plan for water quality management</li> <li>-Understanding current status of water quality of rivers and so on</li> <li>-Understanding water quality standard and effluent standard for monitoring</li> </ul>                |
| Lecturer         | Ministry of Environment and Forestry                                                                                                                                                                                                                                                                                                                                                    |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                       |
| Contents         | <ul style="list-style-type: none"> <li>- Introduction of legal system of water environment administration</li> <li>- State of water quality (rivers, lakes, groundwater and so on)</li> <li>- Water quality goals of 5-year plan 2015~2019 and priority rivers</li> <li>- Water quality standard (45 items) and effluent standard</li> <li>- Monitoring in public water area</li> </ul> |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.55 (Water Quality Management No.1: Identification of Water Pollution Source and Load)</p> <p>Module No.56 (Water Quality Management No.2: Introduction on Water Quality Management)</p>                                                                                                                                           |
| References       |                                                                                                                                                                                                                                                                                                                                                                                         |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                                     |
| Title            | Water Quality Monitoring and Management by River Administrator                                                                                                                                                                                                                                                                                                                                        |
| Outline          | River water quality management is now one of essential duty of B(B)WS, especially urban rivers. B(B)WS's responsibility for water quality management is mainly monitoring of water quality in rivers. Therefore, practical works for river water quality management that should be done by B(B)WS is introduced in this lecture.                                                                      |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing regal duty on water quality management by B(B)WS as a river administrator</li> <li>-Understanding adequate works for water quality, especially monitoring</li> <li>-Understanding stakeholders coordination and public awareness for river water quality management</li> </ul>                                                                    |
| Lecturer         | Dr. Eka Nugraha Abdi, ST, MPPM, PDS, Head of Subdit of Hydrology & Environmental Water Resources, Directorate of Water Resources Management                                                                                                                                                                                                                                                           |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                    |
| Contents         | <ul style="list-style-type: none"> <li>- Current State of water quality in urban rivers</li> <li>- Legal duties and responsibilities of river administrators to manage river water quality</li> <li>- Monitoring system</li> <li>- PDCA (Plan Do Check Action) cycle to improve the quality</li> <li>- Coordination with related organizations and communities</li> <li>- Public awareness</li> </ul> |
| Textbook, Module | Power Point File made by Lecturer<br><br>Module No.61 (Water Quality Management No.7: Water Quality Monitoring)<br>Module No.68 (Water Quality Management No.14: Water Quality Analysis and Sampling)                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                       |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Effluent control and Wastewater Treatment in Jakarta                                                                                                                                                                                                                                                                                                                |
| Outline          | B(B)WS's responsibility for water quality management is mainly monitoring of water quality in rivers. Responsibility of local government for water quality is usually effluent control and water treatment. Therefore, practical works by local government is introduced in this lecture for good understanding / coordination between local government and B(B)WS. |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing practical activity by DKI Jakarta, as a example of local government responsibility</li> <li>-Understanding adequate activity for effluent control and wastewater treatment</li> </ul>                                                                                                                           |
| Lecturer         | DINAS Tata Air, DKI Jakarta                                                                                                                                                                                                                                                                                                                                         |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>- Practical activities of local government, before water flow into river</li> <li>- Water quality standard in Jakarta</li> <li>- Effluent control such as regulating point and non-point and point source pollution</li> <li>- Waste water treatment</li> </ul>                                                              |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                     |
| References       |                                                                                                                                                                                                                                                                                                                                                                     |

## Syllabus

|                  |                                                                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                  |
| Title            | Water Pollution Control Policy and Management in Japan                                                                                                                                                                                                             |
| Outline          | Knowledge on water pollution control policy and management are essential for water quality management. Using examples of environmental conservation policy, especially water environment in Japan, participant will understand deeply on water quality management. |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing environmental standard and water environmental conservation policy in Japan</li> <li>-Understanding law, regulation and guideline on water quality conservation and effluent water control</li> </ul>          |
| Lecturer         | Mr. NISHI Shu, JICA Expert on Sewage Policy, CIPTA KARYA, PUPR                                                                                                                                                                                                     |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>-Environmental Standard</li> <li>-Outline of Water Environmental Conservation Policy</li> <li>-"Water Pollution Control Law" and "Law Concerning Special Measures for Conservation of Lake Water Quality"</li> </ul>        |
| Textbook, Module | Power Point File made by Lecture                                                                                                                                                                                                                                   |
| References       |                                                                                                                                                                                                                                                                    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                           |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                         |
| Title            | River Water Quality Management Policy in Japan                                                                                                                                                                                                                            |
| Outline          | B(B)WS in Japan also has responsibility for water quality management in rivers, lakes and others. Therefore, using examples of policy and activity of B(B)WS in Japan for water quality management, participant will understand deeply on river water quality management. |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing policy and activity for water quality management</li> <li>-Understanding technical guideline on water quality monitoring and adequate activity</li> </ul>                                                             |
| Lecturer         | Mr. HAYAKAWA Jun, JICA Expert on IWRM, PUPR                                                                                                                                                                                                                               |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-River Water Quality Management in Japan</li> <li>-Guideline on river water monitoring</li> <li>-Practical responsibility and activity of Japanese B(B)WS</li> </ul>                                                               |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                         |
| References       |                                                                                                                                                                                                                                                                           |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                      |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                    |
| Title            | Water quality monitoring and response against water quality problem                                                                                                                                                                                                                                                  |
| Outline          | To supply water, water quality monitoring and response for water quality problem are essential. Therefore, using examples of water quality monitoring system and coordination with stakeholders for water quality problem by PJT II, participant will understand deeply on practical river water quality management. |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing system of water quality monitoring system by PJT II</li> <li>-Understanding importance and method of sharing information and coordination activity with stakeholders for water quality problem</li> </ul>                                                        |
| Lecturer         | PJT II                                                                                                                                                                                                                                                                                                               |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                    |
| Contents         | <ul style="list-style-type: none"> <li>- Water quality monitoring system of PJT II</li> <li>- Mechanism of sharing information on water quality with stakeholders</li> <li>- Examples of response against water quality problem</li> </ul>                                                                           |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                      |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                              |
| Title            | Water quality management at Ciliwung River                                                                                                                                                                                                                                                                                                     |
| Outline          | To improve water quality in urban rivers, integrated/comprehensive measure is essential. In this session, participants will understand deeply necessary monitoring of river water and coordination /collaboration with stakeholders for water quality management in urban rivers                                                               |
| Objective        | -Introducing activity of river water quality monitoring by B(B)WS<br>-Understanding importance and method of collaboration activity to reduce water pollution through TKPSDA                                                                                                                                                                   |
| Lecturer         | BBWS Ciliwung Cisadane                                                                                                                                                                                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                              |
| Contents         | <ul style="list-style-type: none"> <li>- River water quality monitoring in Ciliwung and other rivers</li> <li>- Collaboration activity through TKPSDA</li> <li>- How to address mainly non-point source pollution, garbage and so on</li> <li>- Past and Current State of water quality in urban rivers</li> <li>- Public awareness</li> </ul> |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                                |

## Syllabus

|                  |                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                       |
| Title            | Briefing on Field Study                                                                                                                                                                 |
| Outline          | Participants will learn about<br>1) Outline of Waduk Setia Budi<br>2) Outline of Waduk Melati<br>prior to the field study.                                                              |
| Objective        | -Sharing the information of<br>1) Outline of water treatment system at Waduk Setia Budi and Waduk Melati<br>2) Schedule and route<br>before the field study to have a productive visit. |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                               |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                       |
| Contents         | - Schedule and Route of the field study<br>- Outline of water treatment system at Waduk Setia Budi and Waduk Melati                                                                     |
| Textbook, Module |                                                                                                                                                                                         |
| References       |                                                                                                                                                                                         |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Title            | Field Study at Water treatment plants, Waduk Setia Budi and Waduk Melati                                                                                                                                                                                                                                                                                                                                           |
| Outline          | Waduk Setia Budi is water treatment plant for drainage from Business area along Jl. HR.Rasuna Said, operated by PD PAL Jaya. Waduk Melati is water treatment plant for drainage from Tana Abang area. The plants are one of the solutions for river water quality management, it stops direct drainage to river and discharge treated water to river. The water treatment system will be introduced as an example. |
| Objective        | <ul style="list-style-type: none"> <li>- Understanding mechanism of water treatment at Waduk Setia Budi and Waduk Melati as an example for river water quality management</li> <li>- Learning method of operation and maintenance on water treatment plant</li> </ul>                                                                                                                                              |
| Lecturer         | DINAS Tata Air, DKI Jakarta<br>PD PAL Jaya,<br>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                                           |
| Duration         | 450 minutes (10 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                          |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction on outline of Waduk Setia Budi and Waduk Melati as water treatment plants</li> <li>-Description on technical mechanism of water treatment</li> <li>-Description on adequate operation and maintenance of the plant</li> <li>-Site visit at Waduk Setia Budi and Waduk Melati</li> </ul>                                                                       |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                      |
| Title            | Feedback of Lectures and Field Study, Group Presentation                                                                                                                                                                                                                                                                                |
| Outline          | Feedback session to discuss among participants and instructors on things learned from field study for water quality management, especially how the participant can apply for their duty at their office.<br>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group. |
| Objective        | -Presentation on necessary and suitable river water quality management<br>-Through discussion and presentation, participants will understand importance and necessity periodical water quality monitoring and management                                                                                                                |
| Lecturer         | PD PAL Raya,<br>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                               |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                       |
| Contents         | -Presentation from each group (10 minutes * 6 groups = 60 minutes)<br>-Comments from Instructors (30 minutes)                                                                                                                                                                                                                           |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                         |
| References       |                                                                                                                                                                                                                                                                                                                                         |



## Pretest

### Training on Water Quality Management in Urban Rivers

#### 1. Legal Framework for Water Quality (24 Points = 6 points \* 4 Answers)

Fill in laws, regulation and its description on Water Quality

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



## 2. Roles of BBWS, BWS in Water Quality Management (20 Points = 4 points \* 5 answers)

Choose suitable roles of BBWS, BWS in Water Quality Management from below (a. to f.)

Answers: a, b, d, f, g

- a. Collecting water quality data, identify the potential sources of pollution and calculation pollution loads
- b. Maintaining water quality data and trends as the basis of water quality issues and consequently for water allocation decisions
- c. Making laws and technical regulations on environmental conservation
- d. Maintaining or restoring the biological integrity of the Watershed
- e. Giving penalty to person/organization who make water pollution
- f. Coordinating with Environmental Agency and make recommendations on the disposal of liquid waste into the river
- g. Coordinating with Environmental Agency and other agencies to implement pollution control in the river water bodies

## 3. Classification of Water Quality

According to regulation of Indonesia Government No.82/2001, classification for management of water quality and water pollution is described from first class to fourth class.

Choose most suitable description for each class. (16 Points = 4 points \* 4 answers)

Answer:

First Class : b

Second Class : d

Third Class : c

Fourth Class : a

- a. Water for irrigation, and or other uses that require the same water quality
- b. Raw water for drinking water, and or other uses that require the same water quality
- c. Water for fresh water fisheries, livestock, irrigation, and or other uses that require the same water quality
- d. Water for infrastructure / water recreation facilities, fresh water fisheries, livestock, irrigation, and or other uses that require the same water quality



#### 4. Biological Waste Water Treatment

Regarding common process of biological waste water treatment, four processes are mentioned, "PROSES AEROBIK", "PROSES ANOXIC", "PROSES ANAEROBIK" and "GABUNGAN PROSES AEROBIK, ANOXIC DAN ANAEROBIK".

Choose suitable descriptions for each process on biological waste water treatment.

**(28 Points = 4 points \* 7 answers)**

##### Answers

PROSES AEROBIK : b, d, e

PROSES ANOXIC : a

PROSES ANAEROBIK : c, g

GABUNGAN PROSES AEROBIK, ANOXIC DAN ANAEROBIK : f

- a. ada pada proses denitrifikasi baik itu sistem mikroorganisma tersuspensi maupun mikroorganisma melekat
- b. mikroorganisma tersuspensi: lumpur aktif, aerated lagoon dll
- c. mikroorganisma tersuspensi: Proses kontak anaerobic
- d. mikroorganisma melekat pada media: Trickling filter, Reaktor Putar biologis (RBC), Biofilter unggun tetap dll
- e. kombinasi mikroorganisma tersuspensi dan melekat: proses lumpur aktif biofilter dll
- f. Diaplikasikan pada proses pengolahan air limbah dengan lagoon
- g. mikroorganisma melekat pada media: Proses biofilter anaerobik

#### 5. Water Environment Quality Standard

Regarding water pollution that influence to water environment quality standard, it is generally classified into three (3) kinds, "Toxic substance", "Organic pollution" and "Nutrient salts".

Choose suitable descriptions for each.

**(12 Points = 4 points \* 3 answers)**

##### Answers

Toxic Substance : a

Organic Pollution : b

Nutrient Salts : c

- a. Mercury, arsenic, chlorinated organic compound, etc. It effects on people's health and aquatic life
- b. The so called dirtiness and muddiness of water, BOD/COD, DO, SS, etc. It effects on aquatic life



- c. Causative substances of eutrophication Nitrogen, phosphorus. It effects on aquatic life

END



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.007

Training on Operation & Maintenance for Irrigation, in Surabaya on October 2016





## Plan of “Training on Operation & Maintenance for Irrigation”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “Operation & Maintenance for Irrigation”.

Gov. of Indonesia has implemented a project to develop 1.0 million ha agriculture field in 5 years for food security policy. BBWS/BWS need to manage water distribution, irrigation facility and coordination of stakeholders properly.

In relation to this, JICA RBO project will hold a training on “Maintenance for Water Resources Infrastructure”.

Date : 18<sup>th</sup> October 2016 (Tue.) to 21<sup>st</sup> October 2016 (Fri.)

Time : 08:00 WIB – finish

Number of Participants : Approximately 30

Venue : Balai DIKLAT IV Surabaya

Participants of this training will be able to have following technical knowledge and competence;

- a. Current status of laws, regulations, technical standards/guidelines for operation and maintenance of irrigation
- b. Knowledge of water allocation planning and water distribution operation to fulfil demand of irrigation
- c. Adequate method of dam operation & maintenance for irrigation
- d. Practical / proper way for operation & maintenance of irrigation including stakeholder coordination as a water resource manager with the examples in Japan
- e. Practical / proper way for management of planning, operation, maintenance, monitoring and stakeholder coordination for irrigation by BBWS Brantas as a regulator
- f. Concrete method and experience of stakeholder coordination for water allocation and distribution including irrigation water user by PJT I as operator
- g. Practical / concrete method of operating bendung for water distribution and irrigation main / secondary canals at field study
- h. Hydrological data observation and monitoring system for adequate water allocation



and distribution as a regulator at field study

We would like to invite a staff from each agency, who is in charge of operation & maintenance for irrigation. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Operation & Maintenance for Irrigation

## 1. Time and Duration

From 18th Oct. 2016 (Tue.) to 21st of Oct. 2016 (Fri.) , for 4 days

## 2. Venue

In Surabaya city area

- Classroom Lectures: Balai DILAT IV Surabaya, HRDA of PUPR
- Site Visit: Bendung Lengkong Baru, Delta Brantas Irrigation Area

## 3. Expected Participants

Staff from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher
- Year of Experience: Over 3 years on Water Resources Management
- Current Responsibility: Operation / Maintenance of Irrigation

## 4. Curriculum

| Day                 | No. | Time          | Lecture                                                                                                  | Lecturer                                                                                               | Minutes | jp |
|---------------------|-----|---------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>18th<br>Oct. |     | 08:00 -       | Registration                                                                                             |                                                                                                        |         |    |
|                     |     | 08:45 - 09:30 | Opening Ceremony                                                                                         | Dr. Ir. Andreas Suhono, M.Sc., Head of Human Resources Development Agency                              |         |    |
|                     |     |               |                                                                                                          | Mr. Suzuki, JICA RBO Project Coordinator                                                               |         |    |
|                     |     | 09:30 - 09:45 | General Information for Participants                                                                     | Secretariat Member                                                                                     |         |    |
|                     |     |               | Coffee Break                                                                                             |                                                                                                        |         |    |
|                     |     | 10:00 - 10:30 | Pre Test                                                                                                 | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                              |         |    |
|                     | 1   | 10:30 - 12:00 | Legal Aspect and Current Status of Operation and Maintenance of Irrigation                               | Ir. Djito, Sp.1, Head, Sub-dit of Operation and Maintenance of Swamp and Irrigation                    | 90      | 2  |
|                     |     |               | Lunch                                                                                                    |                                                                                                        |         |    |
|                     | 2   | 13:30 - 15:00 | Water Distribution Planning and Operation for Agriculture Products                                       | Ir. Djito, Sp.1, Head, Sub-dit of Operation and Maintenance of Swamp and Irrigation                    | 90      | 2  |
| 2nd<br>19th<br>Oct. |     |               | Coffee Break                                                                                             |                                                                                                        |         |    |
|                     | 3   | 15:15 - 17:30 | Operation and Maintenance of Irrigation in Japan                                                         | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                              | 135     | 3  |
|                     | 4   | 08:00 - 10:15 | Operation & Maintenance of Irrigation Dam                                                                | Mr. M. Adek Rizaldi, ST, M.TechHead, Sub-dit of Operation and Maintenance of Dam and Lake              | 135     | 3  |
|                     |     |               | Coffee Break                                                                                             |                                                                                                        |         |    |
|                     | 5-1 | 10:30 - 12:00 | Operation & Maintenance Works of Irrigation as Regulator (1)                                             | BBWS Brantas                                                                                           | 90      | 2  |
|                     |     |               | Lunch                                                                                                    |                                                                                                        |         |    |
|                     | 5-2 | 13:30 - 14:15 | Operation & Maintenance Works of Irrigation as Regulator (2)                                             | BBWS Brantas                                                                                           | 45      | 1  |
|                     |     |               | Coffee Break                                                                                             |                                                                                                        |         |    |
|                     | 6   | 15:30 - 16:45 | Water User Coordination on Water Allocation                                                              | PJT I                                                                                                  | 135     | 3  |
| 3rd<br>20th<br>Oct. | 7   | 16:45 - 17:30 | Briefing on Field Study                                                                                  | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert, Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project | 45      | 1  |
|                     | 8   | 09:00 - 17:15 | Field Study at Bendung Lengkong Baru and Delta Brantas Irrigation Area                                   |                                                                                                        | 495     | 11 |
|                     |     | 09:00 - 10:30 | Travelling to Bendung Lengkong Baru                                                                      |                                                                                                        |         |    |
|                     |     | 10:30 - 11:30 | Explanation on OP Bendung Lengkong Baru and Delta Brantas Irrigation Area                                | Dinas PU Kabupaten Mojokerto                                                                           |         |    |
|                     |     | 11:30 - 12:00 | Visit of operation Room of Bendung Lengkong Baru                                                         | PJT I                                                                                                  |         |    |
|                     |     | 12:00 - 13:30 | Lunch                                                                                                    | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert, Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project |         |    |
|                     |     | 13:30 - 14:00 | Site Visit of Diversion Gates and Flash Gate                                                             |                                                                                                        |         |    |
|                     |     | 14:00 - 15:00 | Site Visit of Kedung Ploso (Main Canal, Check Gate and Secondary Canal) in Delta Brantas Irrigation Area |                                                                                                        |         |    |
|                     |     | 15:00 - 17:15 | Go Back to Balai DIKLAT                                                                                  |                                                                                                        |         |    |
| 4th<br>21st<br>Oct. |     | 08:00 - 08:30 | Post Test                                                                                                | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                              |         |    |
|                     | 9   | 08:30 - 11:30 | Feedback of Field Study, Group Presentation                                                              | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert, Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project | 180     | 4  |
|                     |     |               | Lunch                                                                                                    |                                                                                                        |         |    |
|                     |     | 13:30 - 13:45 | Questionnaire of the training                                                                            | Secretariat Member                                                                                     |         |    |
|                     |     | 13:45 - 14:30 | Closing Ceremony                                                                                         | DGWR - PUPR                                                                                            |         |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Legal Aspect and Current Status of Operation and Maintenance of Irrigation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Outline          | <p>Operation / maintenance of irrigation includes various aspects, water allocation planning, operation of water distribution, observation of hydro meteorological data, facility maintenance, etc.</p> <p>Required knowledge and work as a good engineer / technician / officer for operation / maintenance of irrigation will be discussed and used.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Objective        | <p>-Introducing legal aspect, law / governmental regulation / ministerial regulation / technical guidelines for irrigation</p> <p>-Understanding responsibility and expected function on Operation / maintenance of irrigation at B(B)WS</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Lecturer         | Ir. Djito, Sp.1, Head, Sub-dit of Operation and Maintenance of Swamp and Irrigation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Contents         | <p>Power Point File made by Lecturer</p> <p>Module No.101 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.4: Operation and Maintenance of Gate for Irrigation)</p> <p>Module No.103 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.6: Compilation of SOP on Operation and Maintenance for Water-intake facility)</p> <p>Module No.104 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.7: Cost Calculation of Operation and Maintenance)</p> <p>Module No.106 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.9:Compilation of SOP on Operation and Maintenance for Irrigation)</p> <p>Module No.109 (Maintenance of Water Gates, Pumps and Other Machineries / Hydromechanics No.12: Operation and Maintenance of Pump for Irrigation)</p> |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Syllabus

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Title            | Water Distribution Planning and Operation for Agriculture Products                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Outline          | There are a number of points to cover for an effective Water Allocation Planning and Operation for Irrigation. The course will aim to provide sufficient information to the participants to make their own water allocation plan and operation.                                                                                                                                                                                                                                                                                                                                              |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding necessary information, necessary irrigation water amount and schedule of each agriculture product, for water allocation planning for irrigation</li> <li>-Knowing example of water allocation and distribution planning for participant as a references</li> <li>-Understanding method of operation to fulfill demand of irrigation</li> </ul>                                                                                                                                                                                         |
| Lecturer         | Ir. Djito, Sp.1, Head, Sub-dit of Operation and Maintenance of Swamp and Irrigation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Guideline of water allocation planning for irrigation</li> <li>-Method of water allocation calculation irrigation</li> <li>-Examples of water allocation plan</li> <li>-Daily, weekly and periodical operation to fulfill demand of irrigation</li> </ul>                                                                                                                                                                                                                                                                                            |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.12 (River Basin Water Allocation Management No.1: Water Use Right)</p> <p>Module No.13 (River Basin Water Allocation Management No.2: Institutional Coordination on Water Allocation Management)</p> <p>Module No.15 (River Basin Water Allocation Management No.4: Annual Water Allocation Plan)</p> <p>Module No.16 (River Basin Water Allocation Management No.5: Monitoring and Evaluation of Water Allocation Management)</p> <p>Module No.18 (River Basin Water Allocation Management No.7: Detail of Water Allocation Plan)</p> |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Operation and Maintenance of Irrigation in Japan                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Outline          | In Japan and Indonesia, managers for water resources infrastructure do their daily operation of water distribution based on Water Allocation Plan and on the demand of water users by coordination of water users. These activities will be focused in this session.                                                                                                                                                                                                |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of practical / daily / periodical coordination with water users and stakeholders for water supply in Japan</li> <li>-Introduction of practical and daily management of water distribution for irrigation, industry and drinking water with water users in Japan</li> <li>-Comparing between Japanese case and current case in Indonesia to find importance and necessary works for water allocation</li> </ul> |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert                                                                                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of Irrigation Canal System in Japan</li> <li>-Daily Coordination with Water Users for Water Distribution Management/Operation/Maintenance</li> <li>-Introduction on Project of Irrigation System Improvement for Irrigation Water Rationalization</li> </ul>                                                                                                                                                        |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>"Outline of Irrigation Canal System in Japan and Daily Coordination with Water Users for Water Distribution Management"</p> <p>"The Water Use Adjustment between Agricultural Water and Domestic Water in Saitama Prefecture"</p>                                                                                                                                                                                       |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Operation & Maintenance of Irrigation Dam                                                                                                                                                                                                                                                                                                                                                            |
| Outline          | <p>Irrigation Dam usually has multi purpose, such as flood control, drinking/industrial water supply, hydropower, river maintenance flow and irrigation. For operation and maintenance of irrigation, the dam is one of essential infrastructure.</p> <p>Required work for dam operation and maintenance as a good engineer / technician will be described and used as a example in the lecture.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of legal aspect, regulation and guidelines for dam operation and maintenance</li> <li>-Understanding adequate role and function as irrigation dam</li> <li>-Knowing example of annual operation and maintenance of irrigation dam</li> </ul>                                                                                                    |
| Lecturer         | Mr. M. Adek Rizaldi, ST, M.TechHead, Sub-dit of Operation and Maintenance of Dam and Lake                                                                                                                                                                                                                                                                                                            |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <ul style="list-style-type: none"> <li>-legal aspect, regulation and guidelines for dam operation and maintenance</li> <li>-Role and function as irrigation dam</li> <li>-Example of annual operation and maintenance of irrigation dam</li> </ul>                                                                                                                                                   |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.40 (Dam Operation &amp; Maintenance No.6: Dam Safety Concept)</p> <p>Module No.46 (Dam Operation &amp; Maintenance No.12: Hydrology for dam operation)</p>                                                                                                                                                                                     |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                      |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                         |
| Title            | Operation & Maintenance Works of Irrigation as Regulator (1), (2)                                                                                                                                                                                                                                                                                                                                         |
| Outline          | Planning / implementing operation and maintenance work for irrigation is one of the essential duties for BBWS and BWS as a regulator. BBWS Brantas has been implementing operation and maintenance of various water resources infrastructures and facilities, including irrigation facility. Participant will learn how to produce a plan and implementation of operation and maintenance for irrigation. |
| Objective        | -To know practical works;<br>1) Water allocation for Irrigation and stakeholders coordination (TKPSDA and T3A)<br>2) Daily / weekly and periodical operation,<br>3) Hydrological data monitoring for water distribution<br>4) Patrol / inspection plan and implementation for irrigation facility                                                                                                         |
| Lecturer         | BBWS Brantas                                                                                                                                                                                                                                                                                                                                                                                              |
| Duration         | 135[90 + 45] minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                               |
| Contents         | -Outline of irrigation area and system in Brantas river basin<br>-Water allocation calculation and stakeholders coordination<br>-Periodical (daily / weekly) operation for fulfilling demand of irrigation<br>-Patrol / inspection of irrigation facility<br>-Hydrological data observation and monitoring                                                                                                |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                                           |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                           |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Water User Coordination on Water Allocation                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Outline          | <p>Water allocation planning should be considered not only irrigation but also other sector, drinking / industrial water, hydropower and river maintenance flow.</p> <p>PJT I has been planning and operating main infrastructures for water resources management in Brantas river basin, and also stakeholders coordination for water supply including irrigation. Experiences of PJT I on Water User Coordination of Water Allocation are shared and transfer to participants in this lecture.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of practical procedure and difficulty of coordination with water users on water allocation</li> <li>-Participants will refer to practical experiences of PJT I for their duty on water allocation</li> </ul>                                                                                                                                                                                                                                    |
| Lecturer         | PJT I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <ul style="list-style-type: none"> <li>-Coordination of Water Users on Water Allocation with BBWS Brantas</li> <li>-Practical Procedure on Periodical Water User Coordination for Water Allocation</li> </ul>                                                                                                                                                                                                                                                                                        |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                     |
| Title            | Briefing on Field Study                                                                                                                                                                               |
| Outline          | Participants will learn about<br>1) Bendung Lengkong Baru<br>2) Irrigation Canals in Delta Brantas<br>prior to the field study.                                                                       |
| Objective        | -Sharing the information of<br>1) Outline of Bendung Lengkong Baru<br>2) Outline of Irrigation Canals in Delta Brantas<br>3) Schedule and route<br>before the field study to have a productive visit. |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                             |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                     |
| Contents         | -Schedule and Route of Field Study<br>-Outline of Bendung Lengkong Baru<br>-Outline of Irrigation Canals in Delta Brantas                                                                             |
| Textbook, Module | Power Point File made by Lecturers                                                                                                                                                                    |
| References       | River Management in Indonesia                                                                                                                                                                         |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Field Study at Bendung Lengkong Baru and Delta Brantas Irrigation Area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Outline          | <p>Bendung Lengkong Baru is one of the main infrastructures for water resources, operated by PJT I. The Bendung provides intake points for drinking, industrial water and irrigation to Delta Brantas Irrigation Area. After bendung lengkong baru, main and secondary canals are operated and monitored well by Dinas PU East Java Province and T3A.</p> <p>That shows significant role and function for water distribution, including irrigation by related agency and organization.</p> <p>The comprehensive operation and maintenance work of irrigation will be introduced as examples.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding a way of practical operation and maintenance for the bendung</li> <li>-Learning a method of periodical operation to fulfil demand of water from intake (bendung), main canal until secondary canals</li> <li>-Knowing examples of hydrological data management for adequate operation</li> </ul>                                                                                                                                                                                                                                           |
| Lecturer         | <p>Dinas PU Kabupaten Mojokerto<br/>PJT I<br/>Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert<br/>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO</p>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Duration         | 495 minutes (11 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Introduction of outline of Bendung Lengkong Baru and Delta Brantas Irrigation Area</li> <li>-Description of actual operation method for water distribution at Bendung Lengkong Baru, Main Canal and Secondary Canal</li> <li>-Description on hydrological data observation, monitoring and sharing</li> <li>-Description on coordination with stakeholders for adequate operation and maintenance</li> </ul>                                                                                                                                             |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                     |
| Title            | Feedback of Field Study, Group Presentation                                                                                                                                                                                                                                                                                           |
| Outline          | Feedback session to discuss among participants and instructors on things learned from field study for maintenance works especially how the participant can apply for their duty at their office.<br>Participants are divided into several groups. Preparation for group presentation will be done by each group.                      |
| Objective        | -Presentation and discussion on necessary and suitable operation and maintenance works for Bendung Lengkong Baru, Main and Secondary Canal in Delta Brantas Irrigation Area<br>-Through discussion and presentation, participants will understand importance and necessity periodical operation, necessary maintenance for irrigation |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert<br>Ir. Sarwono Sukardi, Dipl. HE, Proyek JICA RBO                                                                                                                                                                                                                           |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                                                    |
| Contents         | -Presentation from each group (20 minutes * 6 groups = 120 minutes)<br>-Comments from Instructors (60 minutes)                                                                                                                                                                                                                        |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                       |
| References       |                                                                                                                                                                                                                                                                                                                                       |



## Pretest

### Training on “Operation & Maintenance for Irrigation”

#### 1. Legal Framework for Irrigation (24 Points = 6 points \* 4 Answers)

Fill in laws, regulation and its description on Irrigation

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



## 2. Operation & Maintenance of Irrigation Dam

Choose suitable descriptions about “rutin maintenance” and “periodical maintenance” for Irrigation dam from bellows. **(20 Points = 4 points \* 5 answers)**

Answer:

Rutin Maintenance: a, b, e

Periodical Maintenance: c, d

- a. Pemeliharaan instrumen dan hidromekanikal sesuai dengan yang telah ditetapkan didalam Pedoman Pengelolaan O&P Bendungan yang ada (pelumasan, coating,dll).
- b. Membuat daftar komponen-komponen peralatan yang memerlukan pemeliharaan, perbaikan dan penggantian.
- c. Melaksanakan pengecatan ulang pada pada bangunan pelengkap serta rambu-rambu yang ada di areal bendungan
- d. Melakukan perbaikan pada instrumen dan hidromekanikal yang telah rusak, baik rusak ringan maupun rusak berat.
- e. Melaksanakan pemeliharaan terhadap bendungan beserta bangunan - bangunan pelengkapny, seperti : jalan masuk, rumah jaga, jalan kerja, jembatan pelayanan, sistem drainase, sabuk hijau dan lain – lainnya sesuai dengan ketentuan yang telah ditetapkan didalam Pedoman Pengelolaan O&P Bendungan.

## 3. Irrigation Canal System (Open Canal System)

Choose suitable descriptions on “Open Canal System” from bellows. **(16 Points = 4 points \* 4 answers)**

Answer: b, c, e, g

- f. Water can be supplied within a short time
- g. A long time is required for water supply
- h. A steady water level is required on the canal
- i. Demand-driven water supply
- j. Supply-driven type water supply
- k. Buffer facilities required against the supply volume change
- l. Spillway measures are required



#### 4. Facilities for Irrigation Canal System

Choose suitable descriptions on each facility of irrigation canal system from bellows.

**(24 Points = 4 points \* 6 answers)**

Answers

|                                    |            |
|------------------------------------|------------|
| <u>Intake Facility</u>             | <u>: e</u> |
| <u>Siphon for water conveyance</u> | <u>: b</u> |
| <u>Tunnel for water conveyance</u> | <u>: a</u> |
| <u>Diversion Facility</u>          | <u>: c</u> |
| <u>Check Gate</u>                  | <u>: d</u> |
| <u>Regulating Reservoir</u>        | <u>: f</u> |

- When it is not possible to build an open canal across the mountain or it is less costly to build this facility, rather than detouring the mountain by open canal, this is adopted
- When it is hard to build an open canal because of the lower or bottom part of the valley or a river running, and it is less costly to build this facility or an aqueduct bridge, rather than an open canal, this is adopted.
- There are usually two types of this facility, i.e. 1) the works to separate the water into different major routes, and 2) the works to divert water from the main conveyance facility to the secondary canals.
- The facilities to maintain the water at a certain steady level (Maintains the water level, adjusting the flowing volume by opening and closing of the gate) and to stabilize the divided water volume to secondary canals.
- The facility to take in water from the river or upper level canals. The facility is usually consist of a rubbish remover (Screen), intake gates, a settling basin, etc.
- The facility has the following functions: 1) the water source (storing river water), 2) to regulate the water volume to the downstream, 3) to store extra water, and 4) to shorten the time to convey the canal water.

#### 5. Preparation & Operation for Water Allocation

Choose suitable descriptions about “**Preparation** for Water Allocation” and “**Operation** for Water Allocation” from bellows. **(16 Points = 2 points \* 8 answers)**

Answer:

**Preparation** for Water Allocation: a, b, f, g

**Operation** for Water Allocation: c, d, e, h



- a. Pemeriksaan kesiapan prasarana pengairan
- b. Pemeriksaan peralatan pendukung: Sarana komunikasi, Komputer, perangkat lunak (software) untuk sistem monitoring antara lain flood forecasting and warning system, realtime monitoring system
- c. Pengamatan debit pengambilan dan kondisi air yang meliputi inflow, outflow , tinggi muka air dan kualitas air.
- d. Pengamatan kondisi bangunan pengambilan air.
- e. Pengaturan distribusi air disesuaikan dengan pola alokasi air.
- f. Pemeriksaan peralatan pemantauan termasuk kalibrasinya.
- g. Penyiapan Tenaga Kerja  
Tenaga kerja yang terkait dalam pengelolaan alokasi air perlu ditingkatkan kesiapannya melalui: Pelatihan/penyegaran, Diskusi pemahaman pola alokasi air dan POS
- h. Pelaksanaan Penegakan Hukum terhadap pelanggaran pengambilan air.

END

## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.008

Training on River Rehabilitation, in Jakarta on November 2016





## Plan of “Training on River Rehabilitation”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “River Rehabilitation”.

5-year strategic plan of PUPR 2015 – 2019 mentions “Technical and management assistance for disaster emergency response” at activity 8 “WATER RESOURCES OPERATING AND MAINTENANCE also DISASTER EMERGENCY MITIGATION” by Directorate of Operation and Maintenance with BBWS and BWS. Many river basins have been affected by water related disaster. BBWSs and BWS have responsibility of disaster management, emergency response and river rehabilitation. Better river rehabilitation is strongly recommended for better management of water resources by BBWS/BWS.

In relation to this, JICA RBO project will hold a training on “River Rehabilitation”.

|                        |                                                                                  |
|------------------------|----------------------------------------------------------------------------------|
| Date                   | : 15 <sup>th</sup> November 2016 (Tue.) to 18 <sup>th</sup> November 2016 (Fri.) |
| Time                   | : 08:00 WIB – finish                                                             |
| Number of Participants | : Approximately 30                                                               |
| Venue                  | : DIKLAT III Jakarta                                                             |

Participants of this training will gain following technical knowledge and competence;

- a. Current status and laws, regulations and policy for disaster management
- b. Emergency response policy against water power destructive as a water resources regulator
- c. Knowledge of mechanism and information system of flood warning system as a water resources regulator
- d. Practical emergency response and rehabilitation work by SDA PUPR and BBWS
- e. Effective / proper technical knowledge of investigation/design for river rehabilitation
- f. Experiences and operation of water related disaster management by BBWSs and BWSs in Japan
- g. Legal system for rehabilitation of disaster-stricken public facilities, and engineering restoration work method for "Build Back Better" in Japan



- h. Practical experiences of emergency response and rehabilitation for dam body collapsing at field study
- i. Practical experiences of river channel improvement project to consider river rehabilitation works “Build Back Better” at Field Study

We would like to invite a staff from each agency, who is in charge of water quality management. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on River Rehabilitation

## 1. Time and Duration

From 15th Nov. 2016 (Tue.) to 18th Nov. 2016 (Thu.) , for 4 days

## 2. Venue

In Jakarta

- Classroom Lectures: Balai DIKLAT III Jakarta

- Field Study: Dam Rehabilitation at Situ Gintung, South Tangerang,  
River Channel Improvement Project at Kampung Pulo, Ciliwung River

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: 3 years or more on Water Resources Management

- Current Responsibility: Operation and Maintenance, and Disaster Response

## 4. Curriculum

| Day              | No. | Time          | Lecture                                                                                                                                           | Lecturer                                                                                                                                                                                 | Minutes | JP |
|------------------|-----|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>15th Nov. |     | 08:00 -       | Registration                                                                                                                                      |                                                                                                                                                                                          |         |    |
|                  |     | 08:45 - 09:30 | Opening Remarks                                                                                                                                   | Dr. Ir, Andreas Suhono, M.Sc., Head of Human Resources Development Agency<br>Mr. Suzuki, JICA RBO Project Coordinator                                                                    |         |    |
|                  |     | 09:30 - 09:45 | General Information for Participants                                                                                                              | Secretariat Member                                                                                                                                                                       |         |    |
|                  |     |               | Coffee Break                                                                                                                                      |                                                                                                                                                                                          |         |    |
|                  |     | 10:00 - 10:30 | Pre Test                                                                                                                                          | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                                                                                    |         |    |
|                  | 1   | 10:30 - 12:00 | Natural Disasters and National Disaster Management Policy in Indonesia                                                                            | Mr. M. Robi Amri, Head of Disaster Risk Research Section, Directorate of Disaster Risk Reduction, BNPB                                                                                   | 90      | 2  |
|                  |     |               | Lunch                                                                                                                                             |                                                                                                                                                                                          |         |    |
|                  | 2   | 13:30 - 15:00 | Operations as Disaster Risk Reduction by River Basin Organizations in Japan                                                                       | Mr. SHINYA Takafumi, JICA Expert on Disaster Management, BNPB                                                                                                                            | 90      | 2  |
|                  |     |               | Coffee Break                                                                                                                                      |                                                                                                                                                                                          |         |    |
| 2nd<br>16th Nov. | 3   | 15:15 - 17:30 | Emergency response policy to water destructive power during disaster                                                                              | Ir. Muhammad Asdin Thalib, MT, Head of Sub-dit of Planning of O/M, Directorate of O/M                                                                                                    | 135     | 3  |
|                  | 4   | 08:00 - 09:30 | River information Management and Early Warning System                                                                                             | Dr. Eka Nugraha Abdi, ST, MPPM, PDS, Head of Subdit of Hydrology & Environmental Water Resources, Directorate of Water Resources Management                                              | 90      | 2  |
|                  |     |               | Coffee Break                                                                                                                                      |                                                                                                                                                                                          |         |    |
|                  | 5   | 09:45 - 12:00 | Legal system for Rehabilitation of Disaster-Stricken Public Facilities, and Engineering restoration work method for "Build Back Better", in Japan | Mr. Ozawa, JICA Short Term Expert (Deputy Director of Disaster Management Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism JAPAN) | 135     | 3  |
|                  |     |               | Lunch                                                                                                                                             |                                                                                                                                                                                          |         |    |
|                  | 6   | 13:15 - 15:30 | Practical operations as emergency response to water destructive power during and after disaster                                                   | Ir. Bastari, M Eng., Head of Implementation Division, BBWS Ciliwung Cisadane                                                                                                             | 135     | 3  |
|                  |     |               | Coffee Break                                                                                                                                      |                                                                                                                                                                                          |         |    |
|                  | 7   | 15:45 - 17:15 | Technical points for investigation to determine the cause of collapse and for selection of rehabilitation works (design and construction)         | Staff of Sub-dit of O&M Planning, Directorate of O&M                                                                                                                                     | 90      | 2  |
| 3rd<br>17th Nov. | 8   | 17:15 - 18:00 | Briefing on Field Study                                                                                                                           | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                            | 45      | 1  |
|                  | 9   | 08:00 - 11:45 | Field Study of River Channel Improvement Project at Kampung Pulo, Ciliwung River                                                                  |                                                                                                                                                                                          | 225     | 5  |
|                  |     | 08:00 - 09:30 | Travel to Kampung Pulo                                                                                                                            |                                                                                                                                                                                          |         |    |
|                  |     | 09:30 - 11:00 | Site Visit River Channel Improvement at Kampung Pulo                                                                                              |                                                                                                                                                                                          |         |    |
|                  |     | 11:00 - 11:45 | Travel to Lunch Venue                                                                                                                             |                                                                                                                                                                                          |         |    |
|                  |     | 11:45 - 13:30 | Lunch                                                                                                                                             | BBWS Ciliwung Cisadane                                                                                                                                                                   |         |    |
|                  | 10  | 13:30 - 16:30 | Field Study of Dam Rehabilitation at Situ Gintung, South Tangerang                                                                                | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                            | 180     | 4  |
|                  |     | 13:30 - 14:00 | Travel to Situ Gintung                                                                                                                            |                                                                                                                                                                                          |         |    |
|                  |     | 14:00 - 15:30 | Site Visit Situ Gintung                                                                                                                           |                                                                                                                                                                                          |         |    |
| 4th<br>18th Nov. |     | 15:30 - 16:30 | Back to Balai DIKLAT                                                                                                                              |                                                                                                                                                                                          |         |    |
|                  |     | 08:00 - 08:30 | Post Test                                                                                                                                         |                                                                                                                                                                                          |         |    |
|                  | 11  | 08:30 - 11:30 | Feedback of Field Study, Group Presentation                                                                                                       | Mr. MIURA Hirohisa, ME, JICA RBO Project Technical Expert<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                             | 180     | 4  |
|                  |     |               | Lunch                                                                                                                                             |                                                                                                                                                                                          |         |    |
|                  |     | 13:30 - 13:45 | Questionnaire of the training                                                                                                                     | Secretariat Member                                                                                                                                                                       |         |    |
|                  |     | 13:45 - 14:30 | Closing Ceremony                                                                                                                                  | DGWR - PUPR                                                                                                                                                                              |         |    |

31

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                              |
| Title            | Natural Disasters and National Disaster Management Policy in Indonesia                                                                                                                                                                                                                                                                                                                                         |
| Outline          | <p>Natural disaster management is now one of essential duty of B(B)WS, especially water related disaster.</p> <p>One of the Important works of B(B)WS for disaster management is cooperation with stakeholders for information sharing, planning and conducting collaborative actions and so on.</p> <p>Therefore, policy and administrative system of disaster management are introduced in this lecture.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing current status of disasters in Indonesia</li> <li>-Understanding legal aspect, law / governmental regulation / technical guidelines, and disaster management plans</li> <li>-Understanding coordination mechanism for disaster management</li> </ul>                                                                                                       |
| Lecturer         | Mr. M. Robi Amri, Head of Disaster Risk Research Section, Directorate of Disaster Risk Reduction, BNPB                                                                                                                                                                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                              |
| Contents         | <ul style="list-style-type: none"> <li>-State of natural disasters and damages</li> <li>-Introduction of disaster management policy</li> <li>-Introduction of legal and administrative system of disaster management</li> </ul>                                                                                                                                                                                |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                |

## Syllabus

|                  |                                                                                                                                                                                                                                                                        |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                      |
| Title            | Operations as Disaster Risk Reduction by River Management Office (BBWS, BWS) in Japan                                                                                                                                                                                  |
| Outline          | B(B)WS in Japan also has responsibility for disaster response and risk reduction for water related disasters.<br>Therefore, using examples of operations of B(B)WS in Japan for water related disaster, participant will understand deeply on disaster risk reduction. |
| Objective        | -Understanding adequate works for disaster of B(B)WS as river administrator, using introduction of duty and activity of B(B)WS in Japan for disaster response and risk reduction                                                                                       |
| Lecturer         | Mr. SHINYA Takafumi, JICA Expert on Disaster Management, BNPB                                                                                                                                                                                                          |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                      |
| Contents         | -Duty of B(B)WS in Japan for disaster response and risk reduction<br>-Operation by River Management Office for disasters                                                                                                                                               |
| Textbook, Module | Power Point File made by Lecture                                                                                                                                                                                                                                       |
| References       |                                                                                                                                                                                                                                                                        |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Title            | Emergency response policy to water destructive power during disaster                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Outline          | Emergency response is one of essential duty for SDA PUPR and B(B)WS. Required knowledge and work as a good engineer / technician / officer of SDA PUPR and B(B)WS for emergency response policy to water destructive power (water related disaster) will be described and used as a example in the lecture.                                                                                                                                                                                                                                                                                                  |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of legal aspect, law / governmental regulation / ministerial regulation / technical guidelines for emergency response to water destructive power (water related disaster)</li> <li>-Understanding prospect on emergency response for water destructive power (water related disaster) at SDA PUPR</li> <li>-Understanding responsibility for emergency response for water destructive power (water related disaster) at B(B)WS of PUPR</li> <li>-Knowing examples of emergency response for water destructive power (water related disaster)</li> </ul> |
| Lecturer         | Ir. Muhammad Asdin Thalib, MT, Head of Sub-dit of Planning of O/M, Directorate of O/M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Contents         | <ul style="list-style-type: none"> <li>-Legal duties and responsibilities of B(B)WS to rehabilitate the disaster-stricken river facilities quickly, based on presidential and ministerial regulation</li> <li>-Experiences of emergency response for flood as good example</li> </ul>                                                                                                                                                                                                                                                                                                                        |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | River information Management and Early Warning System                                                                                                                                                                                                                                                                                                                                                                         |
| Outline          | For river information management and early warning system, legal duty of B(B)WS should be known, and method /mechanism also should be understood. Participants will understand deeply on river information and early warning system.                                                                                                                                                                                          |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding legal duties on river information management of B(B)WS</li> <li>-Introduction of method / mechanism on river information monitoring and dissemination</li> <li>-Understanding method / mechanism on early warning system (Flood and other water related disaster)</li> <li>-Introduction of risk mapping and public awareness for warning system improvement</li> </ul> |
| Lecturer         | Dr. Eka Nugraha Abdi, ST, MPPM, PDS, Head of Subdit of Hydrology & Environmental Water Resources, Directorate of Water Resources Management                                                                                                                                                                                                                                                                                   |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                             |
| Contents         | <ul style="list-style-type: none"> <li>-Legal duties and responsibilities of river administrators to monitor and disseminate river information during flooding</li> <li>-Current State of river information system and early warning system</li> <li>-Risk mapping and Public awareness</li> </ul>                                                                                                                            |
| Textbook, Module | <p>Power Point File made by Lecturer</p> <p>Module No.5 (Hydrology No.5:Forecasting and Early Warning of Flood)</p>                                                                                                                                                                                                                                                                                                           |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Legal system for Rehabilitation of Disaster-Stricken Public Facilities, and Engineering restoration work method for "Build Back Better", in Japan                                                                                                                                                                                                                                                                                                                               |
| Outline          | SDA PUPR and B(B)WS in Indonesia have important roles for water related disaster management. Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan also has conducted emergency response/rehabilitation works for water related disasters. Therefore, legal system and practical works of MLIT Japan will be introduced in this session.                                                                                                                        |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing legal system of emergency response and rehabilitation</li> <li>-Introducing rehabilitation works for Disaster-Stricken Public Facilities and engineering restoration work method of "build Back Better" in Japan</li> <li>-Introducing method of sharing experiences of emergency response and rehabilitation for the next disaster</li> <li>-Sharing experiences of emergency response and rehabilitation works</li> </ul> |
| Lecturer         | Mr. Ozawa, JICA Short Term Expert (Deputy Director of Disaster Management Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism JAPAN)                                                                                                                                                                                                                                                                                        |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Contents         | <ul style="list-style-type: none"> <li>-Emergency response and rehabilitation for water related disaster at MLIT and B(B)WS in Japan</li> <li>-Engineering restoration work method for "Build Back Better"</li> <li>-Example on sharing experiences of emergency response/rehabilitation work for water related disaster for the next</li> </ul>                                                                                                                                |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Practical operations as emergency response to water destructive power during and after disaster                                                                                                                                                                                                                                                                                                                                                                               |
| Outline          | BBWS Ciliwung Cisadane has experiences of emergency response for flood disaster in 2009 (Dam Body Collapse of Situ Gintung), 2013 (Flood in Jakarta with overflow of Kanal Banjir Barat). These experiences including rehabilitation works are introduced in this lecture as good examples.                                                                                                                                                                                   |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing activity of emergency response and rehabilitation to flood by B(B)WS</li> <li>-Understanding essential work for water destructive power during and after disaster</li> </ul>                                                                                                                                                                                                                                              |
| Lecturer         | Ir. Bastari, M Eng., Head of Implementation Division, BBWS Ciliwung Cisadane                                                                                                                                                                                                                                                                                                                                                                                                  |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-B(B)WS, which has experience of a big flooding, introduces practical activities during flooding. (knowledge sharing)</li> <li>-B(B)WS, which has experience of big rehabilitation works such as establishing a task force, formulating action plan, applying for and securing budget, implementing rehabilitation works, reporting to PU HQ and so on, introduces practical activities after flooding. (knowledge sharing)</li> </ul> |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Technical points for investigation to determine the cause of collapse and for selection of rehabilitation works (design and construction)                                                                                                                                                                                                                        |
| Outline          | Rehabilitation work for water related disaster is one of important duty at SDA PUPR and B(B)WS. Participants will understand deeply technical/engineering points to investigate the cause of the break facilities and formulate rehabilitation plan.                                                                                                             |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding important and technical/engineering points to investigate the cause of the break of facilities, formulate a rehabilitation plan</li> <li>-Improving technical knowledge on design/construction works of river facility rehabilitation</li> </ul>                                                           |
| Lecturer         | Staff of Sub-dit of O&M Planning, Directorate of O&M                                                                                                                                                                                                                                                                                                             |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Sharing the important and technical/engineering points to formulate an rehabilitation work plan quickly</li> <li>-Sharing the important and technical/engineering points to investigate the cause of the break of facilities<br/>(because selection of rehabilitation works depends on the cause of collapse)</li> </ul> |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                |
| Title            | Briefing on Field Study                                                                                                                                                                                                                          |
| Outline          | Participants will learn about<br>1) Outline of Situ Gintung and Incident in 2009<br>2) Outline of River Channel Improvement Project at Kampung Pulo, Ciliwung River<br>prior to the field study.                                                 |
| Objective        | -Sharing the information of<br>1) Outline of Situ Gintung and Incident in 2009<br>2) Outline of River Channel Improvement Project at Kampung Pulo, Ciliwung River<br>3) Schedule and route<br>before the field study to have a productive visit. |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                        |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                                                |
| Contents         | -Schedule and Route of the field study<br>-Outline of Situ Gintung, and Incident in 2009<br>-Outline of River Channel Improvement Project at Kampung Pulo, Ciliwung River                                                                        |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Field Study of River Channel Improvement Project at Kampung Pulo, Ciliwung River                                                                                                                                                                                                                                                                                                                                 |
| Outline          | River channel improvement project at Kampung Pulo at Ciliwung River in Jakarta was implemented for reduce risk of flood disaster by BBWS Ciliwung Cisadane, PUPR, cooperated with related organizations and communities. The project should be shared for effective implementation of river rehabilitation for participants as good example.                                                                     |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing the project of the river channel improvement for reducing flood risk to consider into river rehabilitation, "Build Back Better"</li> <li>-Understanding technical aspect of planning/designing river rehabilitation to reduce risk of flood</li> <li>-Introducing experiences of cooperation and coordination with local government and community</li> </ul> |
| Lecturer         | BBWS Ciliwung Cisadane                                                                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 225 minutes (5 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                         |
| Contents         | <ul style="list-style-type: none"> <li>-Plan and design of river channel improvement at Kampung Pulo, Ciliwung River as technical aspect</li> <li>-Coordination with local government and community for the project as social aspect</li> </ul>                                                                                                                                                                  |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                               |
| Title            | Field Study at Situ Gintung, South Tangerang                                                                                                                                                                                                                                                                                                     |
| Outline          | Dam body of Situ Gintung (Earth Fill Dam) was collapsed in March 2009 by heavy rain. The incident made huge damages. PUPR and Dinas PU Province Banten conducted adequate emergency response and rehabilitation. The experiences should be shared for effective implementation of emergency response and rehabilitation as good example.         |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding mechanism of dam body collapsing as a example</li> <li>-Introducing emergency response for the disaster</li> <li>-Introducing technical/social aspects of rehabilitation work</li> <li>-Understanding essential works for emergency response/rehabilitation for dam body safety</li> </ul> |
| Lecturer         | BBWS Ciliwung Cisadane                                                                                                                                                                                                                                                                                                                           |
| Duration         | 180 minutes (4 JP) including travel time                                                                                                                                                                                                                                                                                                         |
| Contents         | <ul style="list-style-type: none"> <li>-Factors and mechanism of dam body collapsing</li> <li>-Emergency response and coordination with related agency</li> <li>-Rehabilitation works of dam</li> </ul>                                                                                                                                          |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                                           |
| Title            | Feedback of Field Study, Group Presentation                                                                                                                                                                                                                                                                                                  |
| Outline          | Feedback session to discuss among participants and instructors on things learned from lectures and field study for maintenance works especially how the participant can apply for their duty at their office.<br>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group. |
| Objective        | -Presentation on necessary and suitable river water quality management<br>-Through discussion and presentation, participants will understand importance and necessity periodical water quality monitoring and management                                                                                                                     |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                    |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                                                           |
| Contents         | -Presentation from each group and Discussion (20 minutes * 6 groups = 120 minutes)<br>-Comments from Instructors (60 minutes)                                                                                                                                                                                                                |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                              |



## Pretest

### Training on “River Rehabilitation”

#### 1. Legal Framework for River Rehabilitation (24 Points = 6 points \* 4 Answers)

Fill in laws, regulation and its description on River Rehabilitation

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
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No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

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\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



## 2. World Framework on Disaster Management

At March 2016 in Sendai City, Japan, U.N. World Conference on Disaster Risk Reduction was held, and Seven (7) targets and four (4) priority actions were adopted as “Sendai Framework for Actions (SFA)” for Disaster Risk Reduction.

Choose correct four (4) priority actions from bellows. (16 Points = 4 points \* 4 answers)

Answer: a, d, e, f

- a. Investasi dalam pengurangan risiko bencana untuk ketangguhan
- b. Decentralization of responsibility on disaster risk reduction
- c. Training for experts for capacity building
- d. Meningkatkan kesiapsiagaan bencana untuk respon yang efektif, dan untuk “build back better” dalam pemulihan, rehabilitasi dan rekonstruksi
- e. Memperkuat tata kelola risiko bencana dan manajemen risiko bencana
- f. Memahami risiko bencana

As a reference, 7 targets in “Sendai Frameworks for Actions (SFA)”

Mengurangi

- Kematian akibat bencana
- Jumlah penduduk terdampak bencana
- Jumlah Kerugian akibat bencana
- Kerusakan infrastruktur

Meningkatkan

- Strategi PRB Nasional dan Lokal
- Kerjasama Internasional
- Ketersediaan informasi dan EWS

## 3. Structural & Non-structural Measures Management for Disaster Risk Reduction

Choose suitable descriptions on structural measures management at before, during and after disaster and non-structural measures management at before, during and after disaster from bellows.

(28 Points = 2 points \* 14 answers)

### -Structural measures management

Answer: \_\_\_\_\_

Before disaster: a, d, e, f



During disaster: b

After disaster: c

- a. Ketersediaan peralatan dan operatornya
- b. Memfungsikan kembali prasarana dan sarana SDA secara darurat dengan cara (Swakelola, Dengan menggunakan penyedia jasa (Penunjukkan Langsung))
- c. Pembangunan kembali prasarana dan sarana SDA sesuai dengan standar sebelumnya atau bahkan lebih baik.
- d. Penyediaan bahan banjir
- e. Pembentukan posko bencana
- f. Pengaktifan sistem deteksi dini

#### **-Non-structural measures management**

Answer:

Before disaster: a, b, e, f

During disaster: c, g, h

After disaster: d,

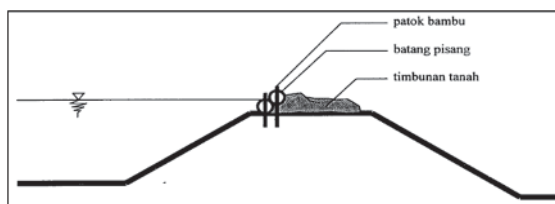
- a. Pembinaan dan pelaksanaan penanganan bencana
- b. Pembuatan Peta Rawan Banjir sebagai realisasi kerjasama antara Ditjen. SDA - BIG - BMKG
- c. Inventaris bangunan-bangunan yang rusak
- d. Pembuatan Studi Sistem Pengendalian Banjir pada wilayah yang sering tertimpa banjir
- e. Sosialisasi dan workshop penanganan bencana yang melibatkan BBWS/BWS dan SKPD Propinsi
- f. Pembinaan pembuatan SOP Banjir bagi BBWS/BWS
- g. Pendampingan penanganan bencana pada BBWS/BWS dan SKPD
- h. Verifikasi anggaran penanganan bencana

#### **4. KEGIATAN TANGGAP DARURAT BENCANA BANJIR**

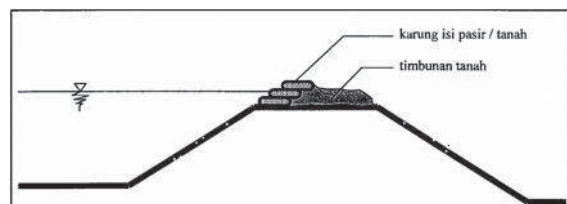
Choose suitable description for each figure on recovery work of levee from bellows.

**(32 Points = 4 points \* 8 answers)**

(1)

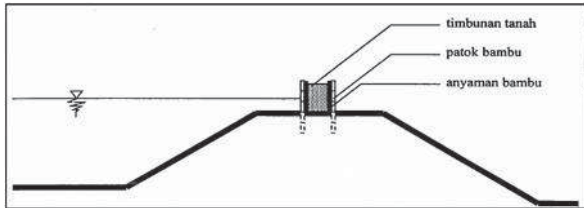


(2)

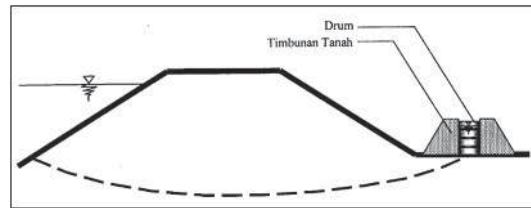




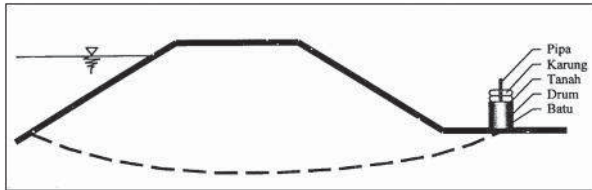
(3)



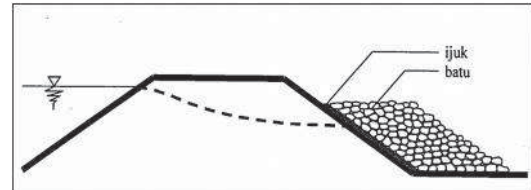
(4)



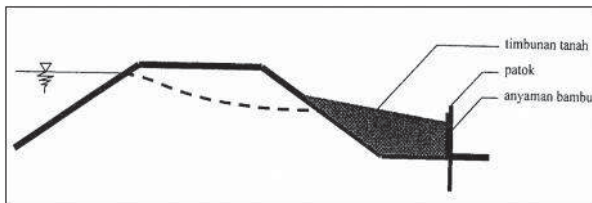
(5)



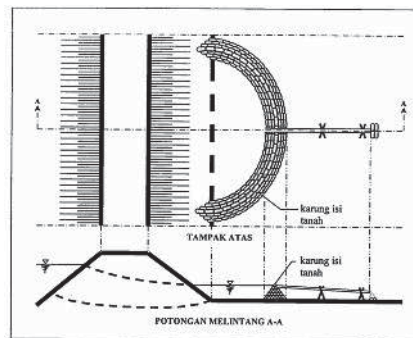
(6)



(7)



(8)



Answers:

- (1): g
- (2): a
- (3): c
- (4): e
- (5): f
- (6): h
- (7): b
- (8): d

- a. Timbunan karung plastik diisi pasir atau tanah untuk Penanggulangan Limpasan
- b. Penanggulangan Bocoran dengan Timbunan Tanah
- c. Timbunan tanah dipadatkan diantara dua dinding anyaman bambu untuk Penanggulangan Limpasan
- d. Bila Kebocoran Terjadi di Beberapa Tempat
- e. Bila bocoran terjadi di satu tempat
- f. Penanggulangan bocoran dengan drum yang dipasang pipa vertical



- g. Timbunan tanah dipadatkan diperkuat dengan batang pohon pisang untuk Penanggulangan Limpasan
- h. Penanggulangan Bocoran dengan Menggunakan Batu Kali

END



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.009

Training on Assessment of BBWS's Performance for Benchmarking, in Solo on  
March 2017



## PELATIHAN RBO PERFORMANCE BENCHMARKING

1. Waktu dan durasi : 4 hari, dari ..... Maret **2017**  
 2. Venue : Solo  
 3. Pembelajaran : Di kelas dan di lapangan (field study)  
 4. Field study : BBWS Bengawan Solo  
 5. Peserta : 30-34 peserta bidang OP dari semua B(BWS) dan PJT

## 6. Curriculum

| Hari | No | Waktu         | Kegiatan                                                                                              | Pengajar<br>Resource Person                 | Menit | Jp |
|------|----|---------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------|-------|----|
| Ke 1 |    | 08.00- 09.00  | Pendaftaran, mengisi biodata.                                                                         | Penyelenggara                               | 60    |    |
|      |    | 09.00 – 10.00 | Menyanyikan Lagu Kebangsaan Indonesia Raya                                                            | Balai Diklat VIII                           | 10    |    |
|      |    |               | Laporan penyelenggara                                                                                 | Balai Diklat VIII                           | 10    |    |
|      |    |               | Opening remark by JICA                                                                                | Suzuki Kashusi                              | 10    |    |
|      |    |               | Sambutan BPSDM (HRDA)                                                                                 | Kepala BPSDM                                | 10    |    |
|      |    |               | Pengalungan tanda peserta                                                                             | Kapusdiklat dan Suzuki                      | 10    |    |
|      |    |               | Doa                                                                                                   | Balai Diklat VIII                           | 10    |    |
|      | 1  | 10.00 - 10.45 | Penjelasan RBO Training Program (manfaat dan urgensi)                                                 | Narasumber: Ka Subdit Kelembagaan           | 45    | 1  |
|      | 2  | 10.45 – 11.30 | Penjelasan Buku Pedoman Pengukuran Kinerja RBO                                                        | Narasumber: Darismanto                      | 45    | 1  |
|      | 3  | 11.30 - 12.15 | Penjelasan tentang NARBO, dan RBO serta pembentukan RBO di Indonesia                                  | Narasumber: Isnugroho                       | 45    | 1  |
|      |    | 12.15 – 13.15 | <b>ISHOMA</b>                                                                                         |                                             |       |    |
|      | 4  | 13.15 - 14.00 | Implemetation of RBO Management in Japan                                                              | JWA/Miura                                   | 45    | 1  |
|      | 5  | 14.00 - 14.45 | Paparan Pelaksanaan RBO Performance Benchmarking di BBWS Bengawan Solo                                | Ka.BBWS Bengawan Solo                       | 45    | 1  |
| Ke 2 |    | 14.45 - 15.30 | Pretest                                                                                               |                                             | 45    |    |
|      | 6  | 15.30 - 17.00 | Pengenalan Instrumen Performance Benchmarking (15 indikator) dan penggunaannya                        | Narasumber:: Isnugroho                      | 90    | 2  |
|      | 7  | 17.00 - 17.45 | Penjelasan mengenai Action Plan                                                                       | Narasumber:Ketut Artana                     | 45    | 1  |
|      |    | 17.45         | <b>ISHOMA</b>                                                                                         |                                             |       |    |
|      | 8  | 08.00 – 09.30 | Latihan 1: Praktik Self Assessment. Peserta dibagi dalam beberapa kelompok (akan ditetapkan kemudian) | Narasumber/Pendamping Bambang Trihariono *) | 90    | 2  |
|      | 9  | 09.30 – 10.15 | Presentasi hasil Latihan I: self assessment oleh kelompok masing-masing.                              | Kelompok Moderator: Nurwidayati             | 90    | 2  |
| Ke 2 | 10 | 10.15 - 11.45 | Penjelasan tentang Peer Review dalam praktik                                                          | Narasumber:Darismanto                       | 90    | 2  |
|      |    | 11.45 - 13.00 | <b>ISHOMA</b>                                                                                         |                                             |       |    |
|      | 11 | 13.00 - 14.30 | Latihan 2: Praktik melakukan Peer Review terhadap hasil Latihan I (SA                                 | Narasumber/Pendamping Darismanto *)         | 90    | 2  |

|                           |    |               |                                                                                                                                                                                 |                                                             |           |        |
|---------------------------|----|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------|--------|
|                           | 12 | 14.30 - 15.00 | Presentasi oleh kelompok dan diskusi hasil Latihan 2: peer review                                                                                                               | - Kelompok<br>- Moderator: Nurwidayati                      | 90        | 2      |
|                           | 13 | 15.00 – 17.15 | - Presentasi oleh kelompok dan diskusi hasil Latihan 2: peer review.<br>- Pemilihan Ketua Kelas<br>- Pembentukan Tim Peer Review untuk melakukan review pada BBWS Bengawan Solo | - Kelompok<br>- Moderator: Hendarti                         | 135       | 3      |
| Ke 3                      | 14 | 08.00 - 08.30 | Perjalanan menuju BBWS Bengawan Solo                                                                                                                                            |                                                             | 30        |        |
|                           | 15 | 08.30 – 08.45 | Sambutan: maksud kunjungan ke BBWS Bengawan Solo                                                                                                                                | Ka Subdit Kelembagaan                                       | 15        |        |
|                           | 16 | 08.45 – 09.00 | Sambutan Ka BBWS Bengawan Solo                                                                                                                                                  | Ka BBWS B.Solo                                              | 15        |        |
|                           | 17 | 09.00 - 11.15 | Praktik menelaah hasil self assessment dan peer review BBWS Bengawan Solo dan meninjau dokumen                                                                                  | - Kelompok<br>- Narasumber: Ketut Artana                    | 135       | 3      |
|                           |    | 11.15 – 13.00 | <b>ISHOMA</b>                                                                                                                                                                   |                                                             |           |        |
|                           | 18 | 13.00 - 15.15 | - Wawancara/konfirmasi dengan staf dan manajemen serta stakeholder<br>- Mmembuat laporan kelompok                                                                               | - Kelompok<br>- Narasumber::Hindarti                        | 90        | 2      |
|                           | 19 | 15.15 – 15.30 | Post test                                                                                                                                                                       |                                                             | 45        |        |
|                           | 20 | 15.30 - 16.00 | Pembuatan laporan kelas yang dihimpun dari laporan kelompok dari hasil kunjungan ke BBWS Bengawan Solo                                                                          | - Ketua Kelas<br>- Moderator: Sumudi                        | 90        | 2      |
|                           | 21 | 16.00 - 16.45 | Presentasi hasil kunjungan ke BBWS Bengawan Solo dihadiri oleh Ka. BBWS Bengawan Solo                                                                                           | - Ketua Kelas<br>- Moderator: Sumudi                        | 45        | 1      |
|                           | 22 | 16.45 - 17.30 | Tanggapan dari Ka.BBWS Bengawan Solo                                                                                                                                            | Ka.BBWS Bengawan Solo                                       | 45        | 1      |
|                           |    | 17.30         | <b>ISHOMA</b>                                                                                                                                                                   |                                                             |           |        |
| Ke 4                      | 23 | 08.00 – 12.00 | Peninjauan ke kawasan Kali PEPE dan kembali ke Venues                                                                                                                           | - Narasumber: Ka.BBWS Bengawan Solo<br>- Moderator: Sarwono | 45<br>225 | 1<br>5 |
|                           |    | 12.00 – 13.00 | <b>ISHOMA</b>                                                                                                                                                                   |                                                             |           |        |
|                           | 24 | 13.00 – 13.30 | Pengumuman hasil test (Pre dan Post)                                                                                                                                            | Balai Diklat VIII                                           | 30        |        |
|                           | 25 | 13.30 – 14.00 | Sambutan penutupan                                                                                                                                                              | Kapusdiklat                                                 | 30        |        |
|                           | 26 | 14.00 – 14.15 | Pelepasan tanda peserta.                                                                                                                                                        | Ka Subdit Kelembagaan                                       | 15        |        |
|                           | 27 | 14.15 – 14.30 | Menyanyikan Lagu Padamu Negeri                                                                                                                                                  |                                                             | 15        |        |
| Jumlah Jam Pelajaran (JP) |    |               |                                                                                                                                                                                 |                                                             |           | 36     |

Keterangan::

Peserta diwajibkan:

- Membawa data struktur organisasi dan uraian tugas
- Membawa laptop

**SILABUS**  
**PELATIHAN PENGUKURAN KINERJA ORGANISASI PENGELOLA WILAYAH SUNGAI**

Pretest

**Syllabus No.1**

| No. Mata Pelajaran                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Catatan                                                                                                           |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Judul                              | Pengantar Kegiatan RBO Performance Benchmarking (RBO PB)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                   |
| Uraian singkat                     | Proses kegiatan pelatihan ini juga merupakan kegiatan pendampingan dalam aplikasi RBO Performance Benchmarking yang memerlukan kesatuan pola pikir mengenai:<br>(1) pengertian performance benchmarking, (2) pemahaman tentang tujuan dan manfaat, (3) keseriusan dalam aplikasi performance benchmarking, (4) konsistensi penerapan yang harus dievaluasi, dan (5) adanya benang merah keterkaitan dengan kebijakan dari pimpinan yang lebih tinggi, baik dalam aspek pekerjaan fisik, finansial maupun legal.<br>Kelima hal tersebut akan digambarkan melalui proses pelatihan selama 4 hari ini. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan                             | Diharapkan penjelasan ini dapat menjadi petunjuk bagaimana melaksanakan performance benchmarking melalui dua kegiatan pokok, yaitu performance self assessment dan peer review. Untuk itulah disusun Pedoman Pengukuran Kinerja RBO (terbit pada bulan Juni 2015) yang menjadi acuan RBO dalam melaksanakan Self assessment dan peer review.                                                                                                                                                                                                                                                        |                                                                                                                   |
| Pengajar/Narasumber                | Kasubdit Kelembagaan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                   |
| Moderator/pendamping               | Pendamping: Kasi III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                   |
| Waktu/durasi                       | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                   |
| Materi/isi                         | <ul style="list-style-type: none"> <li>- Penegrtian RBO</li> <li>- Jumlah RBO di Indonesia saat ini</li> <li>- Manfaat Performance Benchmarking bagi RBO</li> <li>- Perlunya pemahaman mengenai Pedoman Pengukuran Kinerja RBO yang antara lain memberikan petunjuk tentang proses self assessment dan peer review</li> </ul>                                                                                                                                                                                                                                                                       | Bahan disiapkan Subdit Kelembagaan:<br>1. Essay<br>2. Power point                                                 |
| Textbook/module/ dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO (RBO Performance Benchmarking) Edisi 11-12 Juni 2015</li> <li>- Permen PUPR No. 20/PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                               | Disiapkan oleh Subdit Kelembagaan                                                                                 |

## Syllabus No.2

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                     |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran                   | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Catatan                                                                                                             |
| Judul                                | Penjelasan tentang NARBO dan RBO PB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                     |
| Uraian singkat                       | NARBO (Network of Asian River Basin Organization), merupakan jaringan organisasi wilayah sungai Asia, bertujuan membantu mencapai keterpaduan pengelolaan Sumber Daya Air (IWRM - Integrated Water Resources Mnagement) pada wilayah sungai seluruh Asia. Sasaran NARBO adalah memperkuat kapasitas dan efektivitas RBO dalam mempromosikan IWRM, memperbaiki tata kelola air melalui pelatihan dan tukar informasi dan pengalaman di antara RBO dan lembaga di sector keairan, serta memberi saran dalam pembentukan RBO-RBO di Asia. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan   |
| Tujuan                               | Memberikan pemahaman mengenai Network of Asian River Basin Organization dan Organisasi Wilayah Sungai di Indonesia (RBO)                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                     |
| Pengajar/Narasumber                  | Herman Idrus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                     |
| Moderator/pendamping                 | Moderator: Bambang Trihariono                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                     |
| Waktu/durasi                         | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                     |
| Materi/isi                           | <ol style="list-style-type: none"> <li>1. Pengenalan mengenai NARBO</li> <li>2. Mengenali kebutuhan akan jejaring dan pengembangan kapasitas dalam implementasi IWRM</li> <li>3. Peresmian <b>Network of Asian River Basin Organization (NARBO)</b> pada 21 Maret 2003</li> <li>4. Beberapa contoh RBO yang telah ada di Asia</li> <li>5. Perlunya selalu meningkatkan kapasitas dan kompetensi SDM RBO melalui pelatihan</li> </ol>                                                                                                   | Bahan disiapkan oleh pengajar:<br><ol style="list-style-type: none"> <li>1. Esay</li> <li>2. Power point</li> </ol> |
| Textbook/Modul/<br>Dokumen pendukung | NARBO CHARTER<br>Permen PUPR No.20/PRT/M/2016<br>Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                     |

### Syllabus No.3

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran                   | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Catatan                                                                                                           |
| Judul                                | <b>Penjelasan secara garis besar mengenai Buku Pedoman Pengukuran Kinerja RBO</b>                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                   |
| Uraian singkat                       | Buku Pedoman Pengukuran Kinerja RBO yang terbit pada bulan Juni 2015 adalah sarana acuan melaksanakan pelatihan untuk memperbaiki tata kelola air dan tukar menukar pengalaman antar RBO. Melalui buku pedoman ini RBO-RBO di Indonesia diharapkan dapat melakukan kegiatan self assessment untuk meningkatkan kinerjanya.                                                                                                                               | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan                               | Memberikan pedoman bagi RBO dalam melakukan pengukuran kinerja untuk menuju ke perbaikan berkelanjutan                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                   |
| Pengajar/Narasumber                  | Darismanto                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                   |
| Moderator/pendamping                 | Moderator: Bambang Trihariono                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                   |
| Waktu/durasi                         | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                   |
| Materi/isi                           | Selain penjelasan secara garis besar juga ditampilkan contoh:<br>1. Indikator Pengukuran Kinerja BBWS/BWS/BPSDA/PJT<br>2. Data Pendukung untuk Masing-Masing 15 Indikator<br>3. Rencana Aksi ( <i>Action Plan</i> )BBWS/BWS/BPSDA/PJT<br>4. Nota Kesepakatan Tim <i>Self Assessment</i> & Tim <i>Peer Review</i><br>5. Format Laporan <i>Self Assessment</i><br>6. Format Laporan <i>Peer Reviewer</i><br>7. Bagan Alir Pengukuran Kinerja RBO<br>8. DII | Bahan disiapkan oleh pengajar:<br>1.Essay<br>2.Power point                                                        |
| Textbook/Modul/<br>Dokumen pendukung | -NARBO CHARTER<br>-Permen PUPR No.20/PRT/M/2016<br>-Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                   |

**Syllabus No.4**

|                                    |                                                                                                                                                                                                        |                                                |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| No. Mata Pelajaran                 | 4                                                                                                                                                                                                      | Catatan                                        |
| Title                              | <b>Implementetation of RBO Management in Japan</b>                                                                                                                                                     |                                                |
| Outlines                           | To show the development of RBO Management in Japan in case of:<br>- The organization of RBO<br>- The various type of river managed by the organization<br>- The metods of assessment (the achievement) |                                                |
| Objectives                         | To give understanding that benchmarking methods can be applied in various river basin and need to be implemented to assure the level of performance of RBO                                             |                                                |
| Lectures                           | JWA/Miura                                                                                                                                                                                              |                                                |
| Moderator                          | Modrator: Bambang Trihariono                                                                                                                                                                           |                                                |
| Time/durasion                      | 90 minutes                                                                                                                                                                                             |                                                |
| Content                            | - Work area<br>- About achievement<br>- Showing some pictures of river managed by RBO                                                                                                                  | Prepare by Lecturer<br>1.Esay<br>2.Power point |
| Textbook/Modul/Supporting document | TDL                                                                                                                                                                                                    |                                                |

**Syllabus No.5**

|                                  |                                                                                                                                                                                                                                                                 |                                                                                                        |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran               | <b>No.5</b>                                                                                                                                                                                                                                                     | Catatan                                                                                                |
| Judul                            | Paparan Pelaksanaan RBO Performance Benchmarking di BBWS Bengawan Solo                                                                                                                                                                                          |                                                                                                        |
| Uraian singkat                   | Sebagai organisasi pengelola wilayah sungai sesuai dengan fungsinya seperti yang diamanatkan oleh Permen PUPR No. 20/PRT/M/201, diharapkan dapat menunjukkan kinerjanya hasil melalui performance benchmarking sebagai upaya perbaikan berkelanjutan suatu RBO. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan |
| Tujuan                           | Memberikan data hasil performance benchmarking atau metoda pengukuran kinerja yang telah diterapkan di BBWS Bengawan Solo sebagai bahan studi oleh peserta pelatihan.                                                                                           |                                                                                                        |
| Pengajar/narasumber              | Kepala BBWS Bengawan Solo                                                                                                                                                                                                                                       |                                                                                                        |
| Moderator/pendamping             | Nurwidayati                                                                                                                                                                                                                                                     |                                                                                                        |
| Waktu/durasi                     | 45 minutes                                                                                                                                                                                                                                                      |                                                                                                        |
| Materi/isi                       | - Pengenalan BBWS Bengawan So<br>- Tentang capaian (achievement) berdasarkan uraian tugas<br>- Tentang penetapan skor                                                                                                                                           | Bahan disiapkan oleh pengajar/narasumber<br>1.Esay<br>2.Power point                                    |
| Textbook/Modul/dokumen pendukung | - Buku Pedoman Pengukuran Kinerja RBO<br>- Surat Direktur BPSDA No. UM.01.11.DA/1159 Tanggal 30 Nopember 2015 kepada semua BBWS dan BWS                                                                                                                         | -                                                                                                      |

## Syllabus No.6

| No. Mata Pelajaran   | 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Judul                | <b>Pengenalan Instrumen Pengukuran Kinerja RBO (15 indikator) dan penggunaannya serta penjelasan mengenai Action Plan</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Catatan                                                                                                                           |
| Uraian singkat       | <p>Sebagai organisasi pengelola wilayah sungai sesuai dengan fungsinya seperti yang diamanatkan oleh Permen PUPR No. 20/PRT/M/2016, tentunya harus dapat menunjukkan kinerjanya dengan tolok ukur yang terstruktur, oleh karena itu perlu adanya pengukuran-pengukuran yang terpola, yaitu dengan metoda self assessment dan peer review, metoda tersebut yang juga disebut performance benchmarking dibuat untuk tujuan perbaikan berkelanjutan suatu RBO.</p> <p>Action plan adalah suatu dokumen tertulis yang menggambarkan langkah-langkah yang dilalui dalam suatu proses menuju tercapainya suatu tujuan organisasi. Setiap orang yang diwajibkan membantu/berpartisipasi harus terlibat sejak awal. Isi dan format suatu action plan harus dapat membantu pengguna rencana tersebut. Dalam membuat suatu action plan perlu diingat hal-hal sebagai berikut:</p> | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan                            |
| Tujuan               | <p>Memberikan pemahaman bahwa metoda pengukuran kinerja perlu diterapkan untuk memberikan kepastian tingkat kinerja setiap RBO dan</p> <p>Memberikan pemahaman bahwa action plan dapat dibuat sesuai keperluan, mulai yang sederhana sampai pada yang lebih kompleks. Prinsip dasarnya adalah menampilkan suatu rencana mengenai apa, bagaimana dan siapa yang melaksanakan, kapan mulai, kapan selesai, dengan biaya berapa, misalnya Action Plan by Quarters, Action Plan Time Table, Action Plan by Target, dll.</p>                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                   |
| Pengajar/narasumber  | Isnugroho                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                   |
| Moderator/pendamping | Modrator: Bambang Trihariono                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                   |
| Waktu/durasi         | 270 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                   |
| Materi/isi           | <ul style="list-style-type: none"> <li>- Pengenalan istilah-istilah</li> <li>- Format model pengkajian kinerja</li> <li>- Tentang area kinerja yang kritikal</li> <li>- Tentang capaian (achievement) berdasarkan uraian tugas</li> <li>- Tentang indicator dan parameter</li> <li>- Tentang penetapan skor</li> </ul> <p>Action Plan:</p> <ul style="list-style-type: none"> <li>• Kegiatan yang menggambarkan langkah-langkah yang realistik, terukur dan dapat dicapai;</li> <li>• Identifikasi tanggungjawab secara jelas semua pihak yang terkait;</li> <li>• Susun jadwal yang spesifik untuk melengkapi kegiatan yang dilaksanakan;</li> <li>• Identifikasi sumber daya yang diperlukan, termasuk</li> </ul>                                                                                                                                                     | <p>Bahan disiapkan oleh pengajar/narasumber</p> <ol style="list-style-type: none"> <li>1. Esay</li> <li>2. Power point</li> </ol> |

|                                  |                                                                                                                                                                                                                                                                                                                                     |  |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                  | <p>bagaimana mendapatkan sumber daya tersebut;</p> <ul style="list-style-type: none"> <li>• Instruksikan semua yang terlibat dalam kegiatan tersebut membantu/memfasilitasi pengembangan action plan ini. Dokumen/catatan-catatan yang terkait adalah merupakan bahan yang penting dalam mendukung action plan tersebut.</li> </ul> |  |
| Textbook/Modul/dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Surat Direktur BPSDA No. UM.01.11.DA/1159 Tanggal 30 Nopember 2015 kepada semua BBWS dan BWS</li> <li>- Permen PUPR No.20 /PRT/M/2016</li> </ul>                                                                                            |  |

## Syllabus No.7

| No. Mata Pelajaran               | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                       |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Judul                            | Latihan 1: Praktik melakukan self assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Catatan                                                                                                                                                                                                                                               |
| Uraian singkat                   | Membagi peserta ke dalam beberapa kelompok. Masing-masing kelompok mendalami 5 area kinerja kritis yang ada dalam format model pengkajian kinerja<br>5 area kinerja kritis tersebut adalah<br>1 Misi, 2: Pemangku Kepentingan, 3. Pembelajaran dan Pertumbuhan, 4. Tata Kelola Internal, 5. Keuangan.<br>Masing-masing kelompok melakukan self assessment terhadap tugas yang telah ditetapkan dalam Permen PUPR No. 20/PRT/M/2016. Pembimbing/pendamping akan membantu kelompok dalam melakukan self assessment. Pembimbing/pendamping terdiri atas semua narasumber, yang akan ditetapkan tugasnya kemudian. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan<br><br>Semua peswerta sudah dibekali dengan Permen PUPR No.20/PRT/M/2016                                                            |
| Tujuan                           | Pengetahuan tentang self assessment yang telah diterima pada mata pelajaran No.3 perlu dicoba diterapkan (field practice) untuk mengetahui sampai sejauh mana teori yang diterima dapat dipahami dan diterapkan sesuai pedoman.                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                       |
| Pendamping                       | Bambang Trihariono<br>Hindarti<br>Nurwidayati                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                       |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                       |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Penyampaian format model pengukuran kinerja</li> <li>- Menetapkan uraian tugas yang terlingkup oleh area kinerja kritis dan cara mengevaluasinya berdasarkan parameter yang telah ditetapkan</li> <li>- Sistematika penulisan laporan</li> <li>- Cara menetapkan skor</li> <li>- Contoh Laporan Self Assessment.</li> <li>- Pengertian hubungan antara uraian tugas, indikator, parameter</li> </ul>                                                                                                                                                                  | Bahan disiapkan oleh narasumber (Esay,Power point)<br>Kewajiban peserta <ul style="list-style-type: none"> <li>➤ membawa data struktur organisasi dan tugas pokok Balai masing-masing</li> <li>➤ membawa daftar uraian tugas masing-masing</li> </ul> |
| Textbook/Modul/dokumen Pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Permen PUPR No. 20/PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |

### Syllabus No.8

| No. Mata Pelajaran               | 8                                                                                                  | Catatan                                                                                          |
|----------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Judul                            | Presentasi dan diskusi hasil Latihan I: Self Asasessment                                           |                                                                                                  |
| Uraian singkat                   | Setiap kelompok memaparkan hasil self assessment, menggunakan format laporan yang telah disediakan | Laporan Hasil Self Assessment sesuai Format dalam Buku Pedoman Pengukuran Kinerja RBO disediakan |
| Tujuan                           | Untuk memberi kesempatan kepada kelompok untuk menampilkan hasil kerjanya.                         |                                                                                                  |
| Pendamping                       | Nurwidayati<br>Hindarti<br>Sumudi                                                                  |                                                                                                  |
| Waktu/durasi                     | 90 minutes                                                                                         |                                                                                                  |
| Materi/isi                       | Laporan Self Assessment Kelompok (essay), power point                                              |                                                                                                  |
| Textbook/Modul/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                | -                                                                                                |

### Syllabus No.9

| No,Mata Pelajaran                | 9                                                                                                                                                                                                                                                                                                                                         | Catatan                                                                                                                                                         |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Judul                            | Penjelasan mengenai Peer Review dalam praktik                                                                                                                                                                                                                                                                                             |                                                                                                                                                                 |
| Uraian singkat                   | Penjelasan tentang peer review sebagai proses lanjut dari performance self assessment. Hasil self assessment dievaluasi oleh peer (teman sejawat) untuk mengukur tingkat obyektivitasnya. Tim Peer review dibentuk khusus untuk mengevaluasi hasil Self Assessment suatu RBO.                                                             | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan                                               |
| Tujuan                           | Memberikan pemahaman bahwa metoda self assessment perlu ditindak lanjuti dengan review untuk memberikan kepastian tingkat kinerja suatu RBO dan terwujudnya proses kegiatan peer review yang lebih efektif dan efisien dengan mengacu pada ketentuan yang berlaku.                                                                        |                                                                                                                                                                 |
| Pengajar.narasumber              | Darismanto                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                 |
| Moderator/pendamping             | Moderator: Isnugroho                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                 |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                 |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Penjelasan umum mengenai beberapa Istilah dan pengertian dalam proses peer review</li> <li>- Gambaran tentang proses peer review</li> <li>- Metoda yang digunakan</li> <li>- Tahapan dalam melakukan peer review</li> <li>- Output peer review</li> <li>- Rencana aksi</li> <li>- dll</li> </ul> | Bahan disiapkan oleh pengajar. Essay dan power point<br>Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan. |
| Textbook/Modul/dokumen pendukung | - Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                     | -                                                                                                                                                               |

## Syllabus No.10

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                  |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No.Mata Pelajaran                | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Catatan                                                                                                                                                          |
| Judul                            | <b>Latihan 2: Praktik/ujicoba melakukan peer review atas hasil Latihan I (SA)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                  |
| Uraian singkat                   | Membagi peserta ke dalam beberapa kelompok. Masing-masing kelompok bertindak sebagai peer reviewer, mendalami hasil self assessment. Masing-masing kelompok melakukan review terhadap hasil SA pada Latihan I. Pembimbing/pendamping akan membantu kelompok dalam melakukan review<br>Pembimbing/pendamping terdiri atas semua narasumber, yang akan ditetapkan tugasnya kemudian.                                                                                                                                                                                          | Pembagian kelompok sebaiknya dibedakan dengan pembagian kelompok SA<br><br>Pendamping/pembimbing sebaiknya tetap                                                 |
| Tujuan                           | Tujuannya adalah terwujudnya proses kegiatan peer review yang lebih efektif dan efisien dengan mengacu pada ketentuan yang berlaku                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                  |
| Pendamping                       | Darismanto<br>Bambang Trihariono<br>Sumudi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                  |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                  |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Proses peer review yang dilaksanakan ini adalah kelanjutan dari kegiatan performance self assessment</li> <li>- Hasil self assessment dipelajari, dianalisis, dan disimpulkan oleh Tim Peer review</li> <li>- Diskusi dengan pihak RBO dan beberapa pemangku kepentingan adalah salah satu cara untuk mendapatkan keyakinan bahwa nilai (score) atas pemenuhan suatu kriteria memang benar sesuai kenyataan. Hasil self assessment dengan scoring dapat saja berbeda antara Tim Self Assessment dengan Tim Peer review.</li> </ul> | <p>Bahan disiapkan oleh narasumber.</p> <p>Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan</p> |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                  |

**Syllabus No.11**

| No.Mata Pelajaran                | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Judul                            | Presentasi hasil Latihan 2: peer review                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Catatan                                           |
| Uraian singkat                   | <p>Setiap kelompok memaparkan hasil peer review menggunakan format laporan yang telah disediakan</p> <p>Dilanjutkan dengan</p> <ul style="list-style-type: none"> <li>- Pemilihan Ketua Kelas</li> <li>- Pembentukan Tim Peer Review untuk melakukan review pada BBWS Bengawan Solo</li> <li>- Pemberian petunjuk mekanisme kegiatan selama kunjungan di BBWS Bengawan Solo dan pembagian tugas kelompok</li> <li>- Pengaturan dan pembagian tugas kelompok sesuai dengan pengelompokan yang sudah ada</li> </ul> | Laporan dibuat dalam bentuk essay dan power point |
| Tujuan                           | Untuk memberi kesempatan kepada kelompok untuk menampilkan hasil kerjanya.                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                   |
| Penyaji                          | Kelompok                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                   |
| Pendamping                       | Nurwidayati<br>Salmi<br>Herman Idrus                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                   |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                   |
| Materi/isi                       | Laporan Peer review Kelompok (essay), power point                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                   |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                   |

**Syllabus No.12: Perjalanan menuju ke BBWS Bengawan Solo****Syllabus No.13**

| No.Mata Pelajaran   | 13 (di BBWS Bengawan Solo)                                                                                                                                                                                     |                                                                                                                   |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Judul               | Sambutan: maksud kunjungan ke BBWS Bengawan Solo                                                                                                                                                               | Catatan                                                                                                           |
| Uraian singkat      | Menyampaikan maksud kunjungan dan mengharapkan BBWS Bengawan Solo bersedia untuk menerima para peserta yang akan melakukan praktik performance benchmarking dan bersedia memberikan petunjuk pada para peserta | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan              | Agar pelaksanaan field practice ini dapat berjalan dengan lancar sesuai rencana semula yaitu untuk mendapatkan pengalaman baru dari praktik SA dan PR sebenarnya.                                              |                                                                                                                   |
| Pengajar/narasumber | Kasubdit Kelembagaan                                                                                                                                                                                           |                                                                                                                   |
| Waktu/durasi        | 15 minutes                                                                                                                                                                                                     |                                                                                                                   |

#### Syllabus No.14

| No.Mata Pelajaran    | 14 (di BBWS Bengawan Solo)                                                                                                                                        | Catatan                                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Judul                | Sambutan Ka BBWS Bengawan Solo                                                                                                                                    |                                                                                                                   |
| Uraian singkat       | Kesediaan BBWS Bengawan Solo menjadi tempat praktik bagi partisipan Pelatihan Performance Benchmarking                                                            | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan               | Agar pelaksanaan field practice ini dapat berjalan dengan lancar sesuai rencana semula yaitu untuk mendapatkan pengalaman baru dari praktik SA dan PR sebenarnya. |                                                                                                                   |
| Pengajar/narasumber  | Ka BBWS Bengawan Solo                                                                                                                                             |                                                                                                                   |
| Moderator/pendamping | --                                                                                                                                                                |                                                                                                                   |
| Waktu/durasi         | 15 minutes                                                                                                                                                        |                                                                                                                   |

#### Syllabus No.15

| No.Mata Pelajaran                | 15                                                                                                                                                                                                           | Catatan                                                                                                           |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Judul                            | <b>Praktik menelaah hasil Self assessment dan peer review BBWS Bengawan Solo dan meninjau dokumen</b>                                                                                                        |                                                                                                                   |
| Uraian singkat                   | Dua Kelompok mempelajari hasil SA dan kelompok lainnya mempelajari hasil peer review.                                                                                                                        |                                                                                                                   |
| Tujuan                           | Pembagian tugas ini dimaksudkan agar pelaksanaan kunjungan ke BBWS Bengawan Solo ini dapat memberi manfaat bagi kedua belah pihak dalam konteks peningkatan kinerja RBO                                      | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Pendamping                       | Hendarti<br>Ketut Artana<br>Salmi                                                                                                                                                                            |                                                                                                                   |
| Waktu/durasi                     | 135 minutes                                                                                                                                                                                                  |                                                                                                                   |
| Materi/isi                       | Hasil kerja kelompok 1 dan 2 disimpulkan.<br>Hasil kerja kelompok 3, 4, 5 disimpulkan<br>Hasil kesimpulan 5 kelompok dianalisis dengan bimbingan narasumber menggunakan pendekatan performance benchmarking. | Ketua Kelas dapat ditunjuk untuk mengkoordinasikan kegiatan ini.                                                  |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO.                                                                                                                                                                         |                                                                                                                   |

### Syllabus No.16

|                             |                                                                                                          |         |
|-----------------------------|----------------------------------------------------------------------------------------------------------|---------|
| No.Mata Pelajaran           | 16                                                                                                       | Catatan |
| Judul                       | <b>Wawancara/konfirmasi dengan staf, manajemen dan stakeholder, dan menyiapkan laporan kelompok</b>      |         |
| Uraian singkat              | Metoda wawancara ini berupaya mencari kesamaan atau perbedaan pendekatan dalam meningkatkan kinerja RBO. |         |
| Tujuan                      | Mendapatkan masukan yang akan dapat dikembangkan untuk perbaikan metoda performance benchmarking.        |         |
| Ketua Kelas/<br>Koordinator | Ketua Kelas mengkordinir pelaksanaan wawancara                                                           |         |
| Pendamping                  | Hendarti<br>Sumudi<br>Salmi                                                                              |         |
| Waktu/durasi                | 90 minutes                                                                                               |         |
| Materi/isi                  | Kuesioner                                                                                                |         |
| Texbook<br>module           | Buku Pedoman Pengukuran Kinerja RBO                                                                      |         |

### 17. Post test

### Syllabus No.18

|                   |                                                                                                                                                  |                                                                                                                   |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| No.Mata Pelajaran | 18                                                                                                                                               | Catatan                                                                                                           |
| Judul             | <b>Ketua Kelas menyiapkan laporan kelas yang dihimpun dari laporan kelompok hasil kunjungan ke BBWS Bengawan Solo</b>                            |                                                                                                                   |
| Uraian singkat    | Ketua Kelompok menghimpun bahan dari masing-masing kelompok dan menyusun dalam suatu laporan lengkap dari hasil kunjungan ke BBWS Bengawan Solo. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan            | Agar laporan ini betul-betul bernilai dan dapat dipresentasikan dengan baik.                                                                     |                                                                                                                   |
| Narasumber        | Ketua Kelas                                                                                                                                      |                                                                                                                   |
| Pendamping        | Darismanto                                                                                                                                       |                                                                                                                   |
| Waktu/durasi      | 45 minutes                                                                                                                                       |                                                                                                                   |
| Materi/isi        | Himpunan laporan kelompok                                                                                                                        |                                                                                                                   |
| Texbook<br>module | Buku Pedoman Pengukuran Kinerja RBO                                                                                                              |                                                                                                                   |

**Syllabus No.19**

| No.Mata Pelajaran      | 19                                                                                                                             | Catatan |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------|
| Judul                  | <b>Presentasi hasil Kunjungan ke BBWS Bengawan Solo (Power point) oleh Ketua Kelas dihadiri oleh Kepala BBWS Bengawan Solo</b> |         |
| Uraian singkat         | Hasil pelatihan didalam kelas dikombinasikan dengan hasil praktik di BBWS Bengawan Solo                                        |         |
| Tujuan                 | Untuk dapat menghasilkan suatu masukan bagi pengembangan metoda Performance Benchmarking                                       |         |
| Penyaji                | Ketua Kelas                                                                                                                    |         |
| Pendamping             | Sumudi<br>Herman Idrus                                                                                                         |         |
| Waktu/durasi           | 45 minutes                                                                                                                     |         |
| Materi/isi             | Kesimpulan dari kegiatan orientasi Performance Benchmarking                                                                    |         |
| Texbook/module/dokumen | Buku Pedoman Pengukuran Kinerja RBO                                                                                            |         |

**Syllabus No.20**

| No.Mata Pelajaran                | 20                                                                               | Catatan                                   |
|----------------------------------|----------------------------------------------------------------------------------|-------------------------------------------|
| Judul                            | <b>Tanggapan dari Kepala BBWS Bengawan Solo</b>                                  |                                           |
| Uraian singkat                   | Beberapa hal dari paparan Ketua Kelas akan ditanggapi oleh Ka,BBWS Bengawan Solo | *) Disiapkan oleh Balai BBWS Benawan Solo |
| Tujuan                           | Menerima masukan dari BBWS Bengawan Solo                                         |                                           |
| Pembicara                        | Kepala BBWS Bengawan Solo                                                        |                                           |
| Waktu/durasi                     | 45 minutes                                                                       |                                           |
| Materi/isi                       |                                                                                  |                                           |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                              |                                           |

**Syllabus No.21**

| No.Mata Pelajaran                | 21                                                                                               | Catatan                                                       |
|----------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Judul                            | <b>Peninjauan ke kawasan Kali PEPE dan kembali ke Venues</b>                                     |                                                               |
| Uraian singkat                   | Melihat perkembangan Kali Pepe baik dari aspek teknik maupun sosial                              | *) Disiapkan oleh Balai BBWS Benawan Solo dan Sarwono Sukardi |
| Tujuan                           | Memberi horizon baru bagi peswerta tentang partisipasi public dan peran mereka dalam pembangunan |                                                               |
| Pembicara                        | Ka.Balai BBWS Benawan Solo                                                                       |                                                               |
| Pendamping                       | Sarwono Sukardi                                                                                  |                                                               |
| Waktu/durasi                     | 270 minutes                                                                                      |                                                               |
| Materi/isi                       |                                                                                                  |                                                               |
| Texbook/module/dokumen pendukung |                                                                                                  |                                                               |

## PRE TEST

### PELATIHAN PENGUKURAN KINERJA ORGANISASI PENGELOLA WILAYAH SUNGAI

-----

Nama :

Instansi:

1. Tulis/uraikan secara singkat pengetahuan anda mengenai:

- a. NARBO
- b. RBO
- c. Performance benchmarking
- d. Performance indikator

**Jawaban ditulis di kertas lain**

2. Dalam kaitan dengan pengukuran kinerja organisasi pengelola wilayah sungai pilih jawaban ***mana saja*** yang cocok di bawah ini:

Jawaban:

- a. Melalui proses PDCA
- b. Melalui proses self assessment
- c. Melalui proses monev
- d. Melalui proses peer review

3. Pilih deskripsi di bawah ini ***yang paling*** cocok bagi peningkatan organisasi pengelola wilayah sungai:

- a. Perlu diberi wewenang lebih besar
- b. Pemberian pendampingan/supervise dalam aplikasi performance benchmarking
- c. Pemberian alokasi dana yang lebih besar
- d. Proses komunikasi dengan Direktorat Jenderal harus lebih baik

=====

**ANDA DIBERI WAKTU 30 MENIT UNTUK MENYELESAIKAN JAWABAN**

=====

Nama :

Instansi:

## POST TEST

PELATIHAN PENGUKURAN KINERJA

ORGANISASI PENGELOLA WILAYAH SUNGAI

1. Tulis/uraikan secara singkat pengetahuan anda mengenai:

- a. NARBO
- b. RBO
- c. Performance benchmarking
- d. Performance indikator

**Jawaban ditulis di kertas lain**

1. Dalam kaitan dengan pengukuran kinerja organisasi pengelola wilayah sungai pilih jawaban ***mana saja*** yang cocok di bawah ini (***lingkari jawaban yang dipilih***)

Jawaban:

- a. Melalui proses PDCA
- b. Melalui proses self assessment
- c. Melalui proses monev
- d. Melalui proses peer review

2. Pilih (***lingkari***) deskripsi ***yang paling cocok*** bagi peningkatan organisasi pengelola wilayah sungai:

- a. Perlu diberi wewenang lebih besar
- b. Pemberian pendampingan/supervise dalam aplikasi performance benchmarking
- c. Pemberian alokasi dana yang lebih besar
- d. Proses komunikasi dengan Direktorat Jenderal harus lebih baik

3. Tulis/uraikan secara singkat pengetahuan anda mengenai

- a. Model pengukuran kinerja RBO
- b. Siapa yang melakukan pengukuran kinerja
- c. Siapa yang melakukan peer review
- d. Mengapa perlu diskusi dengan pemangku kepentingan

**Jawaban ditulis di kertas lain**

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**ANDA DIBERI WAKTU 30 MENIT UNTUK MENYELESAIKAN JAWABAN**

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## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.010

Training on Sediment Management for Dam, in Yogyakarta on April 2017





## Plan of “Sediment Management for Dam”

Human Resources Development Agency of Ministry of Public Works and Public Houses (hereinafter referred to as PUPR) and Directorate General of Water Resources of PUPR, cooperation with JICA project “Capacity Development for RBOs in Integrated Water Resources Management in Indonesia phase 2” will carry out a training “Sediment Management for Dam”.

Gov. of Indonesia has implemented 65 dam construction projects in 5 years, which need to be managed properly. Sediment management is one of most important and difficult work in dam O/M. Some of existing dams have been faced to severe sedimentation. B(B)WSs should consider structural and non-structural measures from planning stage of dam construction project, and implement suitable operation & maintenance against sedimentation from beginning of management stage.

In relation to this, JICA RBO project will hold a training on “Sediment Management for Dam” that focuses on practical countermeasures for dam reservoir sedimentation

Date : 17<sup>th</sup> April 2017 (Mon.) to 21<sup>st</sup> April 2017 (Fri.)  
Time : 08:00 WIB – finish  
Number of Participants : Approximately 30  
Venue : DIKLAT V Yogyakarta

Participants of this training will gain following technical knowledge and competence;

- a. Current status and laws, regulations and policy for dam operation & maintenance, especially sediment management
- b. Practical examples of structural and non-structural measures on sedimentation of dam in Japan
- c. Planning & design of structural measures at upstream of dam against sedimentation and landslide
- d. Mechanism of sedimentation in dam reservoir and method of survey by bathymetry
- e. Planning & design of dam body and gates with consideration on influences from sedimentation and sediment discharge to downstream
- f. Examples of Sabo works in BBWS Serayu-Opak as structural measures at upstream of dam, including field study session



- g. Case example of countermeasures for sedimentation at Wonogiri dam by spillway for sediment flush and closure dike in reservoir, including field study session

We would like to invite a staff from each agency, who is in charge of research, planning, design, operation & maintenance for dam or sedimentation. Cost for accommodation and transportation should be borne by each agency. The secretariat of the training provides snack and lunch during the training.

END

# Training on Sediment Management for Dam

## 1. Time and Duration

From 17th April 2017 (Monday) until 21st April 2017 (Friday), for 5 days

## 2. Venue

In Yogyakarta

- Classroom Lectures: Balai DIKLAT Yogyakarta

- Field Study: Putih River and Gendol River for Sabo works, Wonogiri Dam for Dam Sediment Management

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: 3 years or more on Water Resources Management

- Current Responsibility: Research, Planning, Design, Operation and Maintenance for Dam or Sedimentation

## 4. Curriculum

| Day               | No. | Time          | Lecture                                                                                           | Lecturer                                                                                                                   | Minutes | JP |
|-------------------|-----|---------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>17th April |     | 08:00 -       | Registration                                                                                      |                                                                                                                            |         |    |
|                   |     | 08:30 - 09:15 | Opening Remarks                                                                                   | Dr. Ir. Andreas Suhono, M.Sc., Head of Human Resources Development Agency<br>Mr. Suzuki, JICA Project Coordinator          |         |    |
|                   |     | 09:15 - 09:45 | General Information from Balai DIKLAT (E-Evaluation)                                              | Balai DIKLAT                                                                                                               |         |    |
|                   |     |               | Coffee Break                                                                                      |                                                                                                                            |         |    |
|                   |     | 10:00 - 10:30 | Pre Test                                                                                          | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                      |         |    |
|                   | 1   | 10:30 - 12:00 | Law, Regulation and Technical Guidelines for Dam & Sediment Management                            | Mr. Adek Rizaldi, ST, MT, Head of Sub-dit of Operation & Maintenance Dam and Lakes                                         | 90      | 2  |
|                   |     |               | Lunch                                                                                             |                                                                                                                            |         |    |
|                   | 2   | 13:30 - 15:00 | Sedimentation of Dam and Countermeasures in Japan                                                 | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                      | 90      | 2  |
| 2nd<br>18th April |     |               | Coffee Break                                                                                      |                                                                                                                            |         |    |
|                   | 3   | 15:15 - 17:30 | Planning & Design of Structural Measures for Sediment & Landslide at Upstream of Dam              | Mr. Ir. Chandra Hasan, Dipl. HE, M.Sc, IPM, Senior Researcher of Sabo Center                                               | 135     | 3  |
|                   | 4   | 08:00 - 09:30 | Mechanism of Sediment transport in Dam Reservoir and Bathymetric Survey                           | Mr. Akhyar Musthafa, ST, Junior Researcher of Sabo Center                                                                  | 90      | 2  |
|                   |     |               | Coffee Break                                                                                      |                                                                                                                            |         |    |
|                   | 5   | 09:45 - 12:00 | Planning & Design of Water Intake Facility and Spillway / Gates with Considering on Sedimentation | Mr. Ir. Dwi Kristianto, M. Eng, Head of Sabo Center<br>Mr. Banata Wahid Ridwan, S.Si, Professional Engineer of Sabo Center | 135     | 3  |
|                   |     |               | Lunch                                                                                             |                                                                                                                            |         |    |
|                   | 6   | 13:15 - 14:45 | Practical Sabo Works in BBWS Serayu-Opak                                                          | Ir. Imam Mardjanto, Dipl. HE                                                                                               | 90      | 2  |
|                   |     |               | Coffee Break                                                                                      |                                                                                                                            |         |    |
| 3rd<br>19th April |     |               |                                                                                                   |                                                                                                                            |         |    |
|                   |     |               |                                                                                                   |                                                                                                                            |         |    |
|                   | 7   | 15:00 - 16:30 | Practical Sediment Management for Dam in Bengawan Solo (Wonogiri Dam)                             | Ir. Yudi Pratondo, MM, Head of BBWS Bengawan Solo                                                                          | 90      | 2  |
|                   | 8   | 16:30 - 17:15 | Briefing on Field Study                                                                           | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                  | 45      | 1  |
|                   | 9   | 08:00 - 17:00 | Field Study at Putih River and Gendol River on Sabo                                               |                                                                                                                            | 540     | 12 |
|                   |     | 08:00 - 09:00 | Travel to Putih River                                                                             | BBWS Serayu-Opak                                                                                                           |         |    |
|                   |     | 09:00 - 12:00 | Field Study at Putih River on Sabo Works                                                          | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,                                                                     |         |    |
|                   |     | 12:00 - 13:00 | Lunch                                                                                             | Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                            |         |    |
| 4th<br>20th April |     | 13:00 - 14:00 | Travel to Gendol River                                                                            |                                                                                                                            |         |    |
|                   |     | 14:00 - 15:00 | Field Study at Gendol River on Sabo Dams                                                          |                                                                                                                            |         |    |
|                   |     | 15:00 - 17:00 | Travel to Solo City                                                                               |                                                                                                                            |         |    |
|                   | 10  | 08:00 - 17:00 | Field Study at Wonogiri Dam on Sediment Management for Dam                                        |                                                                                                                            | 540     | 12 |
|                   |     | 08:00 - 09:30 | Travel to Colo Weir                                                                               | BBWS Bengawan Solo                                                                                                         |         |    |
|                   |     | 09:30 - 10:00 | Field Study at Colo Weir                                                                          | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,                                                                     |         |    |
|                   |     | 10:00 - 10:30 | Travel to Wonogiri Dam                                                                            | Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                            |         |    |
|                   |     | 10:30 - 12:00 | Field Study at Wonogiri Dam                                                                       |                                                                                                                            |         |    |
| 5th<br>21st April |     | 12:00 - 13:00 | Lunch                                                                                             |                                                                                                                            |         |    |
|                   |     | 13:00 - 17:00 | Travel to Yogyakarta                                                                              |                                                                                                                            |         |    |
|                   |     | 08:00 - 08:30 | Post Test                                                                                         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                      |         |    |
|                   | 11  | 08:30 - 11:30 | Feedback of Field Study, Group Presentation                                                       | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                   | 180     | 4  |
|                   |     |               | Lunch                                                                                             |                                                                                                                            |         |    |
|                   |     | 13:30 - 13:45 | Questionnaire of the training                                                                     | Secretariat Member                                                                                                         |         |    |
|                   |     | 13:45 - 14:30 | Closing Ceremony                                                                                  | DGWR - PUPR                                                                                                                | 45      |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Title            | Law, Regulation and Technical Guidelines for Dam & Sediment Management                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Outline          | <p>Dam operation &amp; maintenance is now one of essential duty of B(B)WS, because PUPR has constructed 65 dams until 2019. B(B)WS have to conduct effective operation &amp; maintenance.</p> <p>Regarding important and difficult issue for dam, B(B)WS usually faces to severe sedimentation in dam reservoir. Planning and implementation of countermeasures for sedimentation is strongly need by B(B)WS as a regulator or manager of water resources.</p> <p>Therefore, law, regulation, policy and technical guidelines of dam operation &amp; maintenance, especially sediment management, are introduced in this lecture.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing current status of dam operation &amp; maintenance, especially sedimentation</li> <li>-Understanding legal aspect, law / governmental regulation / technical guidelines on dam operation &amp; maintenance, and sediment management</li> </ul>                                                                                                                                                                                                                                                                                                                                     |
| Lecturer         | Mr. Adek Rizaldi, ST. MT, Head of Sub-dit of Operation & Maintenance Dam and Lakes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Contents         | <ul style="list-style-type: none"> <li>-State of dam operation &amp; maintenance, focusing on sedimentation</li> <li>-Introduction of law, regulation and policy for dam operation &amp; maintenance and sediment management</li> <li>-Introduction of technical guideline on dam operation &amp; maintenance, especially sediment management</li> </ul>                                                                                                                                                                                                                                                                              |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| References       | <p>Module*</p> <p>No.42 (Dam Operation No.8: Sedimentation of Dam)</p> <p>No.45 (Dam Operation No.11: Soil Mechanic of Dam)</p> <p>*Created by JICA Phase 1 Project</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Sedimentation of Dam and Countermeasures in Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Outline          | <p>Projects of dams in Japan usually considers countermeasures for sedimentation, structural and non-structural measures. MLIT<sup>*1</sup> and JWA<sup>*2</sup> have implemented various kinds of countermeasures.</p> <p>Therefore, using examples of structural and non-structural measures for sedimentation of dam reservoir, participant will understand deeply on sediment management of dam.</p> <p><sup>*1</sup>: Ministry of Land, Infrastructure, Transport and Tourism, Japan (Japanese PUPR)<br/> <sup>*2</sup>: Japan Water Agency (Japanese PJT)</p> |
| Objective        | -Understanding adequate countermeasures for sedimentation of dam, using example of structural and non-structural measures in Japan                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <p>-Status of dam sedimentation in Japan</p> <p>-Examples of structural and non-structural measures for dam sedimentation</p>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Textbook, Module | Power Point File made by Lecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| References       | <p>Module*</p> <p>No.42 (Dam Operation No.8: Sedimentation of Dam)</p> <p>No.45 (Dam Operation No.11: Soil Mechanic of Dam)</p> <p>*Created by JICA Phase 1 Project</p>                                                                                                                                                                                                                                                                                                                                                                                             |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Planning & Design of Structural Measures for Sediment & Landslide at Upstream of Dam                                                                                                                                                                                                                                                                                                                                                                                                |
| Outline          | Regarding countermeasures for dam sedimentation, we can classify countermeasures 1) at upstream, 2) in the reservoir, 3) to downstream. For the countermeasures at upstream, check dam and landslide protection works as structural measures are usually installed for sediment inflow control. In this session, participants will understand deeply necessary technical knowledge on planning & design of check dam, landslide protection works and others as structural measures. |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding technical guideline, manual for check dam, landslide protection works, slope protection and other as structural measures at upstream of dam</li> <li>-Knowing example of planning &amp; design of check dam</li> <li>-Knowing example of planning &amp; design of landslide/slope protection works</li> </ul>                                                                                                                 |
| Lecturer         | <i>Senior from Sabo Center (Mr. Chandra Hasan)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Contents         | <ul style="list-style-type: none"> <li>-Technical guideline on check dam, landslide/slop protection</li> <li>-Examples of effective structural measures for dam sedimentation at upstream, check dam, landslide/slope protection works and others</li> </ul>                                                                                                                                                                                                                        |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| References       | <p><b>SNI 2851:2015</b> Desain Bangunan Penahan Sedimen</p> <p><b>03-PRT-M2011</b> Pedoman Tata Cara Pelaksanaan Penggunaan Semen Tanah sebagai Komponen Utama Bangunan Sabo</p> <p><b>Pd.T-16-2004-A</b> KepMenKimpraswil 360/KPTS/M/2004 Perencanaan Teknis Bangunan Tanggul Sungai Lahar</p> <p><b>Pd.T-17-2004-A</b> KepMenKimpraswil 360/KPTS/M/2004 Pengamanan Bangunan Sabo dari Gerusan Lokal</p>                                                                           |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Mechanism of Sediment Transport in Dam Reservoir and Bathymetric Survey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Outline          | <p>Mechanism of sediment transport in dam reservoir from hydraulics view is necessary for planning &amp; design of intake gates for 1) avoiding closure by sedimentation, 2) discharge sedimentation to downstream. And also survey of sedimentation in reservoir by bathymetry is effective for planning of dredging, because it can draw a contour map and cross section map in reservoir. And we can calculate volume of existing sedimentation.</p> <p>In this session, participants will understand technical knowledge on mechanism of sediment transport in reservoir, method of bathymetric survey, including drawing maps and calculation of sedimentation volume.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introduction of mechanism of sediment transport in reservoir</li> <li>-Understanding method of bathymetric survey</li> <li>-Understanding procedure of calculation of sediment volume from drawing contour map and cross section map</li> <li>-Introduction of apply result of bathymetric survey to planning / implementing dredging and other countermeasures</li> </ul>                                                                                                                                                                                                                                                              |
| Lecturer         | <i>Mr. Akhyar Musthafa, Junior Researcher of Sabo Center</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Contents         | <ul style="list-style-type: none"> <li>-Mechanism of sediment transport in dam reservoir</li> <li>-Procedure of bathymetric survey</li> <li>-Method of drawing contour map and cross section map of reservoir, and calculation of sediment volume</li> <li>-Introduction of apply the result of bathymetric survey to planning/implementing dredging and other countermeasures</li> </ul>                                                                                                                                                                                                                                                                                       |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| References       | <p>Module*</p> <p>No.42 (Dam Operation No.8: Sedimentation of Dam)</p> <p>*Created by JICA Phase 1 Project</p> <p>SNI 8283:2016 Metode pengukuran kedalaman menggunakan alat perum gema untuk menghasilkan peta batimetri</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Planning & Design of Water Intake Facility and Spillway / Gates with Considering on Sedimentation                                                                                                                                                                                                                                                                                                                                                    |
| Outline          | <p>There are some dams that have risk of closure of water intake gates by severe sedimentation. Other way, spillway or gate for flushing (sediment discharge to downstream) are sometimes installed as countermeasures for sedimentation.</p> <p>In this session, participants will understand technical knowledge on planning &amp; design of water intake facility and spillway / gate against sedimentation</p>                                   |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing example of influences from sedimentation to dam facility, especially water intake facility in reservoir</li> <li>-Technical knowledge of planning &amp; design of water intake facility to avoid closure by sedimentation, such as screen, selective intake</li> <li>-Technical knowledge of planning &amp; design of spillway / gate for flushing (sediment discharge to downstream)</li> </ul> |
| Lecturer         | <p><i>Mr. Dwi Kristianto, Head of Sabo Center</i></p> <p><i>Mr. Banata Wahid Ridwan, Professional Engineer of Sabo Center</i></p>                                                                                                                                                                                                                                                                                                                    |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <ul style="list-style-type: none"> <li>-Example of influences by severe sedimentation to dam facility, especially water intake facility in reservoir</li> <li>-Planning &amp; design of water intake facility with consideration on influences from sedimentation</li> <li>-Planning &amp; design of spillway &amp; gate for flushing (sediment discharge to downstream)</li> </ul>                                                                  |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                    |
| References       | <p>Module*</p> <p>No.42 (Dam Operation No.8: Sedimentation of Dam)</p> <p>*Created by JICA Phase 1 Project</p>                                                                                                                                                                                                                                                                                                                                       |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                         |
| Title            | Practical Sabo Works in BBWS Serayu-Opak                                                                                                                                                                                                                                                                                                                                  |
| Outline          | <p>BBWS Serayu-Opak has implemented construction works of sabo for Merapi, including Sabo dams. Impermeable type Sabo dam can store sedimentation at upstream side of dam body. It can be considered as a structural measures for dam sedimentation.</p> <p>In this session, participants will know example of Sabo works by BBWS Serayu-Opak, focusing on Sabo dams.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing Sabo works by BBWS Serayu-Opak, especially Sabo dams</li> <li>-Understanding knowledge on planning Sabo dams, impermeable type for capture of sediment</li> </ul>                                                                                                                                                     |
| Lecturer         | <i>BBWS Serayu-Opak or Senior (Ir. Imam Mardjianto)</i>                                                                                                                                                                                                                                                                                                                   |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                         |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of Sabo works by BBWS Serayu-Opak</li> <li>-Introduction of Sabo dams, effective layout and structure for capture of sedimentation by cascade impermeable type</li> </ul>                                                                                                                                                 |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                         |
| References       |                                                                                                                                                                                                                                                                                                                                                                           |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Practical Sediment Management for Dam in Bengawan Solo (Wonogiri Dam)                                                                                                                                                                                                                                                                                                                            |
| Outline          | <p>BBWS Bengawan Solo has implemented rehabilitation project of Wonogiri Dam for sedimentation, including new spillway for flushing (sediment discharge to downstream) with revising operation procedure, closure dike in reservoir</p> <p>In this session, participants will know example of structural and non-structural measures for sedimentation at Wonogiri dam by BBWS Bengawan Solo</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding effective planning and design of spillway for flushing and closure dike for capture of sediment as a example</li> <li>-Improving technical knowledge on planning and design for structural and non-structural measures for sedimentation of dam</li> </ul>                                                                                 |
| Lecturer         | <i>Ir. Yudi Pratondo, MM, Head of BBWS Bengawan Solo</i>                                                                                                                                                                                                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Severe situation of sedimentation at Wonogiri Dam</li> <li>-Outline of Rehabilitation project of Wonogiri dam for sedimentation</li> <li>-Detail design of spillway for flushing and closure dike in reservoir</li> <li>-Revised operation rule for effective flushing</li> </ul>                                                                        |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                |
| Title            | Briefing on Field Study                                                                                                                                                                                                                          |
| Outline          | Participants will learn about<br>1) Outline of Sabo Works at Putih River and Gendol River<br>2) Outline of Rehabilitation Project at Wonogiri Dam for Sedimentation prior to the field study.                                                    |
| Objective        | -Sharing the information of<br>1) Outline of Sabo Works at Putih River and Gendol River<br>2) Outline of Rehabilitation Project at Wonogiri Dam for Sedimentation<br>3) Schedule and route<br>before the field study to have a productive visit. |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                        |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                                                |
| Contents         | -Schedule and Route of the field study<br>-Outline of Sabo Works at Putih River and Gendol River<br>-Outline of Rehabilitation Project at Wonogiri Dam for Sedimentation                                                                         |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                  |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Title            | Field Study at Putih River and Gendol River on Sabo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Outline          | <p>At Putih River and Gendol River, there are several existing Sabo dams, some of the Sabo dams are impermeable type in Cascade system. And in 2010, sediment disaster occurred by eruption of Mont. Merapi, therefore, a project of JICA Loan*<sup>1</sup> has been implemented for disaster risk reduction including construction Sabo dams.</p> <p>In this field study, participants will know Sabo dam planning / construction at the sites as a example.</p> <p>*1: Urgent Disaster Reduction Project for Mount Merapi and Lower Progo River Area (II) (JICA Loan IP-566)</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing the project of Sabo dam construction</li> <li>-Understanding technical aspect of planning/designing Sabo dam for capture of sedimentation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                           |
| Lecturer         | <p>BBWS Serayu-Opak</p> <p>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert</p> <p>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project</p>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Duration         | 540 minutes (12 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Contents         | <ul style="list-style-type: none"> <li>-Planning of cascade system of Sabo dam for capture of sedimentation</li> <li>-Design of impermeable type Sabo dam for capture of sedimentation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Title            | Field Study at Wonogiri Dam on Sediment Management for Dam                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Outline          | <p>BBWS Bengawan Solo has been implementing a Rehabilitation Project at Wonogiri Dam for sedimentation. The project as JICA Loan*1 project includes construction of new spillway for flushing (sediment discharge to downstream) and revising operation rule for effective flushing and construction of closure dike in reservoir for capture of sediment.</p> <p>The project should be shared for effective implementation of dam sediment management for participants as good example.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing the project of rehabilitation works at Wonogiri dam for sedimentation</li> <li>-Understanding technical aspect of planning/designing spillway for flushing at the sites</li> <li>-Introducing plan and construction works of closure dike in reservoir for capture of sediment</li> </ul>                                                                                                                                                |
| Lecturer         | <p>BBWS Bengawan Solo</p> <p>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,</p> <p>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project</p>                                                                                                                                                                                                                                                                                                                                               |
| Duration         | 540 minutes (12 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Contents         | <ul style="list-style-type: none"> <li>-Planning and design of spillway for flushing</li> <li>-Design and construction works of closure dike in reservoir</li> </ul>                                                                                                                                                                                                                                                                                                                         |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 11                                                                                                                                                                                                                                                                                                                                           |
| Title            | Feedback of Lectures and Field Study, Group Presentation                                                                                                                                                                                                                                                                                     |
| Outline          | Feedback session to discuss among participants and instructors on things learned from lectures and field study for maintenance works especially how the participant can apply for their duty at their office.<br>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group. |
| Objective        | -Presentation on necessary and suitable sediment management for dam<br>-Through discussion and presentation, participants will understand effective structural and non-structural measures for dam sedimentation                                                                                                                             |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                    |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                                                           |
| Contents         | -Presentation from each group (10 minutes * 6 groups = 60 minutes)<br>-Comments from Instructors (60 minutes)                                                                                                                                                                                                                                |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                              |



## Pretest

### Training on “Sediment Management for Dam”

Institution: \_\_\_\_\_

Nama : \_\_\_\_\_

#### 1. Legal Framework for Sediment Management for Dam (28 Points = 7 points \* 4 Answers)

Fill in laws, regulations, degrees, technical guidelines and its description on Sediment Management for Dam

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. and Year: \_\_\_\_\_

Title: \_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



**2. Basic definitions and knowledge on Sabo in Indonesia (12 points = 4 points \* 3 answers)**

(1) Choose most suitable description on "Sabo" from sentences below

Answer: c

- a. It is for sediment control for dam
- b. System of conservation of river upstream area, such as greenbelt project
- c. lebih luas berarti sistem pengendali erosi, sedimen, lahar hujan dan penanggulangan tanah longsor
- d. System for only volcanic eruption disaster control

(2) Choose most suitable description on "Sabo Works" from sentences below

Answer: d

- a. It includes only structural measures for volcanic eruption/sediment disaster , such as sabodam, ground sill, river channel works and so on
- b. It includes only non-structural measures for volcanic eruption/sediment disaster, such as warning system of volcanic eruption, monitoring
- c. It is comprehensive implementation of structural and non-structural measures for dam sedimentation
- d. It is comprehensive implementation of structural and non-structural measures for volcanic eruption/sediment disaster

(3) Choose most suitable description on "Mengapa Indonesia perlu Sabo?" from sentences below

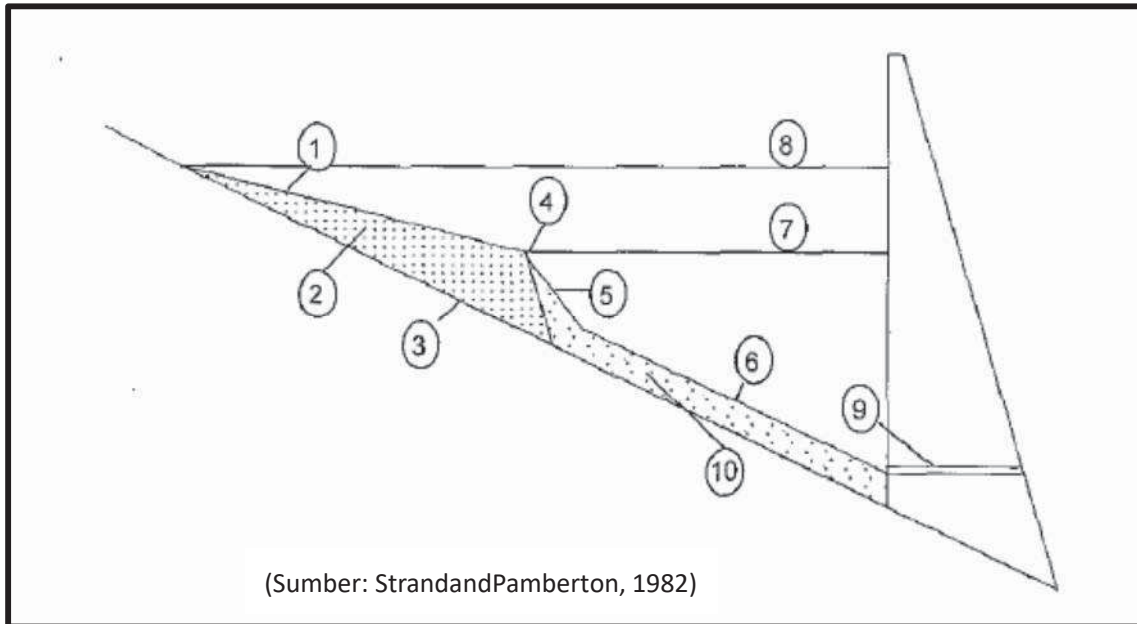
Answer: a

- a. We have 129 active volcanos (17% of volcanos in the world) and many active fault areas, it causes disasters by volcanic eruptions, seismic motions and so on
- b. To create new residential area and agriculture field
- c. We have often suffered flood at city area, it is caused mainly by sediment disasters at upstream area
- d. To control suitable volume of sediment discharge to downstream for environment conservation and coastal protection

### 3. Sediment mechanism of dam reservoir

Figure below shows general sections of dam reservoir.

Choose most suitable No. of section on the figure (from No. 1 to 10) with each sentences (names or descriptions) at below **(20 Points = 2 points \* 10 answers)**



Answer:

|                                                         |             |
|---------------------------------------------------------|-------------|
| Muka Air Normal                                         | : <u>7</u>  |
| Titik perubahan kemiringan endapan (PivotPoint)         | : <u>4</u>  |
| Kemiringan formasi endapan bagian hulu (Topsetslope)    | : <u>1</u>  |
| Muka Air Maksimum                                       | : <u>8</u>  |
| Endapan Sedimen dengan Butiran kasar                    | : <u>2</u>  |
| Kemiringan dasar (bottomset slope)                      | : <u>6</u>  |
| Endapan sedimen dengan butiran halus                    | : <u>10</u> |
| Kemiringanpalungasli(Original ThalwegSlope)             | : <u>3</u>  |
| Kemiringan formasi endapan bagian hilir (Foreset slope) | : <u>5</u>  |
| Fasilitas Pengeluaran (Outlets)                         | : <u>9</u>  |



#### 4. Countermeasures on sediment for dam

- (1) Choose most suitable sediment countermeasures for dam, following category “Controlling sedimentation”, “Passing (discharge) sedimentation to downstream” and “Elimination of sedimentation from reservoir” from sentences below **(12 Points = 4 points \* 3 answers)**

Answer:

|                                                 |   |             |
|-------------------------------------------------|---|-------------|
| Controlling sedimentation                       | : | e, f        |
| Passing (discharge) sedimentation to downstream | : | (b), c, (d) |
| Elimination of sedimentation from reservoir     | : | a, (b), (d) |

- a. Excavation & dredging
- b. Sediment sluicing
- c. Bypass
- d. Sediment flushing
- e. Sabo works
- f. Excavation at Check dam

- (2) Choose most suitable description on Merit and Demerit of Several sediment countermeasures for dam from sentences below **(16 Points = 4 points \* 4 answers)**

Answer:

|                   |   |   |
|-------------------|---|---|
| Excavation        | : | d |
| Dredging          | : | a |
| Bypass tunnel     | : | c |
| Flushing/Sluicing | : | b |

(M: Merit, D: Demerit)

- a. M: Conduct easily without special structures and reservoir water level lowering  
D: Limited volume and limited haulage of sediment
- b. M: Firm discharge is possible with gate operations.  
D: Lowering the reservoir water level is necessary. Gate and damage measures are needed
- c. M: Discharge of sediment can be regulated to meet the volume of flow  
D: Tunnel construction is costly. Bypassing weir and damage measure is necessary
- d. M: Conduct easily without special structures  
D: Limited volume and limited haulage of sediment, lowering reservoir water level is sometimes needed



## 5. Planning / design of Structural Measures for Sediment (Sabo)

- (1) For planning on sediment countermeasures, we should consider functions/advantages of structures for matching purposes, conditions at sites.

Choose most suitable description on function of “Checkdam”, “Dam Konsolidasi” and “Dam Sokong” from sentences below **(12 Points = 4 points \* 3 answers)**

Answer:

|                 |   |   |
|-----------------|---|---|
| Checkdam        | : | c |
| Dam Konsolidasi | : | a |
| Dam Sokong      | : | b |

- a. Untuk mengkonsolidasikan akumulasi debris yang telah berada pada alur besuk ( torrent ) pasca terjadinya aliran debris dan berpotensi menimbulkan bencana berupa ancaman terhadap keselamatan jiwa dan harta benda termasuk psdpu dengan tujuan untuk stabilisasi alur sungai.
- b. Untuk menstabilkan lereng tebing agar tidak runtuh dan menstabilkan dasar sungai rencana serta untuk melindungi fondasi bangunan melintang sungai di hulunya dari gerusan
- c. untuk menampung dan mengontrol debris. Oleh karena itu, desain dam itu harus memadai serta efektif untuk mengamankan fungsi tersebut

END



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.011

Training on Calculation of Water Balance for Water Allocation Planning, in  
Semarang on August 2017



# Training on Calculation of Water Balance for Water Allocation Planning

## 1. Time and Duration

from 22nd August 2017 (Tue.) to 25th August 2017 (Fri.)

## 2. Venue

Hotel Whiz Semarang, Jl. Kapt. Piere Tendean No. 9 Sekayu Semarang City

- Field Study: Water Resources Infrastructures (Dam, Weir and Intake Facility) for Water Balance Calculation/Analysis

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher
- Year of Experience: 3 years or more on Water Resources Management
- Current Responsibility: Planning, Operation & Maintenance for Water Allocation

\*Participants have to bring laptop for Lecture No.4

## 4. Curriculum

| Day              | No. | Time                                          | Lecture                                                                                     | Lecturer                                                                                                          | Minutes | JP |
|------------------|-----|-----------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>22nd Aug. |     | 08:00 -                                       | Registration                                                                                |                                                                                                                   |         |    |
|                  |     | 08:30 - 09:15                                 | Opening Remarks                                                                             | Dr. Ir. Andreas Suhono, M.Sc., Head of Human Resources Development Agency<br>Mr. Suzuki, JICA Project Coordinator |         |    |
|                  |     | 09:15 - 09:45                                 | General Information from Balai DIKLAT (E-Evaluation)                                        | Balai DIKLAT - V                                                                                                  |         |    |
|                  |     |                                               | Coffee Break                                                                                |                                                                                                                   |         |    |
|                  |     | 10:00 - 10:30                                 | Pre Test                                                                                    | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                             |         |    |
|                  | 1   | 10:30 - 12:00                                 | Law, Regulation and Technical Guidelines for Water Balance Calculation and Water Allocation | Sudarsono, CES                                                                                                    | 90      | 2  |
|                  |     |                                               | Lunch                                                                                       |                                                                                                                   |         |    |
|                  | 2   | 13:30 - 15:00                                 | Basic Knowledge and Preparation for Water Balance and Water Allocation                      | Prof. Dr. Waluyo Hatmoko M.Sc.                                                                                    | 90      | 2  |
|                  |     |                                               | Coffee Break                                                                                |                                                                                                                   |         |    |
| 2nd<br>23rd Aug. | 3   | 15:15 - 17:30                                 | Water Balance Calculation                                                                   | Ir. Sigid Santoso, MM, Head of Sub-dit of Hydrology and Environment, Directorate of Water Resources Management    | 135     | 3  |
|                  | 4   | 08:00 - 12:00<br>(10:15 - 10:30 Coffee Break) | Exercise of Analysis / Calculation of Water Availability and Water Demand                   | Ir. Widyarti Sumawinata                                                                                           | 225     | 5  |
|                  |     |                                               | Lunch                                                                                       |                                                                                                                   |         |    |
|                  | 4   | 13:30 - 15:00                                 | Exercise of Analysis / Calculation of Water Availability and Water Demand                   | Ir. Widyarti Sumawinata                                                                                           | 90      | 2  |
|                  |     |                                               | Coffee Break                                                                                |                                                                                                                   |         |    |
|                  | 5   | 15:15 - 16:45                                 | Example of Water Allocation Planning from Water Balance Calculation in Semarang City Area   | V. Untoro Kurniawan, ST., MM., Chief of O&M Division, BBWS Pemali-Juana                                           | 90      | 2  |
| 3rd<br>24th Aug. | 6   | 16:45 - 17:30                                 | Briefing on Field Study                                                                     | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project         | 45      | 1  |
|                  | 7   | 08:00 - 16:45                                 | Field Study at Dam, Weir, Intake for domestic water and Irrigation                          |                                                                                                                   | 675     | 15 |
|                  |     | 08:00 - 09:00                                 | Travel to Jatibarang Dam                                                                    |                                                                                                                   |         |    |
|                  |     | 09:00 - 11:00                                 | <b>Jatibarang Dam</b>                                                                       |                                                                                                                   |         |    |
|                  |     | 11:00 - 11:30                                 | Travel to Rest Area                                                                         | BBWS Pemali-Juana                                                                                                 |         |    |
|                  |     | 11:30 - 13:00                                 | Lunch                                                                                       | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,                                                            |         |    |
|                  |     | 13:00 - 13:30                                 | Travel to Kanal Banjir Barat at Simongan                                                    | Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                   |         |    |
|                  |     | 13:30 - 14:30                                 | <b>Simongan Weir</b>                                                                        |                                                                                                                   |         |    |
|                  |     | 14:00 - 14:30                                 | Travel to PDAM plant                                                                        |                                                                                                                   |         |    |
|                  |     | 14:30 - 16:00                                 | <b>PDAM water treatment plant (IPA) Kaligarang</b>                                          |                                                                                                                   |         |    |
|                  |     | 16:00 - 16:45                                 | Travel to Hotel in Semarang                                                                 |                                                                                                                   |         |    |
| 4th<br>25th Aug. |     | 08:00 - 08:30                                 | Post Test                                                                                   |                                                                                                                   |         |    |
|                  | 8   | 08:30 - 11:30                                 | Feedback of Field Study, Group Presentation                                                 | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project          | 180     | 4  |
|                  |     |                                               | Lunch                                                                                       |                                                                                                                   |         |    |
|                  |     | 13:30 - 13:45                                 | Questionnaire of the training                                                               | Secretariat Member                                                                                                |         |    |
|                  |     | 13:45 - 14:30                                 | Closing Ceremony                                                                            | DGWR - PUPR                                                                                                       |         |    |
|                  |     |                                               |                                                                                             |                                                                                                                   | 36      |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Law, Regulation and Technical Guidelines for Water Balance Calculation and Water Allocation                                                                                                                                                                                                                                                                                                                     |
| Outline          | <p>B(B)WSs have conduct planning water allocation periodically , monthly, every 3 months and annually. Water allocation is based on water balance calculation.</p> <p>At the beginning of the training on "Calculation of Water Balance for Water Allocation", participants will learn law, regulation and technical guidelines on procedure and calculation method of water balance, and water allocation.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing current status of water allocation, such as water balance, water availability and water demand</li> <li>-Understanding legal aspect, law / governmental regulation / technical guidelines on water balance calculation and water allocation</li> </ul>                                                                                                      |
| Lecturer         | Sudarsono, CES                                                                                                                                                                                                                                                                                                                                                                                                  |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                               |
| Contents         | <ul style="list-style-type: none"> <li>-State of water allocation, water balance, water availability and water demand</li> <li>-Introduction of law, regulation and policy for water balance for water allocation</li> <li>-Introduction of technical guideline on calculation of water balance, water availability and water demand</li> </ul>                                                                 |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                               |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Title            | Basic Knowledge and Preparation for Water Balance and Water Allocation                                                                                                                                                                                                                                                                                                                                                                              |
| Outline          | <p>For calculation of water balance, we need numerical data of water availability and water demand. For the calculation of water availability and water demand, we need various hydrological data and others.</p> <p>Before start several lectures on calculation method of water availability, water demand and water balance, participants will understand overall procedure and necessary data for water balance calculation in this lecture</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing overall procedure of water balance calculation, including water availability and water demand calculation</li> <li>-Understanding necessary data for water balance calculation, including water availability and water demand</li> </ul>                                                                                                                                                        |
| Lecturer         | Prof. Dr. Waluyo Hatmoko M.Sc.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Contents         | <ul style="list-style-type: none"> <li>-Overall Procedure of water balance calculation</li> <li>-Brief introduction on analysis/calculation of water availability and water demand</li> <li>-Necessary data for water balance calculation</li> </ul>                                                                                                                                                                                                |
| Textbook, Module | Power Point File made by Lecture                                                                                                                                                                                                                                                                                                                                                                                                                    |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Syllabus

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|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Title            | Water Balance Calculation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Outline          | <p>Water Balance Calculation is indispensable for water allocation planning, update of water use right and planning water resources infrastructure development.</p> <p>Indonesia government has a Mid-term plan that includes 1.0 million agriculture field development. And other hands agriculture field has been converted residential and industrial area in urban area. Update of water allocation plan is essential for both area.</p> <p>In this lecture, participants will learn on procedure, method of water balance calculation</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing procedure and preparation for water balance calculation</li> <li>-Understanding method of water balance calculation, applying water availability and water demand calculation/analysis</li> <li>-Introducing practical example of water balance calculation</li> </ul>                                                                                                                                                                                                                     |
| Lecturer         | Ir. Sigid Santoso, MM, Head of Sub-dit of Hydrology and Environment, Directorate of Water Resources Management                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Contents         | <ul style="list-style-type: none"> <li>-Concept and procedure of water balance calculation</li> <li>-Necessary data/information for preparation of water balance calculation</li> <li>-Calculation method of water balance, applying water availability and water demand</li> <li>-Example of water balance calculation</li> </ul>                                                                                                                                                                                                             |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Syllabus

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|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Title            | Exercise of Analysis / Calculation of Water Availability and Water Demand                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Outline          | <p>Water availability and water demand are essential for water balance calculation. The analysis for water availability needs various hydrological data and calculation, such as streamflow, rainfall, reservoir operation system and so on. For the calculation of water demand, various data collection and analysis are needed, such as area of agriculture field and kinds of crops for Irrigation water, population for drinking water, other data for industry, aquaculture, hydropower and maintenance flow of river.</p> <p>In this lecture, example of analysis / calculation of water availability and water demand is introduced and practice / exercise of the analysis / calculation are also included. Participants will learn practical knowledge and method of analysis / calculation of water availability and demand.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding detail procedure and necessary data/information for analysis / calculation of water availability and water demand</li> <li>-Knowing example of analysis / calculation of water availability and water demand</li> <li>-Understanding calculation method of water availability and water demand for each sector through exercise</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Lecturer         | Ir. Widyarti Sumawinata                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Duration         | 225 + 90 = 315 minutes (5 + 2 = 7JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Contents         | <ul style="list-style-type: none"> <li>-Procedure and necessary data/information for analysis / calculation of water availability and water demand</li> <li>-Practical example of analysis / calculation of water availability and water demand</li> <li>-Exercise of analysis / calculation of water availability and water demand</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| References       | <i>*Participants have to bring laptop for the exercise in this lecture</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                |
| Title            | Example of Water Allocation Planning from Water Balance Calculation in Semarang City Area                                                                                                                                                                                                                                                                                        |
| Outline          | <p>BBWS Pemali-Juana has conducted water allocation as a regulator cooperate with water users. And BBWS manages dams and weirs as water resources infrastructures for water allocation.</p> <p>In this lecture, practical example of water balance for water allocation is introduced. Participants will learn on clear method of water balance calculation with the example</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing practical example of water balance calculation</li> <li>-Understanding clear method of water balance calculation</li> </ul>                                                                                                                                                                                                  |
| Lecturer         | V. Untoro Kurniawan, ST., MM., Chief of O&M Division, BBWS Pemali-Juana                                                                                                                                                                                                                                                                                                          |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-<i>Outline of water resources management in Semarang City area</i></li> <li>-<i>Example of water balance calculation for water allocation for Semarang city area</i></li> </ul>                                                                                                                                                          |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                  |

## Syllabus

|                  |                                                                                                                                                                                                                               |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                             |
| Title            | Briefing on Field Study                                                                                                                                                                                                       |
| Outline          | Participants will learn about<br>1) Outline of Jatibarang dam<br>2) Outline of Simongan weir<br>3) Water treatment plant (PDAM) and Irrigation Area prior to the field study.                                                 |
| Objective        | -Sharing the information of<br>1) Outline of Jatibarang dam<br>2) Outline of Simongan weir<br>3) Water treatment plant (PDAM) and Irrigation Area<br>4) Schedule and route before the field study to have a productive visit. |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                     |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                             |
| Contents         | -Schedule and Route of the field study<br>-Outline of Jatibarang dam and Simongan weir<br>-Outline of water treatment plant and Irrigation Area                                                                               |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                               |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Title            | Field Study at Dam, Weir, Intake for domestic water and Irrigation                                                                                                                                                                                                                                                                                                                                                                                                       |
| Outline          | Participant receive detail explanation and example of water allocation and water balance calculation for Semarang city area at Lecture No.6. In the field study, participants will visit water resources infrastructures and intake points to confirm observed data and water demand information for water balance calculation                                                                                                                                           |
| Objective        | <ul style="list-style-type: none"> <li>-Understanding necessary data and information from dams for water availability calculation</li> <li>-Understanding necessary data and information from weir for water availability and water demand</li> <li>-Understanding necessary data and information from water users for water demand</li> <li>-Understanding necessary data and information from water resources infrastructures for water balance calculation</li> </ul> |
| Lecturer         | BBWS Pemali-Juana<br>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 675 minutes (15 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Observed data and operation system at Jatiranag dam for water availability calculation</li> <li>-Observed data and operation system at Simongan weir for water availability and water demand calculation</li> <li>-Necessary data from water users (PDAM, Irrigation area) for water demand calculation</li> </ul>                                                                                                               |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                      |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Feedback of Field Study, Group Presentation                                                                                                                                                                                                                                                                                                          |
| Outline          | Feedback session to discuss among participants and instructors on things learned from lectures and field study for water balance calculation especially how the participant can apply for their duty at their office.<br>Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group. |
| Objective        | -Presentation on participants' finding at field study on water balance calculation<br>-Through discussion and presentation, participants will understand effective                                                                                                                                                                                   |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                            |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                                                                   |
| Contents         | -Presentation from each group (20 minutes * 6 groups = 120 minutes)<br>-Comments from Instructors (60 minutes)                                                                                                                                                                                                                                       |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                      |
| References       |                                                                                                                                                                                                                                                                                                                                                      |



Pretest  
Pelatihan  
“Perhitungan Neraca Air untuk Perencanaan Alokasi Air”

Institusi : \_\_\_\_\_

Nama : \_\_\_\_\_

**1. Kerangka Hukum untuk Perhitungan Neraca Air dan Alokasi Air (28 point)**

Isilah titik-titik dibawah ini, dasar hukum, peraturan, surat keputusan, pedoman teknis tentang Perhitungan Neraca Air dan Alokasi Air (7 point x 4 = 28)

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



## 2. Pengetahuan dasar tentang Neraca Air dan Alokasi Air (25 point )

(1) Pilihlah kalimat dibawah ini yang merupakan pengertian dari Neraca Air? (5 Point)

Jawaban : c

- Menjatakan air bagi pengguna air yang berhak,
- Sistem konservasi daerah hulu sungai, seperti proyek *greenbelt*
- Informasi awal yang disusun pada tahapan perencanaan dalam rangkaian kegiatan penyelenggaraan alokasi air
- Berdasarkan air yang ada

(2) Pilihlah kalimat dibawah ini yang merupakan pengertian dari Alokasi Air ?(5 Point)

Jawaban : b

- Hanya mencakup langkah-langkah struktural untuk bencana letusan vulkanik / sedimen, seperti *sabo dam*, *ground sill*, pekerjaan saluran sungai dan sebagainya
- Kondisi ketersediaan air dalam bentuk rencana penyediaan air pada saat maksimum, normal dan kering yang memuat alokasi debit setiap titik pengambilan dan status pemenuhannya
- Untuk mengetahui secara dini potensi yang telah dimanfaatkan dan belum dimanfaatkan guna pengelolaan yang berkelanjutan dan demi sebesar-besarnya bagi kemakmuran dan kesejahteraan masyarakat
- Implementasi yang komprehensif dari tindakan-tindakan struktural dan non-struktural untuk letusan vulkanik / bencana sedimen

(3) Berikut ini adalah prinsip-prinsip Alokasi Air: (3 Point x 5 =15 Points)

- Keadilan
- Perlindungan Lingkungan
- Prioritas Pembangunan
- Keseimbangan antara pasokan dan permintaan air
- Mempromosikan efisiensi penggunaan air

Pilihlah deskripsi yang tepat untuk prinsip-prinsip Alokasi Air tersebut diatas dari kalimat-kalimat dibawah ini :

- menyeimbangkan pasokan air dengan tuntutan kebutuhan yang bersifat dinamis, khususnya untuk mengelola variabilitas pasokan alami air, dan untuk menghindari atau mencegah seringnya terjadi defisit air yang tak terduga.
- mengalokasikan air dengan adil dan proporsional di antara kelompok jenis penggunaan, keadilan antar wilayah administrasi, serta keadilan antara daerah hulu dan hilir
- mengalokasikan sejumlah air tawar untuk kebutuhan ekosistem dan termasuk untuk mengakomodasi kebutuhan sedimen transport, resapan air tanah, penguraian limbah dan



kelestarian ekosistem di muara

- d. mempromosikan secara terus menerus kepada para pengguna air agar mereka tergerak dan mampu berprakarsa melakukan efisiensi dalam penggunaan air
- e. mengalokasikan air untuk mendukung kebutuhan pembangunan ekonomi dan sosial, diantaranya untuk mendukung prioritas strategis dan melindungi dependensi kebutuhan yang sudah ada

Jawaban :

1. Keadilan (\_b\_)
2. Perlindungan Lingkungan (\_c\_)
3. Prioritas Pembangunan (\_e\_)
4. Keseimbangan antara pasokan dan permintaan air (\_a\_)
5. Mempromosikan efisiensi penggunaan air (\_d\_)

### 3. Perhitungan Neraca Air (48 Points)

(1). Berikut ini adalah data-data yang dipersiapkan untuk Neraca Air. ( 16 Points )

1. Peta lokasi titik pengambilan air dan daerah layanan
2. Data potensi air tanah dan kualitas air
3. Data penggunaan air untuk berbagai penggunaan, dengan Form A-01
4. Peta DAS, WS, CAT, Administrasi, RTRW
5. Peta lokasi titik pengambilan air dan daerah layanan
6. Skematisasi sistem sungai, beserta lokasi prasarana sumber daya air pengatur air, beserta kapasitasnya
7. Data prakiraan cuaca
8. Data hidrometeorologi, terutama debit rata-rata tengah-bulanan atau 10-harian pada pos duga air, bendung dan bangunan ukur lainnya

Manakah yang termasuk jenis data statis dan data dinamis ?

Jawaban :

- a. Data Statis : (\_4\_,\_6\_) (2 Point x 2 = 4 Point)
- b. Data Dinamis : (\_1\_,\_2\_,\_3\_,\_5\_,\_7\_,\_8\_)(2 Point x 6 =12 Point)

(2) Berikut ini adalah rumus-rumus yang digunakan dalam proses perhitungan Neraca Air : ( 4



Point x 8 = 32 points )

|    |                                                                                            |    |                                                         |
|----|--------------------------------------------------------------------------------------------|----|---------------------------------------------------------|
| a. | $P_N = P_0 \times (1+r)^n$                                                                 | f. | $Q_{ir} = \frac{(Etc + IR + RW + P - ER)}{IE} \times A$ |
| b. | $P(X \geq x) = \frac{m - \alpha}{(n+1 - 2\alpha)} 100\%$                                   | g. | $Q_{ir} = A \times q$                                   |
| c. | $\bar{P} = \frac{P_1 + P_2 + \dots + P_n}{n}$                                              | h. | $Q = A \times q$                                        |
| d. | $\bar{P} = \frac{A_1 P_1 + A_2 P_2 + \dots + A_n P_n}{A_{total}}$                          |    |                                                         |
| e. | $\bar{P} = \frac{A_1(P_1+P_2)/2 + A_2(P_2+P_3)/2 + \dots + A_n(P_n+P_{n+1})/2}{A_{total}}$ |    |                                                         |

Dari tabel diatas, pilihlah rumus yang digunakan untuk menghitung :

Jawaban :

1. Curah hujan rata-rata metode Isohyet (\_e\_)
2. Curah hujan rata-rata (\_c\_)
3. Curah hujan rata-rata metode Thiessen (\_d\_)
4. Kebutuhan air perikanan (\_h\_)
5. Kebutuhan air irigasi cara 1 (\_f\_)
6. Kebutuhan air irigasi cara 2 (\_g\_)
7. Proyeksi pertumbuhan penduduk (\_a\_)
8. Debit andalan Weibull (\_b\_)

SELESAI



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.012

Training on Design of River Facility Structures, in Padang on September 2017



# Training on Design of River Facility Structures

## 1. Time and Duration

From 12th Sep. 2017 to 15th Sep. 2017, 4 days

## 2. Venue

In Padang City

- Classroom Lectures: Hotel Grand Zuri Padang

- Field Study: River Facility in Batang Arau, Kanal Banjir, Batang Kuranji, Batang Anai

## 3. Expected Participants

Approximately 30 Participants Selected from All B(B)WS,

- Education Background and Level: Science and Engineering, Bachelor Degree or higher

- Year of Experience: 3 years or more on Water Resources Management

- Current Responsibility: Planning, Design, Operation and Maintenance for River

## 4. Curriculum

| Day              | No. | Time          | Lecture                                                                                      | Lecturer                                                                                                                                                                                                                          | Minutes | JP |
|------------------|-----|---------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|
| 1st<br>12th Sep. |     | 08:00 -       | Registration                                                                                 |                                                                                                                                                                                                                                   |         |    |
|                  |     | 08:30 - 09:15 | Opening Remarks                                                                              | Ir. K. M. Arsyad, M.Sc., Head of Training Center for WR and Construction<br>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                                                 |         |    |
|                  |     | 09:15 - 09:45 | General Information from Balai DIKLAT (E-Evaluation)                                         | Balai DIKLAT                                                                                                                                                                                                                      |         |    |
|                  |     |               | Coffee Break                                                                                 |                                                                                                                                                                                                                                   |         |    |
|                  |     | 10:00 - 10:30 | Pre Test                                                                                     | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                                                                                                                             |         |    |
|                  | 1   | 10:30 - 12:00 | Law, Regulation and Technical Guidelines for River Facility Structures                       | Dian Kamila, ST., MT., Head of Sub-dit of Technical Assistance, Directorate of River & Coastal /<br>Ir. Indira Aisyah Wetenripada, MT, Chief of Technical Assistance Section for Western Regional, Directorate of River & Coastal | 90      | 2  |
|                  |     |               | Lunch                                                                                        |                                                                                                                                                                                                                                   |         |    |
|                  | 2   | 13:30 - 15:45 | Hydraulics in River Channel of Flood Time for Planning & Design of River Facility Structures | Dr. Eng. Adi Prasetyo, ST., M.Eng, Researcher/ Acting Chief of Research and Development Section, Experimental Station for Hydraulic Structures and Geotechnical, PUSAIR                                                           | 135     | 3  |
|                  |     |               | Coffee Break                                                                                 |                                                                                                                                                                                                                                   |         |    |
|                  | 3   | 16:00 - 17:30 | Practical Planning & Design of Levee and Revetment                                           | Ir. Bambang Warsito, Dipl.HE.                                                                                                                                                                                                     | 90      | 2  |
| 2nd<br>13th Sep. | 4   | 08:00 - 09:30 | Practical Planning & Design of Weir and Groundsill                                           | Ir. Supriyana, Dipl.HE.                                                                                                                                                                                                           | 90      | 2  |
|                  |     |               | Coffee Break                                                                                 |                                                                                                                                                                                                                                   |         |    |
|                  | 5   | 09:45 - 12:00 | Landscape Design (Environment-friendly) for River Facility and Infrastructure                | Ir. Budi Santoso, Dipl.HE.                                                                                                                                                                                                        | 135     | 3  |
|                  |     |               | Lunch                                                                                        |                                                                                                                                                                                                                                   |         |    |
|                  | 6   | 13:15 - 15:30 | Historical and Advanced River Facility Structures in Japan                                   | Mr. Jun Hayakawa, JICA expert on Integrated Water Resources Management                                                                                                                                                            | 135     | 3  |
|                  |     |               | Coffee Break                                                                                 |                                                                                                                                                                                                                                   |         |    |
| 3rd<br>14th Sep. | 7   | 15:45 - 17:15 | Exercise of Planning & Design of River Facility                                              | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                         | 90      | 2  |
|                  | 8   | 17:15 - 18:00 | Briefing on Field Study                                                                      | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                         | 45      | 1  |
|                  | 9   | 09:00 - 17:15 | Field Study on River Facility                                                                |                                                                                                                                                                                                                                   | 450     | 10 |
|                  |     | 09:00 - 09:15 | Travel to Batang Arau                                                                        |                                                                                                                                                                                                                                   |         |    |
|                  |     | 09:15 - 10:00 | Diversi on Gate at Batang Arau (Structure of weir, ground sill)                              |                                                                                                                                                                                                                                   |         |    |
|                  |     | 10:00 - 10:30 | Kanal Banjir (Revetment)                                                                     |                                                                                                                                                                                                                                   |         |    |
|                  |     | 10:30 - 11:00 | Travel to Batang Kuranji                                                                     |                                                                                                                                                                                                                                   |         |    |
|                  |     | 11:00 - 12:00 | Sabo works at Batang Kuranji (Sabo dam, Consolidate dam)                                     | BWS Sumatera V<br>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                       |         |    |
|                  |     | 12:00 - 13:30 | Lunch                                                                                        |                                                                                                                                                                                                                                   |         |    |
|                  |     | 13:30 - 14:00 | Travel to Batang Anai                                                                        |                                                                                                                                                                                                                                   |         |    |
| 4th<br>15th Sep. |     | 08:00 - 08:30 | Post Test                                                                                    |                                                                                                                                                                                                                                   |         |    |
|                  | 10  | 08:30 - 11:30 | Feedback of Field Study, Group Presentation                                                  | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                          | 180     | 4  |
|                  |     |               | Lunch                                                                                        |                                                                                                                                                                                                                                   |         |    |
|                  |     | 13:30 - 13:45 | Questionnaire of the training                                                                | Secretariat Member                                                                                                                                                                                                                |         |    |
|                  |     | 13:45 - 14:30 | Closing Ceremony                                                                             | DGWR - PUPR                                                                                                                                                                                                                       |         |    |
|                  |     |               |                                                                                              | Ir. Moeh Adam, MM, Head of Medan Training Center                                                                                                                                                                                  |         |    |
|                  |     | 13:45 - 14:30 | Closing Ceremony                                                                             | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert                                                                                                                                                                             | 32      |    |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 1                                                                                                                                                                                                                                                                                                                                                                                                            |
| Title            | Law, Regulation and Technical Guidelines for River Facility Structures                                                                                                                                                                                                                                                                                                                                       |
| Outline          | Design of river facility, such as revetment, river bank (levee), weir, intake facility and others should be followed technical standards and considered site condition. In Indonesia, there is a lot of technical standards from SNI, ministerial regulation of PUPR and so on.<br>Therefore, SNI, ministerial regulations and technical guidelines on river facility design are introduced in this lecture. |
| Objective        | -Introducing current trend of design of river facility, revetment, river bank, weir<br>-Knowing useful SNI, ministerial regulation and technical guidelines on design of river facility                                                                                                                                                                                                                      |
| Lecturer         | Ibu Dian Kamila, ST., MT., Head of Sub-dit of Technical Assistance, Directorate of River & Coastal /<br>Bpk. Andri Yosa Sabri, ST., MSc., Chief of Technical Assistance Section for Eastern Regional, Directorate of River & Coastal                                                                                                                                                                         |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | -Trend of river facility design, revetment, river bank, weir and others<br>-SNI, Ministerial regulation and technical guideline on design of river facility                                                                                                                                                                                                                                                  |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                            |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                              |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 2                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Hydraulics in River Channel of Flood Time for Planning & Design of River Facility Structures                                                                                                                                                                                                                                                                                                    |
| Outline          | Hydraulics in River channel in flood time should be considered for river facility design, especially revetment and ground sill of weir. Understanding mechanism and condition of hydraulics in river of flood time is essential as river engineer.<br>In this lecture, participants will learn mechanism of hydraulics mechanism in flood time and how to consider for design of river facility |
| Objective        | -Knowing mechanism of hydraulics in river channel in flood time and influences to river facility stability<br>-Understanding how to consider hydraulics in flood time to design of river facility                                                                                                                                                                                               |
| Lecturer         | Dr. Eng. Adi Prasetyo, ST., M.Eng, Researcher/ Acting Chief of Research and Development Section, Experimental Station for Hydraulic Structures and Geotechnical, PUSAIR                                                                                                                                                                                                                         |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                              |
| Contents         | -Mechanism of hydraulics in river channel in flood time<br>-Influences of hydraulics in flood time to river facility<br>-How to consider the hydraulics in flood time to river facility design                                                                                                                                                                                                  |
| Textbook, Module | Power Point File made by Lecture                                                                                                                                                                                                                                                                                                                                                                |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                 |

## Syllabus

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|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 3                                                                                                                                                                                                                                                                                                                                                                                                               |
| Title            | Practical Planning & Design of Levee and Revetment                                                                                                                                                                                                                                                                                                                                                              |
| Outline          | <p>Regarding levee and revetment, it is applied for River Normalization Works at many rivers in Indonesia. These structures should be considered hydraulics conditions for deciding location, hydraulics pressure and earth pressures for stability analysis on structure design.</p> <p>In this lecture, participants will understand how to design revetment and levee through introducing good examples.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Knowing technical guidelines on planning/design of levee and revetment</li> <li>-Introducing examples of practical planning/design of levee or revetment</li> <li>-Understanding how to choose structure type and to conduct stability analysis</li> </ul>                                                                                                              |
| Lecturer         | Ir.Bambang Warsito, Dipl.HE.                                                                                                                                                                                                                                                                                                                                                                                    |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                               |
| Contents         | <ul style="list-style-type: none"> <li>-Technical guideline on planning/design of levee and revetment</li> <li>-Examples of structures of levee and revetment</li> <li>-Method of choosing structure type and stability analysis for revetment and levee</li> </ul>                                                                                                                                             |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                               |
| References       | <ul style="list-style-type: none"> <li>- Pd. T- 16-2004-A Keputusan Menteri Permukiman dan Prasarana Wilayah Nomor : 360/KPTS/M/2004 ( Perencanaan Teknis Bangunan Tanggul Sungai Lahar )</li> <li>- Pd. T- 17-2004-A Keputusan Menteri Permukiman dan Prasarana Wilayah Nomor : 360/KPTS/M/2004 ( Pengamanan bangunan sabo dari gerusan lokal</li> </ul>                                                       |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Title            | Practical Planning & Design of Weir and Groundsill                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Outline          | Weir is usually constructed on across of river for intake water, control river flow and others. The structure receives hydraulics pressure, earth pressure from both river bank side, uplift pressure from foundation, stress load from attached facility such as gates. And also erosion at aprons of upstream and downstream side affects structure of groundsill. There are a lot of items that have to be considered for stability analysis of weir and groundsill structures. In this lecture, participants will learn basic knowledge of planning / design of weir and groundsill through introducing technical standard and examples of design structures. |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing technical standards on weir and groundsill</li> <li>-Knowing examples of weir and groundsill structure design, including damages structures</li> <li>-Understanding method of stability analysis of weir and groundsill structures</li> </ul>                                                                                                                                                                                                                                                                                                                                                                 |
| Lecturer         | Ir. Supriyana, Dipl.HE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Duration         | 90 minutes (2 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Contents         | <ul style="list-style-type: none"> <li>-Technical standard on design of weir/groundsill</li> <li>-Examples of goof weir/groundsill structure and damaged structures</li> <li>-Method of stability analysis</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| References       | <ul style="list-style-type: none"> <li>- SNI 03-2401-1991 ( Tata Cara Perencanaan Umum Bendung )</li> <li>- SNI 2851 : 2015 ( Desain Bangunan Penahan Sedimen )</li> <li>- Pd. T-12-2004-A Keputusan Menteri Permukiman dan Prasarana Wilayah Nomor 360/KPTS/M/2004 (Perencanaan teknis bendungan pengendali dasar sungai )</li> </ul>                                                                                                                                                                                                                                                                                                                            |

## Syllabus

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title            | Landscape Design (Environment-friendly) for River Facility and Infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Outline          | <p>It is currently said that river structures, such as revetment, levee, weir and so on, are needed consideration on landscape design and environment-friendly. Especially river structures at urban area, landscape design should be considered for creating river-friendly environment for residents. Moreover, it will be necessary to design a revetment with biology-friendly structure and a weir with fish way for river environment conservation</p> <p>In this lecture, participants will learn basic knowledge on design of river structures considering landscape design / environment-friendly through introducing good examples of such river structures.</p>                                                                                                                                                    |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing current trend on landscape design and environment-friendly design for river structures</li> <li>-Knowing good examples of revetment and weir with landscape design/environment-friendly</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Lecturer         | Ir. Budi Santoso, Dipl.HE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Current trend on landscape design and environment-friendly for river structures</li> <li>-Example of revetment and weir considering on landscape design/environment-friendly</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| References       | <ul style="list-style-type: none"> <li>- Module No. 26-34 Pengelolaan Wilayah Sungai <ul style="list-style-type: none"> <li>- 26.Penataan Sempadan dan Bantaran</li> <li>- 27.Peraturan-Peraturan tentang Pengelolaan Daerah Sempadan Sungai, Daerah Manfaat Sungai, dan Daerah Penguasaan Sungai</li> <li>- 28.Sistem Informasi Spasial Kawasan Sungai</li> <li>- 29.Monitoring dan Evaluasi Kinerja Sempadan dan Bantaran Sungai</li> <li>- 30.Organisasi Pengelola dan Instansi Terkait</li> <li>- 31.Pemukiman Masyarakat di Daerah Dataran Banjir</li> <li>- 32.Biaya Observasi dan Pemeliharaan</li> <li>- 33.Daerah Sempadan Sungai, Daerah Manfaat Sungai, dan Daerah Penguasaan Sungai</li> <li>- 34.Aktivitas di Daerah Sempadan Sungai, Daerah Manfaat Sungai, dan Daerah Penguasaan Sungai</li> </ul> </li> </ul> |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Title            | Historical and Advanced River Facility Structures in Japan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Outline          | <p>'Regarding river facility such as Weir, Revetment and Levee in Japan, these structure are similar with structures in Indonesia. However several structures of river facility in Japan has rarely been seen in Indonesia, such as Compound Cross Section Type of River Channel* and Fish way at Weirs. Above 2 (two) structures that will be applied in Indonesia in the future are introduced in this Lecture.</p> <p>Participants will know basic knowledge on planning/design and advantages of these 2 (two) structures.</p> <p><i>**"Compound Cross Section Type of River Channel" has been installed at Batang Anai by JICA Sector Loan Project on Urban Flood Management (IP551)</i></p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing river facility structures in Japan, weir, revetment and levee</li> <li>-Understanding outline and advantages of Compound Cross Section Type of River Channel</li> <li>-Understanding planning / design of Fish way at Weir</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                         |
| Lecturer         | Mr. Jun Hayakawa, JICA policy expert on SDA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Contents         | <ul style="list-style-type: none"> <li>-Outline of River Facility Structures in Japan, focusing on Weir, Revetment and Levee</li> <li>-Compound Cross Section Type of River Channel</li> <li>-Fish way at Weir</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Title            | Exercise of Planning & Design of River Facility                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Outline          | <p>'Through Lecture No.1 to No.6 in this training, basic and technical knowledge are input to participants. However it is also important to learn from failure cases, such as damaged structure and its factors. The knowledge can be reflected to design improvement of river facility structure.</p> <p>In this lecture, participants will learn more effective consideration for river facility structure design/stability analysis from exercise to find factors of failure cases.</p> |
| Objective        | -Understanding more effective consideration for river facility structure design from exercise to find factors of failure cases                                                                                                                                                                                                                                                                                                                                                             |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                                                                                                                                                                  |
| Duration         | 135 minutes (3 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Contents         | <ul style="list-style-type: none"> <li>-Introducing past failure cases</li> <li>-Exercise to think/find factor of failure (structure damages)</li> <li>-Consideration for improvement of design/stability analysis</li> </ul>                                                                                                                                                                                                                                                              |
| Textbook, Module | Power Point File made by Lecturer                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Title            | Briefing on Field Study                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Outline          | <p>Participants will learn about</p> <ol style="list-style-type: none"> <li>1) Outline of Diversion Gates at Batang Arau and Kanal Banjir</li> <li>2) Outline of Sabo Works at Batang Kuranji</li> <li>3) Outline of River Improvement at Batang Anai</li> <li>4) Outline of Coastal Protection and Structure Jetty prior to the field study.</li> </ol>                                                                                                                                   |
| Objective        | <p>-Sharing the information of</p> <ol style="list-style-type: none"> <li>1) Outline of Diversion Gates at Batang Arau and Kanal Banjir</li> <li>2) Outline of Sabo Works at Batang Kuranji</li> <li>3) Outline of River Improvement at Batang Anai</li> <li>4) Outline of Coastal Protection and Structure Jetty</li> <li>5) Schedule and route</li> <li>6) Deciding topics by each groups for field study and presentation before the field study to have a productive visit.</li> </ol> |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                                                                                                                                                                  |
| Duration         | 45 minutes (1 JP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Contents         | <ul style="list-style-type: none"> <li>-Schedule and Route of the field study</li> <li>-Outline of Diversion Gates at Batang Arau and Kanal Banjir</li> <li>-Outline of Sabo Works at Batang Kuranji</li> <li>-Outline of River Improvement at Batang Anai</li> <li>-Outline of Coastal Protection and Structure Jetty</li> <li>-Topic of each group for field study and presentation</li> </ul>                                                                                           |
| Textbook, Module | Power Point made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## Syllabus

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|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Title            | Field Study on River Facility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Outline          | <p>BWS Sumatera V has managed a lot of river facilities and projects, Diversion Gates at Batang Arau, Kanal Banjir, Sabo Works at Batang Kuranji, River Channel Improvement (Revetment, levee and environment-friendly revetment), Coastal Protection, and so on. These facilities and structure are referred for more technical understanding to participants.</p> <p>In this Field Study, participants will understand more about technical knowledge on design / planning river facilities and structures through site study.</p> |
| Objective        | <ul style="list-style-type: none"> <li>-Introducing weir and groundsill structures at Diversion Gates of Batang Arau</li> <li>-Understanding structure of revetment at Kanal Banjir</li> <li>-knowing bank protection works and groundsill at Sabo Works of Batang Kuranji</li> <li>-Understanding compound cross section (low-water and high-water channel type) and environment-friendly revetment at Batang Anai</li> <li>-Introducing coastal protection structure, Jetty</li> </ul>                                             |
| Lecturer         | <p>BWS Sumatera V</p> <p>Mr. MIURA Hirohisa, ME, JICA Project Technical Expert</p> <p>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project</p>                                                                                                                                                                                                                                                                                                                                                                                            |
| Duration         | 450 minutes (10 JP) including travel time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Contents         | <ul style="list-style-type: none"> <li>-Diversion Gates of Batang Arau (Weir and groundsill structures)</li> <li>-Kanal Banjir (Structure of revetment)</li> <li>-Sabo Works of Batang Kuranji (Bank protection works and groundsill)</li> <li>-River channel Improvement at Batang Anai (Compound cross section (low-water and high-water channel type) and environment-friendly revetment)</li> <li>-Coastal protection (Structures of Jetty)</li> </ul>                                                                           |
| Textbook, Module | Power Point, leaflet and Brochure, made by Lecturers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| References       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Syllabus

|                  |                                                                                                                                                                                                                                                                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture No.      | 10                                                                                                                                                                                                                                                                                                                                                           |
| Title            | Feedback of Lectures and Field Study, Group Presentation                                                                                                                                                                                                                                                                                                     |
| Outline          | Feedback session to discuss among participants and instructors on things learned from lectures and field study for design of river facility structures, especially how the participant can apply for their duty at their office. Participants are divided into several groups. Discussion and preparation for group presentation will be done by each group. |
| Objective        | <ul style="list-style-type: none"> <li>-Presentation on river facility structure design</li> <li>-Through discussion and presentation, participants will understand effective design of river facility structures</li> </ul>                                                                                                                                 |
| Lecturer         | Mr. MIURA Hirohisa, ME, JICA Project Technical Expert,<br>Ir. Sarwono Sukardi, Dipl. HE, JICA RBO Project                                                                                                                                                                                                                                                    |
| Duration         | 180 minutes (4 JP)                                                                                                                                                                                                                                                                                                                                           |
| Contents         | <ul style="list-style-type: none"> <li>-Presentation from each group (10 minutes * 6 groups = 60 minutes)</li> <li>-Comments from Instructors (60 minutes)</li> </ul>                                                                                                                                                                                        |
| Textbook, Module |                                                                                                                                                                                                                                                                                                                                                              |
| References       |                                                                                                                                                                                                                                                                                                                                                              |



## Pretest

### Training on “Sediment Management for Dam”

Institusi : \_\_\_\_\_

Nama : \_\_\_\_\_

#### 1. Kerangka Hukum untuk Pengelolaan Sedimen pada untuk Bendsungan ( 25 point )

Isilah titik dibawah ini dengan dasar hukum, peraturan, surat keputusan, pedoman teknis tentang Desain Struktur Fasilitas Sungai.( 5 x 5 Point = 25 Point )

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

No. dan Tahun : \_\_\_\_\_

Judul : \_\_\_\_\_

Deskripsi : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



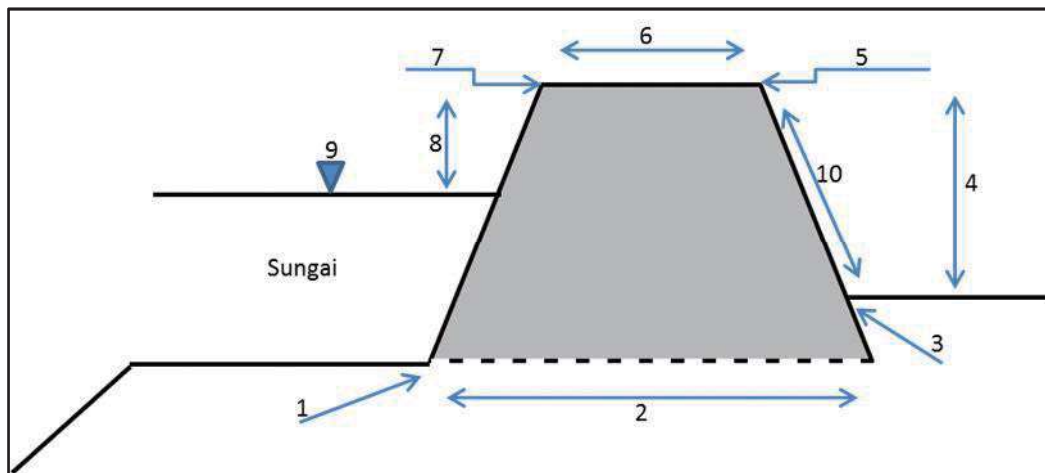
## 2. Definisi dasar dan pengetahuan tentang Perencanaan Tanggul ( 5 + 20 = 25 Point )

(1) Pilihlah deskripsi yang paling cocok untuk “Tanggul” dari kalimat di bawah ini

Jawaban :  b  ( 5 point )

- a. Sebagai sediment kontrol untuk bendungan
- b. suatu konstruksi yang dibuat untuk mencegah banjir di dataran yang dilindungi
- c. lebih luas berarti sistem pengendali erosi, sedimen, lahar hujan dan penanggulangan tanah longsor
- d. Sistem kontrol hanya untuk bencana letusan gunung berapi

(2) Gambar dibawah ini menunjukkan gambaran umum tanggul, cocokkanlah angka-angka pada gambar berikut ( 1 sd 10 ) dengan kalimat atau deskripsi dibawah ini. ( 10 x 2 Point = 20 Point )



Jawaban : \_\_\_\_\_

- a. Kemiringan tanggul : ( \_10\_ )
- b. Tinggi jagaan : ( \_8\_ )
- c. Tinggi tanggul : ( \_4\_ )
- d. Dasar tanggul : ( \_2\_ )
- e. Puncak tanggul : ( \_6\_ )
- f. Rencana Tinggi Muka Air : ( \_9\_ )
- g. Kaki tanggul dalam : ( \_1\_ )
- h. Kaki tanggul luar : ( \_3\_ )
- i. Bahu tanggul dalam : ( \_7\_ )
- j. Bahu tanggul luar : ( \_5\_ )



**3. Dasar Perencanaan Bendung dan Ambang ( 5 + 5 + 10 = 20 point )**

(1) Pilihlah deskripsi yang tepat untuk “Bendung” ( 5 point )

Jawban : ( c )

- a. Suatu struktur konstruksi yang berfungsi untuk menghubungkan dua bagian jalan yang terputus oleh adanya rintangan-rintangan seperti lembah yang dalam, alur sungai saluran irigasi dan pembuang ;
- b. Bangunan yang berupa urukan tanah, urukan batu, beton, dan/atau pasangan batu yang dibangun selain untuk menahan dan menampung air, dapat pula dibangun untuk menahan dan menampung limbah tambang ("tailing"), atau menampung lumpur sehingga terbentuk waduk;
- c. Bangunan melintang alur sungai yang berfungsi meninggikan muka air;
- d. Semacam tembok miring/tegak lurus baik buatan maupun alami dan dipergunakan untuk mengatur muka air

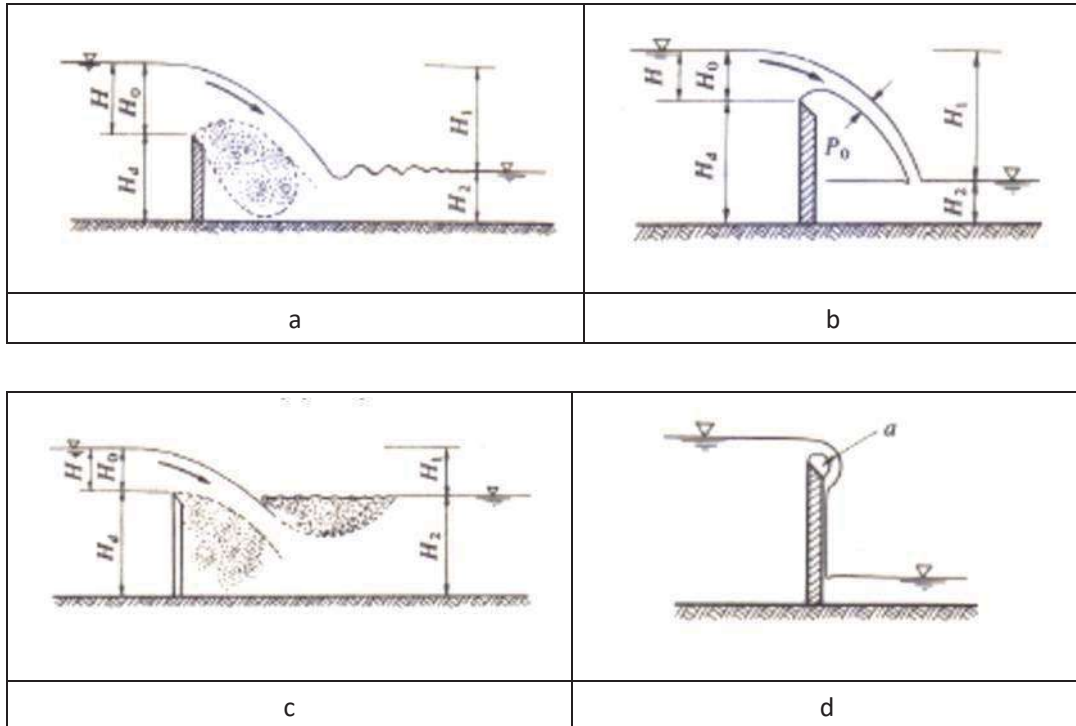
(2) Pilihlah deskripsi yang tepat untuk “Bendungan” ( 5 point )

Jawban : ( b )

- a. Suatu struktur konstruksi yang berfungsi untuk menghubungkan dua bagian jalan yang terputus oleh adanya rintangan-rintangan seperti lembah yang dalam, alur sungai saluran irigasi dan pembuang ;
- b. Bangunan yang berupa urukan tanah, urukan batu, beton, dan/atau pasangan batu yang dibangun selain untuk menahan dan menampung air, dapat pula dibangun untuk menahan dan menampung limbah tambang ("tailing"), atau menampung lumpur sehingga terbentuk waduk;
- c. Bangunan melintang alur sungai yang berfungsi meninggikan muka air;
- d. Semacam tembok miring/tegak lurus baik buatan maupun alami dan dipergunakan untuk mengatur muka air



(3) Berikut ini gambar bendung pelimpah :



Cocokkanlah gambar-gambar diatas dengan deskripsi berikut : ( 4 x 2.5 point = 10 point )

Jawaban :

1.  $H_4 > 2,5 H$ , Limpahan sempurna : ( \_b\_ )
2.  $H \ll$  dari  $0,4 H_4$ , Limpahan melekat : ( \_d\_ )
3.  $H_4 \leq 2,5 H$ , Limpahan tidak sempurna : ( \_a\_ )
4.  $H_1 \leq 0,75 H_4$ , Limpahan tidak sempurna : ( \_c\_ )

#### 4. Desain Landscape untuk Fasilitas Sungai ( 10 + 10 = 20 point )

(1) Pilihlah dari fungsi-fungsi berikut yang merupakan fungsi sempadan sungai :

- |                                 |                                |
|---------------------------------|--------------------------------|
| a. Fungsi keberadaan ekosistem; | e. Fungsi penahan erosi;       |
| b. Fungsi Agraris;              | f. Fungsi pendukung ekosistem; |
| c. Fungsi Ekonomis;             | g. Fungsi alami;               |
| d. Fungsi ruang publik;         | h. filter terhadap polutan.    |

Jawaban : ( a,d,e,f,h ) ( 5 x 2 point = 10 point )



(2) Sempadan merupakan wilayah yang dilindungi, oleh sebab itu tidak semua bangunan/struktur diizinkan untuk dibangun di area sempadan, bangunan/struktur apa saja yang dapat dibangun di wilayah sempadan ?

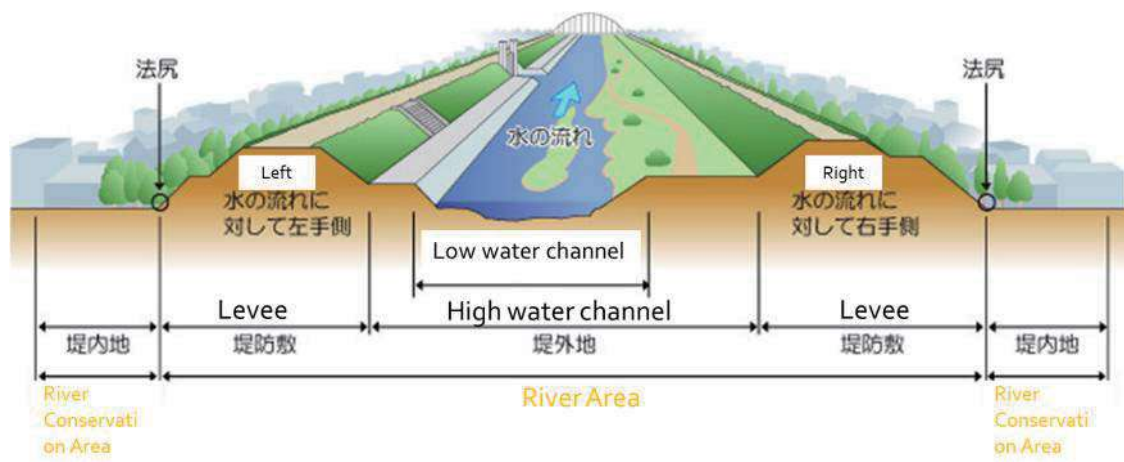
- |                                          |                                         |
|------------------------------------------|-----------------------------------------|
| a. Kantor RT/RW ;                        | e. Bangunan Sekolah ;                   |
| b. Fasilitas jembatan dan dermaga ;      | f. Bangunan prasarana sumber daya air ; |
| c. Rumah Sakit ;                         | g. jalur pipa gas dan air minum ;       |
| d. Rentangan kabel listrik dan telekom ; | h. Hotel dan Mall.                      |

Jawaban : ( b,d,f,g ) ( 4 x 2.5 point = 10)

#### 5. Struktur Fasilitas Sungai ( 10 point )

(1) Sebuah gambar di bawah ini menunjukkan "Gabungan Penampang Melintang" yang merupakan salah satu bentuk melintang saluran sungai. Bagian " Gabungan Penampang Melintang " terdiri dari saluran air rendah dan air tinggi.

Pilihlah mana yang **bukan deskripsi** dari "Gabungan Penampang Melintang" sungai, dari penjelasan kalimat dibawah ini :



- Untuk waktu banjir, kedalaman air dan kecepatan aliran air umumnya dapat dikurangi pada saluran air tinggi. Biasanya membuat tanggul berisiko rendah untuk runtun ;
- Area saluran air tinggi dapat diterapkan untuk berbagai keperluan, misalnya, pelestarian dan restorasi hewan dan tumbuhan, untuk rekreasi, seperti taman, lapangan sepak bola ;



- c. Lebar saluran air rendah harus ditentukan secara umum dengan mempertimbangkan bahwa bentuk saluran pengaliran adalah penting ;
- d. Tanggul dengan "Gabungan Penampang Melintang" benar-benar aman, karena aliran air biasanya hanya di saluran air rendah. Karena itu, biaya untuk pemeliharaan tanggul bisa dikurangi

SELESAI



## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.013

Training on RBO Performance Benchmarking for BBWS and BWS in West  
Region, in Palembang on April 2018



## Pelatihan RBO Performance Benchmarking - Palembang

### 1. Waktu dan Durasi

5 Hari, dari tanggal 9 s/d 13 April

### 2. Venue

- Palembang
- Diklat Klasikal:
- Studi Lapangan: BBWS Sumatera VIII

### 3. Peserta

- 30-34 Peserta dari Petugas yang menangani RBO-PB dari B(BWS) dan PJT di Wilayah Barat
- Latar belakang pendidikan: Sarjana/ Sarjana Muda, Teknis/ Non-Teknis
- Pengalaman Kerja: 2 tahun atau lebih (PNS/ Non-PNS)

### 4. Kurikulum

| Hari                       | No. | Waktu         | Kegiatan                                                                                                 | Narasumber                                   | Menit | JP |
|----------------------------|-----|---------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------|-------|----|
| Ke 1<br>9 April<br>Senin   |     | 12:00 - 13:00 | Pendaftaran dan ISHOMA                                                                                   | Balai DIKLAT                                 | 60    |    |
|                            |     | 13:00 - 14:00 | Acara Pembukaan:                                                                                         |                                              |       |    |
|                            |     |               | - Menyanyikan lagu kebangsaan Indonesia Raya                                                             | Balai DIKLAT                                 |       |    |
|                            |     |               | - Laporan penyelenggara                                                                                  |                                              |       |    |
|                            |     |               | - Sambutan pembukaan oleh JICA                                                                           | Mr. Suzuki Kazushi, JICA Project Coordinator |       |    |
|                            |     |               | - Sambutan pembukaan oleh BPSDM                                                                          | Kepala BPSDM/ Kapusdiklat                    |       |    |
|                            |     |               | - Pengalungan tanda peserta                                                                              | Kapusdiklat dan Mr. Suzuki                   |       |    |
|                            |     |               | - Doa                                                                                                    | Balai DIKLAT                                 |       |    |
|                            |     | 14:00 - 14:15 | Coffee Break                                                                                             |                                              |       |    |
|                            |     | 14:15 - 15:00 | Pre test                                                                                                 | Tim Pengajar                                 | 45    |    |
|                            | 1   | 15:00 - 16:30 | Pengantar kegiatan RBO Performance Benchmarking (RBO-PB)                                                 | Triyono Tulus S                              | 90    | 2  |
| Ke 2<br>10 April<br>Selasa | 2   | 16:30 - 18:00 | Penjelasan Umum Buku Pedoman Pengukuran Kinerja RBO                                                      | Triyono Tulus S                              | 90    | 2  |
|                            | 3   | 18:00 - 18:45 | Pembagian kelompok (Termasuk pemilihan ketua kelas)                                                      | Bambang Trihariono                           | 45    | 1  |
|                            |     | 18:45         | ISHOMA                                                                                                   |                                              |       |    |
|                            | 4   | 08:00 - 09:30 | Penjelasan tentang NARBO dan RBO-PB                                                                      | Herman Idrus                                 | 90    | 2  |
|                            |     | 09:30 - 09:45 | Coffee Break                                                                                             |                                              |       |    |
|                            | 5   | 09:45 - 11:15 | Implementation of RBO Management in Japan                                                                | Miura Hirohisa, JICA RBO Project             | 90    | 2  |
|                            | 6   | 11:15 - 12:45 | Pengenalan Instrumen Performance Benchmarking (15 indikator) dan Action Plan (1)                         | Isnugroho                                    | 90    | 2  |
|                            |     | 12:45 - 13:45 | ISHOMA                                                                                                   |                                              |       |    |
|                            | 6   | 13:45 - 16:45 | Pengenalan Instrumen Performance Benchmarking (15 indikator) dan Action Plan (2)                         | Isnugroho                                    | 180   | 4  |
| Ke 3<br>11 April<br>Rabu   |     | 16:45 - 17:00 | Coffee Break                                                                                             |                                              |       |    |
|                            | 7   | 17:00 - 19:15 | Pengelolaan dokumen RBO-PB                                                                               | Bambang Trihariono                           | 135   | 3  |
|                            |     | 19:15         | ISHOMA                                                                                                   |                                              |       |    |
|                            | 8   | 08:00 - 09:30 | Latihan 1: Praktik Self Assessment.<br>Peserta dibagi dalam beberapa kelompok (akan ditetapkan kemudian) | Pendamping:<br>- Hendarti                    | 90    | 2  |
|                            |     | 09:30 - 09:45 | Coffee Break                                                                                             |                                              |       |    |
|                            | 9   | 09:45 - 11:15 | Presentasi Hasil Latihan I: self assessment                                                              | Moderator: Herman Idrus                      | 90    | 2  |
|                            | 10  | 11:15 - 12:45 | Penjelasan tentang Peer Review dalam praktik                                                             | Isnugroho                                    | 90    | 2  |
|                            |     | 12:45 - 13:45 | ISHOMA                                                                                                   |                                              |       |    |
|                            | 11  | 13:45 - 15:15 | Latihan 2: Praktik melakukan Peer Review terhadap hasil Latihan I (SA)                                   | Pendamping:<br>- Herman Idrus                | 90    | 2  |
|                            |     | 15:15 - 15:30 | Coffee Break                                                                                             |                                              |       |    |
|                            | 12  | 15:30 - 17:00 | Presentasi oleh kelompok dan diskusi hasil Latihan 2: Peer Review                                        | Moderator:<br>- Dyah Sriyati                 | 90    | 2  |
|                            | 13  | 17:00 - 18:30 | Paparan Pelaksanaan RBO-PB di BBWS Sum VIII                                                              | Ka. BBWS Sum VIII                            | 90    | 2  |
|                            |     | 18:30         | ISHOMA                                                                                                   |                                              |       |    |

|                           |    |               |                                                                                                                                |                                                                       |     |   |
|---------------------------|----|---------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----|---|
| Ke 4<br>12 April<br>Kamis |    | 07:30 - 16:00 | Kunjungan Lapangan ke BBWS Sum VIII                                                                                            |                                                                       |     |   |
|                           |    | 07:30 - 08:00 | Perjalanan menuju BBWS Sum VIII                                                                                                |                                                                       | 30  |   |
|                           |    | 08:00 - 08:30 | Sambutan Subdit Kelembagaan                                                                                                    | Dyah Sriyati                                                          | 15  |   |
|                           |    | 08:30 - 09:00 | Sambutan Ka. BBWS Sum VIII                                                                                                     | Ka. BBWS Sum VIII                                                     | 15  |   |
|                           | 14 | 09:00 - 11:15 | Praktik menelaah hasil self assessment dan peer review BBWS Sum VIII dan meninjau dokumen                                      | Pendamping:<br>- Hendarti                                             | 135 | 3 |
|                           |    | 11:15 - 13:00 | ISHOMA                                                                                                                         |                                                                       |     |   |
|                           | 15 | 13:00 - 15:15 | - Wawancara/ konfirmasi dengan staf dan manajemen serta stakeholder<br>- Membuat laporan kelompok                              | Pembimbing:<br>- Isnugroho                                            | 135 | 3 |
|                           |    | 15:15 - 16:00 | Post Test                                                                                                                      | Tim Pengajar                                                          |     |   |
|                           |    | 16:00 - 16:30 | Perjalanan kembali ke Balai Diklat                                                                                             |                                                                       |     |   |
|                           |    | 16:30 - 16:45 | Coffee Break                                                                                                                   |                                                                       |     |   |
|                           | 16 | 16:45 - 18:15 | Pembuatan laporan kelas yang dihimpun dari laporan kelompok dari hasil kunjungan ke BBWS Sum VIII                              | Pendamping:<br>- Herman Idrus                                         | 90  | 2 |
|                           |    | 18:15         | ISHOMA                                                                                                                         |                                                                       |     |   |
| Ke 5<br>13 April<br>Jumat | 17 | 08:00 - 10:15 | - Presentasi ketua kelas hasil hasil kunjungan ke BBWS Sum VIII<br>- Tanggapan (hasil presentasi kelas) dari Ka. BBWS Sum VIII | Pembimbing: Herman Idrus<br>Ka. BBWS Sum VIII<br>Moderator: Isnugroho | 90  | 2 |
|                           |    | 10:15 - 10:45 | Pengumuman hasil test (Pre dan Post)                                                                                           | Balai DIKLAT                                                          |     |   |
|                           |    | 10:45 - 11:30 | Acara Penutupan:                                                                                                               |                                                                       |     |   |
|                           |    |               | - Sambutan Penutupan                                                                                                           | Kapusdiklat dan Mr. Suzuki Kazushi                                    |     |   |
|                           |    |               | - Pelepasan Tanda Peserta                                                                                                      | Kasubdit Kelembagaan                                                  |     |   |
|                           |    |               | - Menyanyikan Lagu Padamu Negeri                                                                                               | Balai DIKLAT                                                          |     |   |
|                           |    |               |                                                                                                                                |                                                                       |     |   |
| Jumlah Jam Pelajaran (JP) |    |               |                                                                                                                                |                                                                       | 40  |   |

Peserta Diwajibkan :

- Membawa data struktur organisasi dan uraian tugas
- Membawa laptop
- Membawa buku LAKIP

**SILABUS**  
**PELATIHAN PENGUKURAN KINERJA ORGANISASI PENGELOLA WILAYAH SUNGAI**  
Pelaksanaan pada BBWS Sumatera VIII  
Tanggal 9 – 13 April 2018

**Syllabus No.1**

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                   |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>No. Mata Pelajaran</b>          | <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                   |
| <b>Judul</b>                       | <b>Pengantar Kegiatan RBO Performance Benchmarking (RBO PB)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Catatan</b>                                                                                                    |
| Uraian singkat                     | Proses kegiatan pelatihan ini juga merupakan kegiatan pendampingan dalam aplikasi RBO Performance Benchmarking yang memerlukan kesatuan pola pikir mengenai: (1) pengertian performance benchmarking, (2) pemahaman tentang tujuan dan manfaat, (3) keseriusan dalam aplikasi performance benchmarking, (4) konsistensi penerapan yang harus dievaluasi, dan (5) adanya benang merah keterkaitan dengan kebijakan dari pimpinan yang lebih tinggi, baik dalam aspek pekerjaan fisik, finansial maupun legal. Kelima hal tersebut akan digambarkan melalui proses pelatihan selama 5 hari ini. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan                             | Diharapkan penjelasan ini dapat menjadi petunjuk bagaimana melaksanakan performance benchmarking melalui dua kegiatan pokok, yaitu performance self assessment dan peer review. Untuk itulah disusun Pedoman Pengukuran Kinerja RBO (terbit pada bulan Juni 2015) yang menjadi acuan RBO dalam melaksanakan Self assessment dan peer review.                                                                                                                                                                                                                                                  |                                                                                                                   |
| Pengajar/Narasumber                | Kasubdit Kelembagaan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                   |
| Waktu/durasi                       | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                   |
| Materi/isi                         | <ul style="list-style-type: none"> <li>- Penegrtian RBO</li> <li>- Jumlah RBO di Indonesia saat ini</li> <li>- Manfaat Performance Benchmarking bagi RBO</li> <li>- Perlunya pemahaman mengenai Pedoman Pengukuran Kinerja RBO yang antara lain memberikan petunjuk tentang proses self assessment dan peer review</li> </ul>                                                                                                                                                                                                                                                                 | Bahan disiapkan Subdit Kelembagaan:<br>1. Essay<br>2. Power point                                                 |
| Textbook/module/ dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO (RBO Performance Benchmarking) Edisi 11-12 Juni 2015</li> <li>- Permen PUPR No. 20/PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                         | Disiapkan oleh Subdit Kelembagaan                                                                                 |

## Syllabus No.2

| No. Mata Pelajaran               | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                     |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Judul                            | Penjelasan tentang NARBO dan RBO PB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Catatan                                                                                                             |
| Uraian singkat                   | NARBO (Network of Asian River Basin Organization), merupakan jaringan organisasi wilayah sungai Asia, bertujuan membantu mencapai keterpaduan pengelolaan Sumber Daya Air (IWRM - Integrated Water Resources Management) pada wilayah sungai seluruh Asia. Sasaran NARBO adalah memperkuat kapasitas dan efektivitas RBO dalam mempromosikan IWRM, memperbaiki tata kelola air melalui pelatihan dan tukar informasi dan pengalaman di antara RBO dan lembaga di sector keairan, serta memberi saran dalam pembentukan RBO-RBO di Asia. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan   |
| Tujuan                           | Memberikan pemahaman mengenai Network of Asian River Basin Organization dan Organisasi Wilayah Sungai di Indonesia (RBO)                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                     |
| Pengajar/Narasumber              | Herman Idrus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                     |
| Materi/isi                       | <ol style="list-style-type: none"> <li>1. Pengenalan mengenai NARBO</li> <li>2. Mengenali kebutuhan akan jejaring dan pengembangan kapasitas dalam implementasi IWRM</li> <li>3. Peresmian <b>Network of Asian River Basin Organization (NARBO)</b> pada 21 Maret 2003</li> <li>4. Beberapa contoh RBO yang telah ada di Asia</li> <li>5. Perlunya selalu meningkatkan kapasitas dan kompetensi SDM RBO melalui pelatihan</li> </ol>                                                                                                    | Bahan disiapkan oleh pengajar:<br><ol style="list-style-type: none"> <li>1. Esay</li> <li>2. Power point</li> </ol> |
| Textbook/Modul/Dokumen pendukung | NARBO CHARTER<br>Permen PUPR No.20/PRT/M/2016<br>Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                     |

## Syllabus No.3

| No. Mata Pelajaran  | 3                                                                                                                                                                                                                                                                                                                          |                                                                                                                   |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Judul               | Penjelasan umum garis besar mengenai Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                   | Catatan                                                                                                           |
| Uraian singkat      | Buku Pedoman Pengukuran Kinerja RBO yang terbit pada bulan Juni 2015 adalah sarana acuan melaksanakan pelatihan untuk memperbaiki tata kelola air dan tukar menukar pengalaman antar RBO. Melalui buku pedoman ini RBO-RBO di Indonesia diharapkan dapat melakukan kegiatan self assessment untuk meningkatkan kinerjanya. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan              | Memberikan pedoman bagi RBO dalam melakukan pengukuran kinerja untuk menuju ke perbaikan berkelanjutan                                                                                                                                                                                                                     |                                                                                                                   |
| Pengajar/Narasumber | Kasubdit Kelembagaan                                                                                                                                                                                                                                                                                                       |                                                                                                                   |

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                        |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Waktu/durasi                         | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                        |
| Materi/isi                           | <p>Selain penjelasan secara garis besar juga ditampilkan contoh:</p> <ol style="list-style-type: none"> <li>1. Indikator Pengukuran Kinerja BBWS/BWS/BPSDA/PJT</li> <li>2. Dokumen Pendukung untuk Masing-Masing kriteria</li> <li>3. Rencana Aksi (<i>Action Plan</i>)BBWS/BWS/BPSDA/PJT</li> <li>4. Nota Kesepakatan Tim <i>Self Assessment</i>&amp; Tim <i>Peer Review</i></li> <li>5. Format Laporan <i>Self Assessment</i></li> <li>6. Format Laporan <i>Peer Reviewer</i></li> <li>7. Bagan Alir Pengukuran Kinerja RBO</li> <li>8. DII</li> </ol> | <p>Bahan disiapkan oleh pengajar:</p> <ol style="list-style-type: none"> <li>1.Essay</li> <li>2.Power point</li> </ol> |
| Textbook/Modul/<br>Dokumen pendukung | <p>-NARBO CHARTER</p> <p>-Permen PUPR No.20/PRT/M/2016</p> <p>-Buku Pedoman Pengukuran Kinerja RBO</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                        |

#### Syllabus No.4

|                                     |                                                                                                                                                                                                                                                                           |                                                                                                            |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran                  | 4                                                                                                                                                                                                                                                                         | Catatan                                                                                                    |
| Judul                               | <b>Implementation of RBO Management in Japan</b>                                                                                                                                                                                                                          |                                                                                                            |
| Outlines                            | <p>To show the development of RBO Management in Japan in case of:</p> <ul style="list-style-type: none"> <li>- The organization of RBO</li> <li>- The various type of river managed by the organization</li> <li>- The methods of assessment (the achievement)</li> </ul> |                                                                                                            |
| Objectives                          | To give understanding that benchmarking methods can be applied in various river basin and need to be implemented to assure the level of performance of RBO                                                                                                                |                                                                                                            |
| Lectures                            | JICA/Miura                                                                                                                                                                                                                                                                |                                                                                                            |
| Time/durasion                       | 90 minutes                                                                                                                                                                                                                                                                |                                                                                                            |
| Content                             | <ul style="list-style-type: none"> <li>- Work area</li> <li>- About achievement</li> <li>- Showing some pictures of river managed by RBO</li> </ul>                                                                                                                       | <p>Prepare by Lecturer</p> <ol style="list-style-type: none"> <li>1.Esay</li> <li>2.Power point</li> </ol> |
| Textbook/Module/Supporting document | TDL                                                                                                                                                                                                                                                                       |                                                                                                            |

#### Syllabus No.5

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Catatan                                                                                                       |
| Judul              | <b>Pengenalan Instrumen Pengukuran Kinerja RBO (15 indikator) dan penggunaannya serta penjelasan mengenai Action Plan</b>                                                                                                                                                                                                                                                                                                                                       |                                                                                                               |
| Uraian singkat     | <p>Sebagai organisasi pengelola wilayah sungai sesuai dengan fungsinya seperti yang diamanatkan oleh Permen PUPR No. 20/PRT/M/2016, tentunya harus dapat menunjukkan kinerjanya dengan tolok ukur yang terstruktur, oleh karena itu perlu adanya pengukuran-pengukuran yang terpola, yaitu dengan metoda self assessment dan peer review, metoda tersebut yang juga disebut performance benchmarking dibuat untuk tujuan perbaikan berkelanjutan suatu RBO.</p> | <p>Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan</p> |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                                  | <p>Action plan adalah suatu dokumen tertulis yang menggambarkan langkah-langkah yang dilalui dalam suatu proses menuju tercapainya suatu tujuan organisasi. Setiap orang yang diwajibkan membantu/berpartisipasi harus terlibat sejak awal. Isi dan format suatu action plan harus dapat membantu pengguna rencana tersebut.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                   |
| Tujuan                           | <ul style="list-style-type: none"> <li>- Memberikan pemahaman bahwa metoda pengukuran kinerja perlu diterapkan untuk memberikan kepastian tingkat kinerja setiap RBO</li> <li>- Memberikan pemahaman bahwa action plan dapat dibuat sesuai keperluan, mulai yang sederhana sampai pada yang lebih kompleks. Prinsip dasarnya adalah menampilkan suatu rencana mengenai apa, bagaimana dan siapa yang melaksanakan, kapan mulai, kapan selesai, dengan biaya berapa, misalnya Action Plan by Quarters, Action Plan Time Table, Action Plan by Target, dll.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                   |
| Pengajar/narasumber              | Isnugroho                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                   |
| Waktu/durasi                     | 270 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                   |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Pengenalan istilah-istilah</li> <li>- Format model pengkajian kinerja</li> <li>- Tentang area kinerja yang kritis</li> <li>- Tentang capaian (achievement) berdasarkan uraian tugas</li> <li>- Tentang indicator dan parameter</li> <li>- Tentang penetapan skor</li> </ul> <p>Action Plan:</p> <ul style="list-style-type: none"> <li>• Kegiatan yang menggambarkan langkah-langkah yang realistis, terukur dan dapat dicapai;</li> <li>• Identifikasi tanggungjawab secara jelas semua pihak yang terkait;</li> <li>• Susun jadwal yang spesifik untuk melengkapi kegiatan yang dilaksanakan;</li> <li>• Identifikasi sumber daya yang diperlukan, termasuk bagaimana mendapatkan sumber daya tersebut;</li> <li>• Instruksikan semua yang terlibat dalam kegiatan tersebut membantu/memfasilitasi pengembangan action plan ini. Dokumen/catatan-catatan yang terkait adalah merupakan bahan yang penting dalam mendukung action plan tersebut.</li> </ul> | <p>Bahan disiapkan oleh pengajar/narasumber</p> <ol style="list-style-type: none"> <li>1. Esay</li> <li>2. Power point</li> </ol> |
| Textbook/Modul/dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Surat Direktur BPSDA No. UM.01.11.DA/1159 Tanggal 30 Nopember 2015 kepada semua BBWS dan BWS</li> <li>- Permen PUPR No.20 /PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                   |

**Syllabus No.6**

| No. Mata Pelajaran               | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Judul                            | Pengelolaan Dokumen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Catatan |
| Uraian singkat                   | Disadari bahwa dokumen baik bahan pelatihan maupun hasil pelatihan sangat penting untuk dikelola dengan cara yang benar dengan mengikuti ketentuan filing system.                                                                                                                                                                                                                                                                                                                                                                                   |         |
| Tujuan                           | Semua dokumen yang terkait dengan proses pelaksanaan RBO PB perlu dikendalikan sesuai ketentuan filing system, meliputi penanganan mulai dari penyusunan, penerbitan, pendistribusian, penyimpanan, peminjaman sampai dengan pemusnahan, dengan demikian pengendalian ini akan memudahkan proses penelusuran / menemukan kembali semua dokumen /data bila sewaktu-waktu diperlukan (ada fungsi traceability/mampu telusur) dan membantu unit kerja untuk menelusuri suatu kejadian atau peristiwa yang ada kaitannya dengan pelaksanaan suatu tugas |         |
| Waktu/durasi                     | 135 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |
| Narasumber                       | Bambang Trihariono                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |
| Materi/isi                       | Di dalam mengelola suatu dokumen harus dibedakan antara dokumen pendukung (supporting document) dan bukti kerja (efidence)<br>Mengenai perbedaan antara dokumen pendukung (supporting document) dan bukti kerja (evidence) perlu ditekankan kembali pada saat pelatihan                                                                                                                                                                                                                                                                             | -       |
| Textbook/Modul/dokumen Pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -       |

**Syllabus No.7**

| No. Mata Pelajaran | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                            |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Judul              | Latihan 1: Praktik melakukan self assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Catatan                                                                                                                                                                                    |
| Uraian singkat     | Membagi peserta ke dalam beberapa kelompok. Masing-masing kelompok mendalami 5 area kinerja kritis yang ada dalam format model pengkajian kinerja 5 area kinerja kritis tersebut adalah 1 Misi, 2: Pemangku Kepentingan, 3. Pembelajaran dan Pertumbuhan, 4. Tata Kelola Internal, 5. Keuangan. Masing-masing kelompok melakukan self assessment terhadap tugas yang telah ditetapkan dalam Permen PUPR No. 20/PRT/M/2016. Pembimbing/pendamping akan membantu kelompok dalam melakukan self assessment. Pembimbing/pendamping terdiri atas semua narasumber, yang akan ditetapkan tugasnya kemudian. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan<br><br>Semua peswerta sudah dibekali dengan Permen PUPR No.20/PRT/M/2016 |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tujuan                           | Pengetahuan tentang self assessment yang telah diterima pada mata pelajaran No.3 perlu dicoba diterapkan (field practice) untuk mengetahui sampai sejauh mana teori yang diterima dapat dipahami dan diterapkan sesuai pedoman.                                                                                                                                                                                                               | Pendamping:<br>Nur Widayati<br>Hendarti                                                                                                                                                                                                               |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                       |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Penyampaian format model pengukuran kinerja</li> <li>- Menetapkan uraian tugas yang terlingkup oleh area kinerja kritis dan cara mengevaluasinya berdasarkan parameter yang telah ditetapkan</li> <li>- Sistematika penulisan laporan</li> <li>- Cara menetapkan skor</li> <li>- Contoh Laporan Self Assessment.</li> <li>- Pengertian hubungan antara uraian tugas, indicator, parameter</li> </ul> | Bahan disiapkan oleh narasumber (Esay,Power point)<br>Kewajiban peserta <ul style="list-style-type: none"> <li>➤ membawa data struktur organisasi dan tugas pokok Balai masing-masing</li> <li>➤ membawa daftar uraian tugas masing-masing</li> </ul> |
| Textbook/Modul/dokumen Pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Permen PUPR No. 20/PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                       |

#### Syllabus No.8

|                                  |                                                                                                    |                                                                                                  |
|----------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran               | <b>8</b>                                                                                           | Catatan                                                                                          |
| Judul                            | <b>Presentasi dan diskusi hasil Latihan I: Self Asasessment</b>                                    |                                                                                                  |
| Uraian singkat                   | Setiap kelompok memaparkan hasil self assessment, menggunakan format laporan yang telah disediakan | Laporan Hasil Self Assessment sesuai Format dalam Buku Pedoman Pengukuran Kinerja RBO disediakan |
| Tujuan                           | Untuk memberi kesempatan kepada kelompok untuk menampilkan hasil kerjanya.                         | Moderator: Herman Idrus                                                                          |
| Waktu/durasi                     | 90 minutes                                                                                         |                                                                                                  |
| Materi/isi                       | Laporan Self Assessment Kelompok (esay), power point                                               |                                                                                                  |
| Textbook/Modul/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                | -                                                                                                |

#### Syllabus No.9

|                   |                                                                                                                                                                                                                                                                               |                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| No,Mata Pelajaran | <b>9</b>                                                                                                                                                                                                                                                                      | Catatan                                                                                                           |
| Judul             | <b>Penjelasan mengenai Peer Review dalam praktik</b>                                                                                                                                                                                                                          |                                                                                                                   |
| Uraian singkat    | Penjelasan tentang peer review sebagai proses lanjut dari performance self assessment. Hasil self assessment dievaluasi oleh peer (teman sejawat) untuk mengukur tingkat obyektivitasnya. Tim Peer review dibentuk khusus untuk mengevaluasi hasil Self Assessment suatu RBO. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |

|                                  |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                    |
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| Tujuan                           | Memberikan pemahaman bahwa metoda self assessment perlu ditindak lanjuti dengan review untuk memberikan kepastian tingkat kinerja suatu RBO dan terwujudnya proses kegiatan peer review yang lebih efektif dan efisien dengan mengacu pada ketentuan yang berlaku.                                                              |                                                                                                                                                                    |
| Pengajar.narasumber              | Isnugroho                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                    |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                    |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Penjelasan umum mengenai beberapa Istilah dan pengertian dalam proses peer review</li> <li>- Gambaran tentang proses peer review</li> <li>- Metoda yang digunakan</li> <li>- Tahapan dalam melakukan peer review</li> <li>- Output peer review</li> <li>- Rencana aksi, dll</li> </ul> | Bahan disiapkan oleh pengajar.<br>Essay dan power point<br>Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan. |
| Textbook/Modul/dokumen pendukung | - Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                           | -                                                                                                                                                                  |

#### Syllabus No.10

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                  |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| No.Mata Pelajaran                | <b>10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                  |
| Judul                            | <b>Latihan 2: Praktik/ujicoba melakukan peer review atas hasil Latihan I (SA)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Catatan                                                                                                          |
| Uraian singkat                   | Membagi peserta ke dalam beberapa kelompok. Masing-masing kelompok bertindak sebagai peer reviewer, mendalami hasil self assessment. Masing-masing kelompok melakukan review terhadap hasil SA pada Latihan I. Pembimbing/pendamping akan membantu kelompok dalam melakukan review<br>Pembimbing/pendamping terdiri atas semua narasumber, yang akan ditetapkan tugasnya kemudian.                                                                                                                                                                                          | Pembagian kelompok sebaiknya dibedakan dengan pembagian kelompok SA<br><br>Pendamping/pembimbing sebaiknya tetap |
| Tujuan                           | Tujuannya adalah terwujudnya proses kegiatan peer review yang lebih efektif dan efisien dengan mengacu pada ketentuan yang berlaku                                                                                                                                                                                                                                                                                                                                                                                                                                          | Pendamping:<br>Herman Idrus                                                                                      |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                  |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Proses peer review yang dilaksanakan ini adalah kelanjutan dari kegiatan performance self assessment</li> <li>- Hasil self assessment dipelajari, dianalisis, dan disimpulkan oleh Tim Peer review</li> <li>- Diskusi dengan pihak RBO dan beberapa pemangku kepentingan adalah salah satu cara untuk mendapatkan keyakinan bahwa nilai (score) atas pemenuhan suatu kriteria memang benar sesuai kenyataan. Hasil self assessment dengan scoring dapat saja berbeda antara Tim Self Assessment dengan Tim Peer review.</li> </ul> |                                                                                                                  |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                  |

**Syllabus No.11**

| No.Mata Pelajaran                | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Catatan                                           |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Judul                            | <b>Presentasi hasil Latihan 2: peer review</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                   |
| Uraian singkat                   | Setiap kelompok memaparkan hasil peer review menggunakan format laporan yang telah disediakan<br>Dilanjutkan dengan <ul style="list-style-type: none"> <li>- Pemilihan Ketua Kelas</li> <li>- Pembentukan Tim Peer Review untuk melakukan review pada BBWS Sumatera VIII</li> <li>- Pemberian petunjuk mekanisme kegiatan selama kunjungan di BBWS BBWS Sumatera VIII dan pembagian tugas kelompok</li> <li>- Pengaturan dan pembagian tugas kelompok sesuai dengan pengelompokan yang sudah ada</li> </ul> | Laporan dibuat dalam bentuk essay dan power point |
| Tujuan                           | Untuk memberi kesempatan kepada kelompok untuk menampilkan hasil kerjanya.                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                   |
| Penyaji                          | Kelompok                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Moderator:<br>Herman Idrus                        |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                   |
| Materi/isi                       | Laporan Peer review Kelompok (essay), power point                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                   |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                   |

**Syllabus No.12**

| No. Mata Pelajaran               | No.12                                                                                                                                                                                                                                                           | Catatan                                                                                                |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Judul                            | Paparan Pelaksanaan RBO Performance Benchmarking di BBWS Sumatera VIII                                                                                                                                                                                          |                                                                                                        |
| Uraian singkat                   | Sebagai organisasi pengelola wilayah sungai sesuai dengan fungsinya seperti yang diamanatkan oleh Permen PUPR No. 20/PRT/M/201, diharapkan dapat menunjukkan kinerjanya hasil melalui performance benchmarking sebagai upaya perbaikan berkelanjutan suatu RBO. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan |
| Tujuan                           | Memberikan data hasil performance benchmarking atau metoda pengukuran kinerja yang telah diterapkan di BBWS Sumatera VIII sebagai bahan studi oleh peserta pelatihan.                                                                                           | Bahan disiapkan oleh pengajar/narasumber<br>1.Esay<br>2.Power point                                    |
| Pengajar/narasumber              | Kepala BBWS Sumatera VIII                                                                                                                                                                                                                                       |                                                                                                        |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                      |                                                                                                        |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Pengenalan BBWS Sumatera VIII</li> <li>- Tentang capaian (achievement) berdasarkan uraian tugas</li> <li>- Tentang penetapan skor</li> </ul>                                                                           |                                                                                                        |
|                                  | -Pembentukan Tim Peer review untuk melakukan review pada BBWS Sumatera VIII                                                                                                                                                                                     |                                                                                                        |
|                                  | 45 menit                                                                                                                                                                                                                                                        | Hendarti                                                                                               |
| Textbook/Modul/dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Surat Direktur BPSDA No. UM.01.11.DA/1159 Tanggal 30 Nopember 2015 kepada semua BBWS dan BWS</li> </ul>                                                                 | -                                                                                                      |

### Syllabus No.13

|                                  |                                                                                                                                                                         |                         |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| No.Mata Pelajaran                | <b>1</b>                                                                                                                                                                | Catatan                 |
| Judul                            | <b>Praktik menelaah hasil Self assessment dan peer review BBWS Sumatera VIII dan meninjau dokumen</b>                                                                   |                         |
| Uraian singkat                   | Dua Kelompok mempelajari hasil SA dan kelompok lainnya mempelajari hasil peer review.                                                                                   | Pendamping:<br>Hindarti |
| Tujuan                           | Pembagian tugas ini dimaksudkan agar pelaksanaan kunjungan ke BBWS Sumatera VIII ini dapat memberi manfaat bagi kedua belah pihak dalam konteks peningkatan kinerja RBO |                         |
| Waktu/durasi                     | 135 minutes                                                                                                                                                             |                         |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO.                                                                                                                                    |                         |

### Syllabus No.14

|                   |                                                                                                                                                   |                          |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| No.Mata Pelajaran | <b>14</b>                                                                                                                                         | Catatan                  |
| Judul             | <b>Wawancara/konfirmasi dengan staf, manajemen dan stakeholder, dan menyiapkan laporan kelompok</b>                                               |                          |
| Uraian singkat    | Metoda wawancara ini berupaya mencari kesamaan atau perbedaan pendekatan dalam meningkatkan kinerja RBO.                                          | Pendamping:<br>Isnugroho |
| Tujuan            | Mendapatkan masukan yang akan dapat dikembangkan untuk perbaikan metoda performance benchmarking. Ketua Kelas mengkoordinir pelaksanaan wawancara |                          |
| Waktu/durasi      | 135 minutes                                                                                                                                       |                          |
| Materi/isi        | Kuesioner                                                                                                                                         |                          |
| Texbook module    | Buku Pedoman Pengukuran Kinerja RBO                                                                                                               |                          |

### Syllabus No.15

|                   |                                                                                                                       |                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------|
| No.Mata Pelajaran | <b>15</b>                                                                                                             | Catatan                 |
| Judul             | <b>Ketua Kelas menyiapkan laporan kelas yang dihimpun dari laporan kelompok hasil kunjungan ke BBWS Sumatera VIII</b> |                         |
| Tujuan            | Agar laporan ini betul-betul bernilai dan dapat dipresentasikan dengan baik.                                          | Pendamping:<br>Hendarti |
| Waktu/durasi      | 90 minutes                                                                                                            |                         |
| Materi/isi        | Himpunan laporan kelompok                                                                                             |                         |
| Texbook/module    | Buku Pedoman Pengukuran Kinerja RBO                                                                                   |                         |

### Syllabus No.16

|                        |                                                                                                                                                                                                   |                                  |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| No.Mata Pelajaran      | <b>16</b>                                                                                                                                                                                         | Catatan                          |
| Judul                  | <b>- Presentasi hasil Kunjungan ke BBWS Sumatera VIII (Power point) oleh Ketua Kelas dihadiri oleh Kepala BBWS Sumatera VIII</b><br><b>-Tanggapan Ka.BBWS Sumatera VIII atas presentasi kelas</b> |                                  |
| Uraian singkat         | Hasil pelatihan didalam kelas dikombinasikan dengan hasil praktik di BBWS Sumatera VIII                                                                                                           | Moderator:<br>Bambang Trihariono |
| Tujuan                 | Untuk dapat menghasilkan suatu masukan bagi pengembangan metoda Performance Benchmarking                                                                                                          |                                  |
| Waktu/durasi           | 135 minutes                                                                                                                                                                                       |                                  |
| Materi/isi             | Kesimpulan dari kegiatan orientasi Performance Benchmarking                                                                                                                                       |                                  |
| Texbook/module/dokumen | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                               |                                  |

## **ANNEX 6-4**

Training Curriculum, Syllabus, Pre/Post Test No.014

Training on RBO Performance Benchmarking for BBWS and BWS in East  
Region, in Mataram on April 2018



## Pelatihan RBO Performance Benchmarking - Lombok

### 1. Waktu dan Durasi

5 Hari, dari tanggal 16 s/d 20 April

### 2. Venue

Hotel Lombok Astoria

- Diklat Klasikal:

- Studi Lapangan: BWS NT I

### 3. Peserta

30-34 Peserta dari Petugas yang menangani RBO-PB dari B(BWS) dan PJT di Wilayah Timur

- Latar belakang pendidikan: Sarjana/ Sarjana Muda, Teknis/ Non-Teknis

- Pengalaman Kerja: 2 tahun atau lebih (PNS/ Non-PNS)

### 4. Kurikulum

| Hari                       | No. | Waktu         | Kegiatan                                                                                                 | Narasumber                                   | Menit | JP |
|----------------------------|-----|---------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------|-------|----|
| Ke 1<br>16 April<br>Senin  |     | 12:00 - 13:00 | Pendaftaran dan ISHOMA                                                                                   | Balai DIKLAT                                 | 60    |    |
|                            |     | 13:00 - 14:00 | Acara Pembukaan:                                                                                         |                                              |       |    |
|                            |     |               | - Menyanyikan lagu kebangsaan Indonesia Raya                                                             | Balai DIKLAT                                 |       |    |
|                            |     |               | - Laporan penyelenggara                                                                                  |                                              |       |    |
|                            |     |               | - Sambutan pembukaan oleh JICA                                                                           | Mr. Suzuki Kazushi, JICA Project Coordinator |       |    |
|                            |     |               | - Sambutan pembukaan oleh BPSDM                                                                          | Kepala BPSDM/ Kapusdiklat                    |       |    |
|                            |     |               | - Pengalungan tanda peserta                                                                              | Kapusdiklat dan Mr. Suzuki                   |       |    |
|                            |     |               | - Doa                                                                                                    | Balai DIKLAT                                 |       |    |
|                            |     | 14:00 - 14:15 | Coffee Break                                                                                             |                                              |       |    |
|                            |     | 14:15 - 15:00 | Pre test                                                                                                 | Tim Pengajar                                 | 45    |    |
| Ke 2<br>17 April<br>Selasa | 1   | 15:00 - 16:30 | Pengantar kegiatan RBO Performance Benchmarking (RBO-PB)                                                 | Triyono Tulus S                              | 90    | 2  |
|                            | 2   | 16:30 - 18:00 | Penjelasan Umum Buku Pedoman Pengukuran Kinerja RBO                                                      | Triyono Tulus S                              | 90    | 2  |
|                            | 3   | 18:00 - 18:45 | Pembagian kelompok (Termasuk pemilihan ketua kelas)                                                      | Bambang Trihariono                           | 45    | 1  |
|                            |     | 18:45         | ISHOMA                                                                                                   |                                              |       |    |
|                            | 4   | 08:00 - 09:30 | Penjelasan tentang NARBO dan RBO-PB                                                                      | Herman Idrus                                 | 90    | 2  |
|                            |     | 09:30 - 09:45 | Coffee Break                                                                                             |                                              |       |    |
| Ke 3<br>18 April<br>Rabu   | 5   | 09:45 - 11:15 | Implementation of RBO Management in Japan                                                                | Miura Hirohisa, JICA RBO Project             | 90    | 2  |
|                            | 6   | 11:15 - 12:45 | Pengenalan Instrumen Performance Benchmarking (15 indikator) dan Action Plan (1)                         | Isnugroho                                    | 90    | 2  |
|                            |     | 12:45 - 13:45 | ISHOMA                                                                                                   |                                              |       |    |
|                            | 6   | 13:45 - 16:45 | Pengenalan Instrumen Performance Benchmarking (15 indikator) dan Action Plan (2)                         | Isnugroho                                    | 180   | 4  |
|                            |     | 16:45 - 17:00 | Coffee Break                                                                                             |                                              |       |    |
|                            | 7   | 17:00 - 19:15 | Pengelolaan dokumen RBO-PB                                                                               | Bambang Trihariono                           | 135   | 3  |
|                            |     | 19:15         | ISHOMA                                                                                                   |                                              |       |    |
|                            | 8   | 08:00 - 09:30 | Latihan 1: Praktik Self Assessment.<br>Peserta dibagi dalam beberapa kelompok (akan ditetapkan kemudian) | Pendamping:<br>- Hendarti                    | 90    | 2  |
|                            |     | 09:30 - 09:45 | Coffee Break                                                                                             |                                              |       |    |
|                            | 9   | 09:45 - 11:15 | Presentasi Hasil Latihan I: self assessment                                                              | Moderator: Herman Idrus                      | 90    | 2  |
| Ke 3<br>18 April<br>Rabu   | 10  | 11:15 - 12:45 | Penjelasan tentang Peer Review dalam praktik                                                             | Isnugroho                                    | 90    | 2  |
|                            |     | 12:45 - 13:45 | ISHOMA                                                                                                   |                                              |       |    |
|                            | 11  | 13:45 - 15:15 | Latihan 2: Praktik melakukan Peer Review terhadap hasil Latihan I (SA)                                   | Pendamping:<br>- Herman Idrus                | 90    | 2  |
|                            |     | 15:15 - 15:30 | Coffee Break                                                                                             |                                              |       |    |
|                            | 12  | 15:30 - 17:00 | Presentasi oleh kelompok dan diskusi hasil Latihan 2: Peer Review                                        | Moderator:<br>- Nur Widayati                 | 90    | 2  |
|                            | 13  | 17:00 - 18:30 | Paparan Pelaksanaan RBO-PB di BWS NT I                                                                   | Ka. BWS NT I                                 | 90    | 2  |
|                            |     | 18:30         | ISHOMA                                                                                                   |                                              |       |    |

|                           |    |               |                                                                                                                      |                                                                  |     |    |
|---------------------------|----|---------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----|----|
| Ke 4<br>19 April<br>Kamis |    | 07:30 - 16:00 | Kunjungan Lapangan ke BWS NT I                                                                                       |                                                                  |     |    |
|                           |    | 07:30 - 08:00 | Perjalanan menuju BWS NT I                                                                                           |                                                                  | 30  |    |
|                           |    | 08:00 - 08:30 | Sambutan Subdit Kelembagaan                                                                                          | Nur Widayati                                                     | 15  |    |
|                           |    | 08:30 - 09:00 | Sambutan Ka. BWS NT I                                                                                                | Ka. BWS NT I                                                     | 15  |    |
|                           | 14 | 09:00 - 11:15 | Praktik menelaah hasil self assessment dan peer review BWS NT I dan meninjau dokumen                                 | Pendamping:<br>- Hendarti                                        | 135 | 3  |
|                           |    | 11:15 - 13:00 | ISHOMA                                                                                                               |                                                                  |     |    |
|                           | 15 | 13:00 - 15:15 | - Wawancara/ konfirmasi dengan staf dan manajemen serta stakeholder<br>- Membuat laporan kelompok                    | Pembimbing:<br>- Isnugroho                                       | 135 | 3  |
|                           |    | 15:15 - 16:00 | Post Test                                                                                                            | Tim Pengajar                                                     |     |    |
|                           |    | 16:00 - 16:30 | Perjalanan kembali ke Hotel                                                                                          |                                                                  |     |    |
|                           |    | 16:30 - 16:45 | Coffee Break                                                                                                         |                                                                  |     |    |
|                           | 16 | 16:45 - 18:15 | Pembuatan laporan kelas yang dihimpun dari laporan kelompok dari hasil kunjungan ke BWS NT I                         | Pendamping:<br>- Herman Idrus                                    | 90  | 2  |
|                           |    | 18:15         | ISHOMA                                                                                                               |                                                                  |     |    |
| Ke 5<br>20 April<br>Jumat | 17 | 08:00 - 10:15 | - Presentasi ketua kelas hasil hasil kunjungan ke BWS NT I<br>- Tanggapan (hasil presentasi kelas) dari Ka. BWS NT I | Pembimbing: Herman Idrus<br>Ka. BWS NT I<br>Moderator: Isnugroho | 90  | 2  |
|                           |    | 10:15 - 10:45 | Pengumuman hasil test (Pre dan Post)                                                                                 | Balai DIKLAT                                                     |     |    |
|                           |    | 10:45 - 11:30 | Acara Penutupan:                                                                                                     |                                                                  |     |    |
|                           |    |               | - Sambutan Penutupan                                                                                                 | Kapuskdiklat dan Mr. Suzuki Kazushi                              |     |    |
|                           |    |               | - Pelepasan Tanda Peserta                                                                                            | Kasubdit Kelembagaan                                             |     |    |
|                           |    |               | - Menyanyikan Lagu Padamu Negeri                                                                                     | Balai DIKLAT                                                     |     |    |
|                           |    |               |                                                                                                                      |                                                                  |     |    |
| Jumlah Jam Pelajaran (JP) |    |               |                                                                                                                      |                                                                  |     | 40 |

Peserta Diwajibkan :

- Membawa data struktur organisasi dan uraian tugas
- Membawa laptop
- Membawa buku LAKIP

**SILABUS**  
**PELATIHAN PENGUKURAN KINERJA ORGANISASI PENGELOLA WILAYAH SUNGAI**  
Pelaksanaan pada BWS Nusa Tenggara I  
Tanggal 16 – 20 April 2018

**Syllabus No.1**

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                   |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>No. Mata Pelajaran</b>          | <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                   |
| <b>Judul</b>                       | <b>Pengantar Kegiatan RBO Performance Benchmarking (RBO PB)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Catatan</b>                                                                                                    |
| Uraian singkat                     | Proses kegiatan pelatihan ini juga merupakan kegiatan pendampingan dalam aplikasi RBO Performance Benchmarking yang memerlukan kesatuan pola pikir mengenai: (1) pengertian performance benchmarking, (2) pemahaman tentang tujuan dan manfaat, (3) keseriusan dalam aplikasi performance benchmarking, (4) konsistensi penerapan yang harus dievaluasi, dan (5) adanya benang merah keterkaitan dengan kebijakan dari pimpinan yang lebih tinggi, baik dalam aspek pekerjaan fisik, finansial maupun legal. Kelima hal tersebut akan digambarkan melalui proses pelatihan selama 5 hari ini. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan                             | Diharapkan penjelasan ini dapat menjadi petunjuk bagaimana melaksanakan performance benchmarking melalui dua kegiatan pokok, yaitu performance self assessment dan peer review. Untuk itulah disusun Pedoman Pengukuran Kinerja RBO (terbit pada bulan Juni 2015) yang menjadi acuan RBO dalam melaksanakan Self assessment dan peer review.                                                                                                                                                                                                                                                  |                                                                                                                   |
| Pengajar/Narasumber                | Kasubdit Kelembagaan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                   |
| Waktu/durasi                       | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                   |
| Materi/isi                         | <ul style="list-style-type: none"> <li>- Penegrtian RBO</li> <li>- Jumlah RBO di Indonesia saat ini</li> <li>- Manfaat Performance Benchmarking bagi RBO</li> <li>- Perlunya pemahaman mengenai Pedoman Pengukuran Kinerja RBO yang antara lain memberikan petunjuk tentang proses self assessment dan peer review</li> </ul>                                                                                                                                                                                                                                                                 | Bahan disiapkan Subdit Kelembagaan:<br>1. Essay<br>2. Power point                                                 |
| Textbook/module/ dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO (RBO Performance Benchmarking) Edisi 11-12 Juni 2015</li> <li>- Permen PUPR No. 20/PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                         | Disiapkan oleh Subdit Kelembagaan                                                                                 |

## Syllabus No.2

| No. Mata Pelajaran               | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                     |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Judul                            | Penjelasan tentang NARBO dan RBO PB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Catatan                                                                                                             |
| Uraian singkat                   | NARBO (Network of Asian River Basin Organization), merupakan jaringan organisasi wilayah sungai Asia, bertujuan membantu mencapai keterpaduan pengelolaan Sumber Daya Air (IWRM - Integrated Water Resources Management) pada wilayah sungai seluruh Asia. Sasaran NARBO adalah memperkuat kapasitas dan efektivitas RBO dalam mempromosikan IWRM, memperbaiki tata kelola air melalui pelatihan dan tukar informasi dan pengalaman di antara RBO dan lembaga di sector keairan, serta memberi saran dalam pembentukan RBO-RBO di Asia. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan   |
| Tujuan                           | Memberikan pemahaman mengenai Network of Asian River Basin Organization dan Organisasi Wilayah Sungai di Indonesia (RBO)                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                     |
| Pengajar/Narasumber              | Herman Idrus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                     |
| Materi/isi                       | <ol style="list-style-type: none"> <li>1. Pengenalan mengenai NARBO</li> <li>2. Mengenali kebutuhan akan jejaring dan pengembangan kapasitas dalam implementasi IWRM</li> <li>3. Peresmian <b>Network of Asian River Basin Organization (NARBO)</b> pada 21 Maret 2003</li> <li>4. Beberapa contoh RBO yang telah ada di Asia</li> <li>5. Perlunya selalu meningkatkan kapasitas dan kompetensi SDM RBO melalui pelatihan</li> </ol>                                                                                                    | Bahan disiapkan oleh pengajar:<br><ol style="list-style-type: none"> <li>1. Esay</li> <li>2. Power point</li> </ol> |
| Textbook/Modul/Dokumen pendukung | NARBO CHARTER<br>Permen PUPR No.20/PRT/M/2016<br>Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                     |

## Syllabus No.3

| No. Mata Pelajaran  | 3                                                                                                                                                                                                                                                                                                                          |                                                                                                                   |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Judul               | Penjelasan umum garis besar mengenai Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                   | Catatan                                                                                                           |
| Uraian singkat      | Buku Pedoman Pengukuran Kinerja RBO yang terbit pada bulan Juni 2015 adalah sarana acuan melaksanakan pelatihan untuk memperbaiki tata kelola air dan tukar menukar pengalaman antar RBO. Melalui buku pedoman ini RBO-RBO di Indonesia diharapkan dapat melakukan kegiatan self assessment untuk meningkatkan kinerjanya. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |
| Tujuan              | Memberikan pedoman bagi RBO dalam melakukan pengukuran kinerja untuk menuju ke perbaikan berkelanjutan                                                                                                                                                                                                                     |                                                                                                                   |
| Pengajar/Narasumber | Kasubdit Kelembagaan                                                                                                                                                                                                                                                                                                       |                                                                                                                   |

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                        |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Waktu/durasi                         | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                        |
| Materi/isi                           | <p>Selain penjelasan secara garis besar juga ditampilkan contoh:</p> <ol style="list-style-type: none"> <li>1. Indikator Pengukuran Kinerja BBWS/BWS/BPSDA/PJT</li> <li>2. Dokumen Pendukung untuk Masing-Masing kriteria</li> <li>3. Rencana Aksi (<i>Action Plan</i>)BBWS/BWS/BPSDA/PJT</li> <li>4. Nota Kesepakatan Tim <i>Self Assessment</i>&amp; Tim <i>Peer Review</i></li> <li>5. Format Laporan <i>Self Assessment</i></li> <li>6. Format Laporan <i>Peer Reviewer</i></li> <li>7. Bagan Alir Pengukuran Kinerja RBO</li> <li>8. DII</li> </ol> | <p>Bahan disiapkan oleh pengajar:</p> <ol style="list-style-type: none"> <li>1.Essay</li> <li>2.Power point</li> </ol> |
| Textbook/Modul/<br>Dokumen pendukung | <p>-NARBO CHARTER</p> <p>-Permen PUPR No.20/PRT/M/2016</p> <p>-Buku Pedoman Pengukuran Kinerja RBO</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                        |

#### Syllabus No.4

|                                     |                                                                                                                                                                                                                                                                           |                                                                                                            |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran                  | 4                                                                                                                                                                                                                                                                         |                                                                                                            |
| Judul                               | <b>Implementation of RBO Management in Japan</b>                                                                                                                                                                                                                          | Catatan                                                                                                    |
| Outlines                            | <p>To show the development of RBO Management in Japan in case of:</p> <ul style="list-style-type: none"> <li>- The organization of RBO</li> <li>- The various type of river managed by the organization</li> <li>- The methods of assessment (the achievement)</li> </ul> |                                                                                                            |
| Objectives                          | To give understanding that benchmarking methods can be applied in various river basin and need to be implemented to assure the level of performance of RBO                                                                                                                |                                                                                                            |
| Lectures                            | JICA/Miura                                                                                                                                                                                                                                                                |                                                                                                            |
| Time/durasion                       | 90 minutes                                                                                                                                                                                                                                                                |                                                                                                            |
| Content                             | <ul style="list-style-type: none"> <li>- Work area</li> <li>- About achievement</li> <li>- Showing some pictures of river managed by RBO</li> </ul>                                                                                                                       | <p>Prepare by Lecturer</p> <ol style="list-style-type: none"> <li>1.Esay</li> <li>2.Power point</li> </ol> |
| Textbook/Module/Supporting document | TDL                                                                                                                                                                                                                                                                       |                                                                                                            |

#### Syllabus No.5

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                               |
| Judul              | <b>Pengenalan Instrumen Pengukuran Kinerja RBO (15 indikator) dan penggunaannya serta penjelasan mengenai Action Plan</b>                                                                                                                                                                                                                                                                                                                                       | Catatan                                                                                                       |
| Uraian singkat     | <p>Sebagai organisasi pengelola wilayah sungai sesuai dengan fungsinya seperti yang diamanatkan oleh Permen PUPR No. 20/PRT/M/2016, tentunya harus dapat menunjukkan kinerjanya dengan tolok ukur yang terstruktur, oleh karena itu perlu adanya pengukuran-pengukuran yang terpola, yaitu dengan metoda self assessment dan peer review, metoda tersebut yang juga disebut performance benchmarking dibuat untuk tujuan perbaikan berkelanjutan suatu RBO.</p> | <p>Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan</p> |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                                  | <p>Action plan adalah suatu dokumen tertulis yang menggambarkan langkah-langkah yang dilalui dalam suatu proses menuju tercapainya suatu tujuan organisasi. Setiap orang yang diwajibkan membantu/berpartisipasi harus terlibat sejak awal. Isi dan format suatu action plan harus dapat membantu pengguna rencana tersebut.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                   |
| Tujuan                           | <ul style="list-style-type: none"> <li>- Memberikan pemahaman bahwa metoda pengukuran kinerja perlu diterapkan untuk memberikan kepastian tingkat kinerja setiap RBO</li> <li>- Memberikan pemahaman bahwa action plan dapat dibuat sesuai keperluan, mulai yang sederhana sampai pada yang lebih kompleks. Prinsip dasarnya adalah menampilkan suatu rencana mengenai apa, bagaimana dan siapa yang melaksanakan, kapan mulai, kapan selesai, dengan biaya berapa, misalnya Action Plan by Quarters, Action Plan Time Table, Action Plan by Target, dll.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                   |
| Pengajar/narasumber              | Isnugroho                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                   |
| Waktu/durasi                     | 270 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                   |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Pengenalan istilah-istilah</li> <li>- Format model pengkajian kinerja</li> <li>- Tentang area kinerja yang kritis</li> <li>- Tentang capaian (achievement) berdasarkan uraian tugas</li> <li>- Tentang indicator dan parameter</li> <li>- Tentang penetapan skor</li> </ul> <p>Action Plan:</p> <ul style="list-style-type: none"> <li>• Kegiatan yang menggambarkan langkah-langkah yang realistis, terukur dan dapat dicapai;</li> <li>• Identifikasi tanggungjawab secara jelas semua pihak yang terkait;</li> <li>• Susun jadwal yang spesifik untuk melengkapi kegiatan yang dilaksanakan;</li> <li>• Identifikasi sumber daya yang diperlukan, termasuk bagaimana mendapatkan sumber daya tersebut;</li> <li>• Instruksikan semua yang terlibat dalam kegiatan tersebut membantu/memfasilitasi pengembangan action plan ini. Dokumen/catatan-catatan yang terkait adalah merupakan bahan yang penting dalam mendukung action plan tersebut.</li> </ul> | <p>Bahan disiapkan oleh pengajar/narasumber</p> <ol style="list-style-type: none"> <li>1. Esay</li> <li>2. Power point</li> </ol> |
| Textbook/Modul/dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Surat Direktur BPSDA No. UM.01.11.DA/1159 Tanggal 30 Nopember 2015 kepada semua BBWS dan BWS</li> <li>- Permen PUPR No.20 /PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                   |

## Syllabus No.6

| No. Mata Pelajaran               | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Judul                            | Pengelolaan Dokumen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Catatan |
| Uraian singkat                   | Disadari bahwa dokumen baik bahan pelatihan maupun hasil pelatihan sangat penting untuk dikelola dengan cara yang benar dengan mengikuti ketentuan filing system.                                                                                                                                                                                                                                                                                                                                                                                   |         |
| Tujuan                           | Semua dokumen yang terkait dengan proses pelaksanaan RBO PB perlu dikendalikan sesuai ketentuan filing system, meliputi penanganan mulai dari penyusunan, penerbitan, pendistribusian, penyimpanan, peminjaman sampai dengan pemusnahan, dengan demikian pengendalian ini akan memudahkan proses penelusuran / menemukan kembali semua dokumen /data bila sewaktu-waktu diperlukan (ada fungsi traceability/mampu telusur) dan membantu unit kerja untuk menelusuri suatu kejadian atau peristiwa yang ada kaitannya dengan pelaksanaan suatu tugas |         |
| Waktu/durasi                     | 135 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |
| Narasumber                       | Bambang Trihariono                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |
| Materi/isi                       | Di dalam mengelola suatu dokumen harus dibedakan antara dokumen pendukung (supporting document) dan bukti kerja (efidence)<br>Mengenai perbedaan antara dokumen pendukung (supporting document) dan bukti kerja (evidence) perlu ditekankan kembali pada saat pelatihan                                                                                                                                                                                                                                                                             | -       |
| Textbook/Modul/dokumen Pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -       |

## Syllabus No.7

| No. Mata Pelajaran | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                            |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Judul              | Latihan 1: Praktik melakukan self assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Catatan                                                                                                                                                                                    |
| Uraian singkat     | Membagi peserta ke dalam beberapa kelompok. Masing-masing kelompok mendalami 5 area kinerja kritis yang ada dalam format model pengkajian kinerja 5 area kinerja kritis tersebut adalah 1 Misi, 2: Pemangku Kepentingan, 3. Pembelajaran dan Pertumbuhan, 4. Tata Kelola Internal, 5. Keuangan. Masing-masing kelompok melakukan self assessment terhadap tugas yang telah ditetapkan dalam Permen PUPR No. 20/PRT/M/2016. Pembimbing/pendamping akan membantu kelompok dalam melakukan self assessment. Pembimbing/pendamping terdiri atas semua narasumber, yang akan ditetapkan tugasnya kemudian. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan<br><br>Semua peswerta sudah dibekali dengan Permen PUPR No.20/PRT/M/2016 |

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| Tujuan                           | Pengetahuan tentang self assessment yang telah diterima pada mata pelajaran No.3 perlu dicoba diterapkan (field practice) untuk mengetahui sampai sejauh mana teori yang diterima dapat dipahami dan diterapkan sesuai pedoman.                                                                                                                                                                                                               | Pendamping:<br>Dyah Sriyati<br>Hendarti                                                                                                                                                                                                               |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                       |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Penyampaian format model pengukuran kinerja</li> <li>- Menetapkan uraian tugas yang terlingkup oleh area kinerja kritis dan cara mengevaluasinya berdasarkan parameter yang telah ditetapkan</li> <li>- Sistematika penulisan laporan</li> <li>- Cara menetapkan skor</li> <li>- Contoh Laporan Self Assessment.</li> <li>- Pengertian hubungan antara uraian tugas, indicator, parameter</li> </ul> | Bahan disiapkan oleh narasumber (Esay,Power point)<br>Kewajiban peserta <ul style="list-style-type: none"> <li>➤ membawa data struktur organisasi dan tugas pokok Balai masing-masing</li> <li>➤ membawa daftar uraian tugas masing-masing</li> </ul> |
| Textbook/Modul/dokumen Pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Permen PUPR No. 20/PRT/M/2016</li> </ul>                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                       |

#### Syllabus No.8

|                                  |                                                                                                    |                                                                                                  |
|----------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| No. Mata Pelajaran               | <b>8</b>                                                                                           | Catatan                                                                                          |
| Judul                            | <b>Presentasi dan diskusi hasil Latihan I: Self Asasessment</b>                                    |                                                                                                  |
| Uraian singkat                   | Setiap kelompok memaparkan hasil self assessment, menggunakan format laporan yang telah disediakan | Laporan Hasil Self Assessment sesuai Format dalam Buku Pedoman Pengukuran Kinerja RBO disediakan |
| Tujuan                           | Untuk memberi kesempatan kepada kelompok untuk menampilkan hasil kerjanya.                         | Moderator: Herman Idrus                                                                          |
| Waktu/durasi                     | 90 minutes                                                                                         |                                                                                                  |
| Materi/isi                       | Laporan Self Assessment Kelompok (esay), power point                                               |                                                                                                  |
| Textbook/Modul/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                | -                                                                                                |

#### Syllabus No.9

|                   |                                                                                                                                                                                                                                                                               |                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| No,Mata Pelajaran | <b>9</b>                                                                                                                                                                                                                                                                      | Catatan                                                                                                           |
| Judul             | <b>Penjelasan mengenai Peer Review dalam praktik</b>                                                                                                                                                                                                                          |                                                                                                                   |
| Uraian singkat    | Penjelasan tentang peer review sebagai proses lanjut dari performance self assessment. Hasil self assessment dievaluasi oleh peer (teman sejawat) untuk mengukur tingkat obyektivitasnya. Tim Peer review dibentuk khusus untuk mengevaluasi hasil Self Assessment suatu RBO. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar/narasumber dalam pelaksanaan pelatihan |

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| Tujuan                           | Memberikan pemahaman bahwa metoda self assessment perlu ditindak lanjuti dengan review untuk memberikan kepastian tingkat kinerja suatu RBO dan terwujudnya proses kegiatan peer review yang lebih efektif dan efisien dengan mengacu pada ketentuan yang berlaku.                                                              |                                                                                                                                                                    |
| Pengajar.narasumber              | Isnugroho                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                    |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                    |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Penjelasan umum mengenai beberapa Istilah dan pengertian dalam proses peer review</li> <li>- Gambaran tentang proses peer review</li> <li>- Metoda yang digunakan</li> <li>- Tahapan dalam melakukan peer review</li> <li>- Output peer review</li> <li>- Rencana aksi, dll</li> </ul> | Bahan disiapkan oleh pengajar.<br>Essay dan power point<br>Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan. |
| Textbook/Modul/dokumen pendukung | - Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                           | -                                                                                                                                                                  |

#### Syllabus No.10

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|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| No.Mata Pelajaran                | <b>10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                  |
| Judul                            | <b>Latihan 2: Praktik/ujicoba melakukan peer review atas hasil Latihan I (SA)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Catatan                                                                                                          |
| Uraian singkat                   | Membagi peserta ke dalam beberapa kelompok. Masing-masing kelompok bertindak sebagai peer reviewer, mendalami hasil self assessment. Masing-masing kelompok melakukan review terhadap hasil SA pada Latihan I. Pembimbing/pendamping akan membantu kelompok dalam melakukan review<br>Pembimbing/pendamping terdiri atas semua narasumber, yang akan ditetapkan tugasnya kemudian.                                                                                                                                                                                          | Pembagian kelompok sebaiknya dibedakan dengan pembagian kelompok SA<br><br>Pendamping/pembimbing sebaiknya tetap |
| Tujuan                           | Tujuannya adalah terwujudnya proses kegiatan peer review yang lebih efektif dan efisien dengan mengacu pada ketentuan yang berlaku                                                                                                                                                                                                                                                                                                                                                                                                                                          | Pendamping:<br>Herman Idrus                                                                                      |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                  |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Proses peer review yang dilaksanakan ini adalah kelanjutan dari kegiatan performance self assessment</li> <li>- Hasil self assessment dipelajari, dianalisis, dan disimpulkan oleh Tim Peer review</li> <li>- Diskusi dengan pihak RBO dan beberapa pemangku kepentingan adalah salah satu cara untuk mendapatkan keyakinan bahwa nilai (score) atas pemenuhan suatu kriteria memang benar sesuai kenyataan. Hasil self assessment dengan scoring dapat saja berbeda antara Tim Self Assessment dengan Tim Peer review.</li> </ul> |                                                                                                                  |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                  |

**Syllabus No.11**

| No.Mata Pelajaran                 | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Catatan                                           |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Judul                             | <b>Presentasi hasil Latihan 2: peer review</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                   |
| Uraian singkat                    | Setiap kelompok memaparkan hasil peer review menggunakan format laporan yang telah disediakan<br>Dilanjutkan dengan <ul style="list-style-type: none"> <li>- Pemilihan Ketua Kelas</li> <li>- Pembentukan Tim Peer Review untuk melakukan review pada BBWS Nusa Tenggara I</li> <li>- Pemberian petunjuk mekanisme kegiatan selama kunjungan di BBWS Nusa Tenggara I dan pembagian tugas kelompok</li> <li>- Pengaturan dan pembagian tugas kelompok sesuai dengan pengelompokan yang sudah ada</li> </ul> | Laporan dibuat dalam bentuk essay dan power point |
| Tujuan                            | Untuk memberi kesempatan kepada kelompok untuk menampilkan hasil kerjanya.                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                   |
| Penyaji                           | Kelompok                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Moderator:<br>Herman Idrus                        |
| Waktu/durasi                      | 90 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                   |
| Materi/isi                        | Laporan Peer review Kelompok (essay), power point                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                   |
| Textbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                   |

**Syllabus No.12**

| No. Mata Pelajaran               | No.12                                                                                                                                                                                                                                                           | Catatan                                                                                                |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Judul                            | Paparan Pelaksanaan RBO Performance Benchmarking di BWS Nusa Tenggara I                                                                                                                                                                                         |                                                                                                        |
| Uraian singkat                   | Sebagai organisasi pengelola wilayah sungai sesuai dengan fungsinya seperti yang diamanatkan oleh Permen PUPR No. 20/PRT/M/201, diharapkan dapat menunjukkan kinerjanya hasil melalui performance benchmarking sebagai upaya perbaikan berkelanjutan suatu RBO. | Uraian dalam syllabus ini dapat dikembangkan dan disesuaikan oleh pengajar dalam pelaksanaan pelatihan |
| Tujuan                           | Memberikan data hasil performance benchmarking atau metoda pengukuran kinerja yang telah diterapkan di BWS Nusa Tenggara I sebagai bahan studi oleh peserta pelatihan.                                                                                          | Bahan disiapkan oleh pengajar/narasumber<br>1.Esay<br>2.Power point                                    |
| Pengajar/narasumber              | Kepala BWS Nusa Tenggara I                                                                                                                                                                                                                                      |                                                                                                        |
| Waktu/durasi                     | 90 minutes                                                                                                                                                                                                                                                      |                                                                                                        |
| Materi/isi                       | <ul style="list-style-type: none"> <li>- Pengenalan BWS Nusa Tenggara I</li> <li>- Tentang capaian (achievement) berdasarkan uraian tugas</li> <li>- Tentang penetapan skor</li> </ul>                                                                          |                                                                                                        |
|                                  | -Pembentukan Tim Peer review untuk melakukan review pada BWS Nusa Tenggara I                                                                                                                                                                                    |                                                                                                        |
|                                  | 45 menit                                                                                                                                                                                                                                                        | Hendarti                                                                                               |
| Textbook/Modul/dokumen pendukung | <ul style="list-style-type: none"> <li>- Buku Pedoman Pengukuran Kinerja RBO</li> <li>- Surat Direktur BPSDA No. UM.01.11.DA/1159 Tanggal 30 Nopember 2015 kepada semua BBWS dan BWS</li> </ul>                                                                 | -                                                                                                      |

**Syllabus No.13**

|                                  |                                                                                                                                                                          |                         |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| No.Mata Pelajaran                | <b>1</b>                                                                                                                                                                 | Catatan                 |
| Judul                            | <b>Praktik menelaah hasil Self assessment dan peer review BWS Nusa Tenggara I dan meninjau dokumen</b>                                                                   |                         |
| Uraian singkat                   | Dua Kelompok mempelajari hasil SA dan kelompok lainnya mempelajari hasil peer review.                                                                                    | Pendamping:<br>Hendarti |
| Tujuan                           | Pembagian tugas ini dimaksudkan agar pelaksanaan kunjungan ke BWS Nusa Tenggara I ini dapat memberi manfaat bagi kedua belah pihak dalam konteks peningkatan kinerja RBO |                         |
| Waktu/durasi                     | 135 minutes                                                                                                                                                              |                         |
| Texbook/module/dokumen pendukung | Buku Pedoman Pengukuran Kinerja RBO.                                                                                                                                     |                         |

**Syllabus No.14**

|                   |                                                                                                                                                   |                          |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| No.Mata Pelajaran | <b>14</b>                                                                                                                                         | Catatan                  |
| Judul             | <b>Wawancara/konfirmasi dengan staf, manajemen dan stakeholder, dan menyiapkan laporan kelompok</b>                                               |                          |
| Uraian singkat    | Metoda wawancara ini berupaya mencari kesamaan atau perbedaan pendekatan dalam meningkatkan kinerja RBO.                                          | Pendamping:<br>Isnugroho |
| Tujuan            | Mendapatkan masukan yang akan dapat dikembangkan untuk perbaikan metoda performance benchmarking. Ketua Kelas mengkoordinir pelaksanaan wawancara |                          |
| Waktu/durasi      | 135 minutes                                                                                                                                       |                          |
| Materi/isi        | Kuesioner                                                                                                                                         |                          |
| Texbook module    | Buku Pedoman Pengukuran Kinerja RBO                                                                                                               |                          |

**Syllabus No.15**

|                   |                                                                                                                        |                         |
|-------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------|
| No.Mata Pelajaran | <b>15</b>                                                                                                              | Catatan                 |
| Judul             | <b>Ketua Kelas menyiapkan laporan kelas yang dihimpun dari laporan kelompok hasil kunjungan ke BWS Nusa Tenggara I</b> |                         |
| Tujuan            | Agar laporan ini betul-betul bernilai dan dapat dipresentasikan dengan baik.                                           | Pendamping:<br>Hendarti |
| Waktu/durasi      | 90 minutes                                                                                                             |                         |
| Materi/isi        | Himpunan laporan kelompok                                                                                              |                         |
| Texbook/module    | Buku Pedoman Pengukuran Kinerja RBO                                                                                    |                         |

# Syllabus No.16

|                        |                                                                                                                                                                                        |                                  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| No.Mata Pelajaran      | 16                                                                                                                                                                                     | Catatan                          |
| Judul                  | - Presentasi hasil Kunjungan ke BWS Nusa Tenggara I (Power point) oleh Ketua Kelas dihadiri oleh Kepala BWS Nusa Tenggara I<br>-Tanggapan Ka.BWS Nusa Tenggara I atas presentasi kelas |                                  |
| Uraian singkat         | Hasil pelatihan didalam kelas dikombinasikan dengan hasil praktik di BWS Nusa Tenggara I                                                                                               | Moderator:<br>Bambang Trihariono |
| Tujuan                 | Untuk dapat menghasilkan suatu masukan bagi pengembangan metoda Performance Benchmarking                                                                                               |                                  |
| Waktu/durasi           | 135 minutes                                                                                                                                                                            |                                  |
| Materi/isi             | Kesimpulan dari kegiatan orientasi Performance Benchmarking                                                                                                                            |                                  |
| Texbook/module/dokumen | Buku Pedoman Pengukuran Kinerja RBO                                                                                                                                                    |                                  |

## **ANNEX 6-5**

Reviewed Module as Certificated Official Regulation/Standard No.001

Ministerial Regulation 17/PRT/M/2017 on Guidelines for the establishment of  
TKPSDA at the river basin level





MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT  
REPUBLIK INDONESIA

PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT  
REPUBLIK INDONESIA  
NOMOR 17/PRT/M/2017  
TENTANG  
PEDOMAN PEMBENTUKAN TIM KOORDINASI PENGELOLAAN SUMBER DAYA  
AIR PADA TINGKAT WILAYAH SUNGAI

DENGAN RAHMAT TUHAN YANG MAHA ESA

MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT  
REPUBLIK INDONESIA,

- Menimbang : a. bahwa berdasarkan Pasal 2 ayat (4) Peraturan Presiden Nomor 10 Tahun 2017 tentang Dewan Sumber Daya Air Nasional, pelaksanaan koordinasi pengelolaan sumber daya air pada tingkat wilayah sungai dilaksanakan sesuai dengan ketentuan peraturan perundang-undangan;
- b. bahwa untuk melaksanakan koordinasi pengelolaan sumber daya air pada tingkat wilayah sungai sebagaimana dimaksud dalam huruf a, sesuai dengan Pasal 2 ayat (5) Peraturan Presiden Nomor 10 Tahun 2017 tentang Dewan Sumber Daya Air Nasional dibentuk Tim Koordinasi Pengelolaan Sumber Daya Air;
- c. bahwa untuk membentuk Tim Koordinasi Pengelolaan Sumber Daya Air sebagaimana dimaksud dalam huruf b, perlu menyusun pedoman Pembentukan Tim Koordinasi Pengelolaan Sumber Daya Air pada Tingkat Wilayah Sungai;

- d. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a sampai dengan huruf c, perlu menetapkan Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat tentang Pedoman Pembentukan Tim Koordinasi Pengelolaan Sumber Daya Air pada Tingkat Wilayah Sungai;

Mengingat : 1. Peraturan Presiden Nomor 15 Tahun 2015 tentang Kementerian Pekerjaan Umum dan Perumahan Rakyat (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 16);

2. Peraturan Presiden Nomor 10 Tahun 2017 tentang Dewan Sumber Daya Air Nasional (Lembaran Negara Republik Indonesia Tahun 2017 Nomor 19);

3. Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 15/PRT/M/2015 tentang Organisasi dan Tata Kerja Kementerian Pekerjaan Umum dan Perumahan Rakyat (Berita Negara Republik Indonesia Tahun 2015 Nomor 881) sebagaimana telah diubah dengan Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 05/PRT/M/2017 tentang Perubahan atas Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat tentang Organisasi dan Tata Kerja Kementerian Pekerjaan Umum dan Perumahan Rakyat (Berita Negara Republik Indonesia Tahun 2017 Nomor 466);

4. Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 20/PRT/M/2016 tentang Organisasi dan Tata Kerja Unit Pelaksana Teknis di Kementerian Pekerjaan Umum dan Perumahan Rakyat (Berita Negara Republik Indonesia Tahun 2016 Nomor 817);

MEMUTUSKAN:

Menetapkan : PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT TENTANG PEDOMAN PEMBENTUKAN TIM KOORDINASI PENGELOLAAN SUMBER DAYA AIR PADA TINGKAT WILAYAH SUNGAI.

## BAB I KETENTUAN UMUM

### Pasal 1

Dalam Peraturan Menteri ini yang dimaksud dengan:

1. Wilayah Sungai adalah kesatuan wilayah pengelolaan sumber daya air dalam satu atau lebih daerah aliran sungai dan/atau pulau-pulau kecil yang luasnya kurang dari atau sama dengan 2.000 km<sup>2</sup>.
2. Tim Koordinasi Pengelolaan Sumber Daya Air Wilayah Sungai yang selanjutnya disebut TKPSDA WS adalah wadah koordinasi pengelolaan sumber daya air pada Wilayah Sungai.
3. Tim Koordinasi Pengelolaan Sumber Daya Air Wilayah Sungai Lintas Negara yang selanjutnya disebut TKPSDA WS Lintas Negara adalah wadah koordinasi pengelolaan sumber daya air pada wilayah sungai lintas Negara.
4. Tim Koordinasi Pengelolaan Sumber Daya Air Wilayah Sungai Lintas Provinsi yang selanjutnya disebut TKPSDA WS Lintas Provinsi adalah wadah koordinasi pengelolaan sumber daya air pada wilayah sungai lintas provinsi.
5. Tim Koordinasi Pengelolaan Sumber Daya Air Wilayah Sungai Strategis Nasional yang selanjutnya disingkat selanjutnya disebut TKPSDA WS Strategis Nasional adalah wadah koordinasi pengelolaan sumber daya air pada Wilayah Sungai strategis nasional.
6. Tim Koordinasi Pengelolaan Sumber Daya Air Wilayah Sungai Lintas Kabupaten/Kota yang selanjutnya disingkat TKPSDA WS Lintas Kabupaten/Kota adalah wadah koordinasi pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota.
7. Tim Koordinasi Pengelolaan Sumber Daya Air Wilayah Sungai dalam Satu Kabupaten/Kota yang selanjutnya disebut TKPSDA WS dalam Satu Kabupaten/Kota adalah wadah koordinasi pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota.

8. Unsur Pemerintah adalah wakil instansi Pemerintah, pemerintah provinsi, dan pemerintah kabupaten/kota.
9. Unsur Nonpemerintah adalah wakil yang berasal dari kelompok pengguna, pengusaha dan pengendali daya rusak sumber daya air serta lembaga masyarakat adat dan lembaga masyarakat pelestari lingkungan sumber daya air.
10. Pemerintah Pusat adalah Presiden Republik Indonesia yang memegang kekuasaan pemerintahan negara Republik Indonesia yang dibantu oleh Wakil Presiden dan menteri sebagaimana dimaksud dalam Undang-Undang Dasar Negara Republik Indonesia Tahun 1945.
10. Pemerintah Daerah adalah gubernur, bupati atau walikota dan perangkat daerah sebagai unsur penyelenggara pemerintahan daerah.
11. Menteri adalah menteri yang menyelenggarakan urusan pemerintahan di bidang pengelolaan sumber daya air.

## BAB II

### PEMBENTUKAN

#### Pasal 2

- (1) Peraturan Menteri ini dimaksudkan sebagai acuan bagi Pemerintah Pusat, pemerintah daerah provinsi dan pemerintah daerah kabupaten/kota dalam pembentukan TKPSDA WS.
- (2) Peraturan Menteri ini bertujuan agar terbentuk TKPSDA WS sebagai wadah koordinasi pada tingkat wilayah sungai yang mewakili berbagai kepentingan lintas sektor.

#### Pasal 3

Ruang lingkup pengaturan dalam Peraturan Menteri ini meliputi:

- a. pembentukan;
- b. kedudukan, tugas dan fungsi;
- c. susunan organisasi dan tata kerja;

- d. kriteria dan mekanisme pemilihan anggota;
- e. hubungan kerja antar TKPSDA WS; dan
- f. pembiayaan.

#### Pasal 4

- (1) Untuk melaksanakan koordinasi pengelolaan sumber daya air pada Wilayah Sungai lintas negara dibentuk TKPSDA WS Lintas Negara.
- (2) Pembentukan TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (1) ditetapkan dengan Keputusan Menteri.

#### Pasal 5

- (1) Untuk melaksanakan koordinasi pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi dibentuk TKPSDA WS Lintas Provinsi.
- (2) Pembentukan TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (1) ditetapkan dengan Keputusan Menteri.

#### Pasal 6

- (1) Untuk melaksanakan koordinasi pengelolaan sumber daya air pada Wilayah Sungai strategis nasional dibentuk TKPSDA WS Strategis Nasional.
- (2) Pembentukan TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (1) ditetapkan dengan Keputusan Menteri.

#### Pasal 7

- (1) Untuk melaksanakan koordinasi pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota dapat dibentuk TKPSDA WS Lintas Kabupaten/Kota sesuai dengan intensitas kebutuhan pengelolaan sumber daya air.

- (2) Pembentukan TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (1) ditetapkan dengan Keputusan Gubernur.

#### Pasal 8

Intensitas kebutuhan pengelolaan sumber daya air sebagaimana dimaksud dalam Pasal 7 ayat (1) meliputi:

- a. tingginya potensi konflik penggunaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota;
- b. tidak seimbangnya antara ketersediaan air dan kebutuhan air; dan
- c. pesatnya laju pertumbuhan pembangunan pada Wilayah Sungai lintas kabupaten/kota.

#### Pasal 9

- (1) Untuk melaksanakan koordinasi pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota dapat dibentuk TKPSDA WS dalam Satu Kabupaten/Kota sesuai dengan intensitas kebutuhan pengelolaan sumber daya air.
- (2) Pembentukan TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (1) ditetapkan dengan Keputusan Bupati/Walikota.

#### Pasal 10

Intensitas kebutuhan pengelolaan sumber daya air sebagaimana dimaksud dalam Pasal 9 ayat (1) meliputi:

- a. tingginya potensi konflik penggunaan sumber daya air pada kabupaten/kota;
- b. tidak seimbangnya antara ketersediaan air dan kebutuhan air; dan
- c. pesatnya laju pertumbuhan pembangunan pada kabupaten/kota.

### BAB III KEDUDUKAN, TUGAS DAN FUNGSI

#### Bagian Kesatu TKPSDA WS Lintas Negara

##### Pasal 11

- (1) TKPSDA WS Lintas Negara berkedudukan di negara Republik Indonesia dalam Wilayah Sungai yang bersangkutan sesuai dengan lokasi kantor sekretariat TKPSDA WS Lintas Negara.
- (2) TKPSDA WS Lintas Negara bersifat nonstruktural, berada di bawah dan bertanggung jawab langsung kepada Menteri.

##### Pasal 12

TKPSDA WS Lintas Negara sebagaimana dimaksud dalam Pasal 11 mempunyai tugas membantu Menteri dalam koordinasi pengelolaan sumber daya air melalui:

- a. pembahasan rancangan pola dan rancangan rencana pengelolaan sumber daya air pada Wilayah Sungai lintas negara guna perumusan bahan pertimbangan untuk penetapan pola dan rencana pengelolaan sumber daya air;
- b. pembahasan rancangan program dan rancangan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai lintas negara guna perumusan bahan pertimbangan untuk penetapan program dan rencana kegiatan sumber daya air;
- c. pembahasan usulan rencana alokasi air dari setiap sumber air pada Wilayah Sungai lintas negara guna perumusan bahan pertimbangan untuk penetapan rencana alokasi air;
- d. pembahasan rencana pengelolaan sistem informasi hidrologi, hidrometeorologi, dan hidrogeologi pada

Wilayah Sungai lintas negara untuk mencapai keterpaduan pengelolaan sistem informasi;

- e. pembahasan rancangan pendayagunaan kelembagaan pengelolaan sumber daya air pada Wilayah Sungai lintas negara; dan
- f. pemberian pertimbangan kepada Menteri mengenai pelaksanaan pengelolaan sumber daya air pada Wilayah Sungai lintas negara.

### Pasal 13

Untuk melaksanakan tugas sebagaimana dimaksud dalam Pasal 12, TKPSDA WS Lintas Negara menyelenggarakan fungsi koordinasi melalui:

- a. konsultasi dengan pihak terkait yang diperlukan guna keterpaduan pengelolaan sumber daya air pada Wilayah Sungai lintas negara serta tercapainya kesepahaman antarsektor, antarwilayah dan antarpemilik kepentingan;
- b. pengintegrasian dan penyelarasan kepentingan antarsektor, antarwilayah serta antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai lintas negara; dan
- c. kegiatan pemantauan dan evaluasi pelaksanaan program dan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai lintas negara.

### Pasal 14

Dalam melaksanakan tugas sebagaimana dimaksud dalam Pasal 12, TKPSDA WS Lintas Negara harus menyampaikan laporan tertulis kepada Menteri paling sedikit 2 (dua) kali dalam 1 (satu) tahun dengan tembusan kepada para gubernur dan bupati/walikota terkait.

Bagian Kedua  
TKPSDA WS Lintas Provinsi

Pasal 15

- (1) TKPSDA WS Lintas Provinsi berkedudukan di salah satu ibukota kabupaten/kota dalam Wilayah Sungai yang bersangkutan sesuai dengan lokasi kantor sekretariat TKPSDA WS
- (2) Dalam hal terdapat lebih dari 1 (satu) sekretariat dalam 1 (satu) TKPSDA WS lintas provinsi, kedudukan TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (1) ditentukan sesuai dengan kesepakatan.
- (3) TKPSDA WS Lintas Provinsi bersifat nonstruktural, berada di bawah dan bertanggung jawab langsung kepada Menteri.

Pasal 16

TKPSDA WS Lintas Provinsi sebagaimana dimaksud dalam Pasal 15 mempunyai tugas membantu Menteri dalam koordinasi pengelolaan sumber daya air melalui:

- a. pembahasan rancangan pola dan rancangan rencana pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi guna perumusan bahan pertimbangan untuk penetapan pola dan rencana pengelolaan sumber daya air;
- b. pembahasan rancangan program dan rancangan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi guna perumusan bahan pertimbangan untuk penetapan program dan rencana kegiatan sumber daya air;
- c. pembahasan usulan rencana alokasi air dari setiap sumber air pada Wilayah Sungai lintas provinsi guna perumusan bahan pertimbangan untuk penetapan rencana alokasi air;
- d. pembahasan rencana pengelolaan sistem informasi hidrologi, hidrometeorologi, dan hidrogeologi pada

Wilayah Sungai lintas provinsi untuk mencapai keterpaduan pengelolaan sistem informasi;

- e. pembahasan rancangan pendayagunaan kelembagaan pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi; dan
- f. pemberian pertimbangan kepada Menteri mengenai pelaksanaan pengelolaan sumber daya air pada wilayah sungai lintas provinsi.

#### Pasal 17

Untuk melaksanakan tugas sebagaimana dimaksud dalam Pasal 16, TKPSDA WS Lintas Provinsi menyelenggarakan fungsi koordinasi melalui:

- a. konsultasi dengan pihak terkait yang diperlukan guna keterpaduan pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi serta tercapainya kesepahaman antarsektor, antarwilayah dan antarpemilik kepentingan;
- b. pengintegrasian dan penyelarasan kepentingan antarsektor, antarwilayah serta antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi; dan
- c. kegiatan pemantauan dan evaluasi pelaksanaan program dan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi.

#### Pasal 18

Dalam melaksanakan tugas sebagaimana dimaksud dalam Pasal 16, TKPSDA WS Lintas Provinsi harus menyampaikan laporan tertulis kepada Menteri paling sedikit 2 (dua) kali dalam 1 (satu) tahun dengan tembusan kepada para gubernur dan bupati/walikota terkait.

Bagian Ketiga  
TKPSDA WS Strategis Nasional

Pasal 19

- (1) TKPSDA WS Strategis Nasional berkedudukan di salah satu kabupaten/kota dalam Wilayah Sungai yang bersangkutan sesuai dengan lokasi kantor sekretariat TKPSDA WS Strategis Nasional.
- (2) TKPSDA WS Strategis Nasional bersifat nonstruktural, berada di bawah dan bertanggung jawab langsung kepada Menteri.

Pasal 20

TKPSDA WS Strategis Nasional sebagaimana dimaksud dalam Pasal 19 mempunyai tugas membantu Menteri dalam koordinasi pengelolaan sumber daya air melalui:

- a. pembahasan rancangan pola dan rancangan rencana pengelolaan sumber daya air pada Wilayah Sungai strategis nasional guna perumusan bahan pertimbangan untuk penetapan pola dan rencana pengelolaan sumber daya air;
- b. pembahasan rancangan program dan rancangan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai strategis nasional guna perumusan bahan pertimbangan untuk penetapan program dan rencana kegiatan sumber daya air;
- c. pembahasan usulan rencana alokasi air dari setiap sumber air pada Wilayah Sungai strategis nasional guna perumusan bahan pertimbangan untuk penetapan rencana alokasi air;
- d. pembahasan rencana pengelolaan sistem informasi hidrologi, hidrometeorologi, dan hidrogeologi pada Wilayah Sungai strategis nasional untuk mencapai keterpaduan pengelolaan sistem informasi;

- e. pembahasan rancangan pendayagunaan kelembagaan pengelolaan sumber daya air pada Wilayah Sungai strategis nasional; dan
- f. pemberian pertimbangan kepada Menteri mengenai pelaksanaan pengelolaan sumber daya air pada Wilayah Sungai strategis nasional.

#### Pasal 21

Untuk melaksanakan tugas sebagaimana dimaksud dalam Pasal 20, TKPSDA WS Strategis Nasional menyelenggarakan fungsi koordinasi melalui:

- a. konsultasi dengan pihak terkait yang diperlukan guna keterpaduan dalam pengelolaan sumber daya air pada Wilayah Sungai strategis nasional, serta tercapainya kesepahaman antarsektor, antarwilayah dan antarpemilik kepentingan;
- b. pengintegrasian dan penyelarasan kepentingan antarsektor, antarwilayah serta antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai strategis nasional; dan
- c. kegiatan pemantauan dan evaluasi pelaksanaan program dan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai strategis nasional.

#### Pasal 22

Dalam melaksanakan tugas sebagaimana dimaksud dalam Pasal 20, TKPSDA WS Strategis Nasional harus menyampaikan laporan tertulis kepada Menteri paling sedikit 2 (dua) kali dalam 1 (satu) tahun dengan tembusan kepada para gubernur dan bupati/walikota terkait.

Bagian Keempat  
TKPSDA WS Lintas Kabupaten/Kota

Pasal 23

- (1) TKPSDA WS Lintas Kabupaten/Kota berkedudukan di salah satu kabupaten/kota dalam Wilayah Sungai yang bersangkutan sesuai dengan lokasi kantor sekretariat TKPSDA WS Lintas Kabupaten/Kota.
- (2) TKPSDA WS Lintas Kabupaten/Kota bersifat nonstruktural, berada di bawah dan bertanggung jawab langsung kepada gubernur.

Pasal 24

TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud dalam Pasal 23 mempunyai tugas membantu gubernur dalam koordinasi pengelolaan sumber daya air melalui:

- a. pembahasan rancangan pola dan rancangan rencana pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota guna perumusan bahan pertimbangan untuk penetapan pola dan rencana pengelolaan sumber daya air;
- b. pembahasan rancangan program dan rancangan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota guna perumusan bahan pertimbangan untuk penetapan program dan rencana kegiatan sumber daya air;
- c. pembahasan usulan rencana alokasi air dari setiap sumber air pada Wilayah Sungai lintas kabupaten/kota guna perumusan bahan pertimbangan untuk penetapan rencana alokasi air;
- d. pembahasan rencana pengelolaan sistem informasi hidrologi, hidrometeorologi, dan hidrogeologi pada wilayah sungai lintas kabupaten/kota untuk mencapai keterpaduan pengelolaan sistem informasi;

- e. pembahasan rancangan pendayagunaan kelembagaan pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota; dan
- f. pemberian pertimbangan kepada gubernur mengenai pelaksanaan pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota.

#### Pasal 25

Untuk melaksanakan tugas sebagaimana dimaksud dalam Pasal 24, TKPSDA WS Lintas Kabupaten/Kota menyelenggarakan fungsi koordinasi melalui:

- a. konsultasi dengan pihak terkait yang diperlukan guna keterpaduan pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota serta tercapainya kesepahaman antarsektor, antarwilayah dan antarpemilik kepentingan;
- b. pengintegrasian dan penyelarasan kepentingan antarsektor, antarwilayah serta antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota; dan
- c. kegiatan pemantauan dan evaluasi pelaksanaan program dan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota.

#### Pasal 26

Dalam melaksanakan tugas sebagaimana dimaksud dalam Pasal 24, TKPSDA WS Lintas Kabupaten/Kota harus menyampaikan laporan tertulis kepada gubernur paling sedikit 2 (dua) kali dalam 1 (satu) tahun dengan tembusan kepada para bupati/walikota terkait.

Bagian Kelima  
TKPSDA WS Dalam Satu Kabupaten/Kota

Pasal 27

- (1) TKPSDA WS dalam Satu Kabupaten/Kota berkedudukan di ibukota kabupaten/kota.
- (2) TKPSDA WS dalam Satu Kabupaten/Kota bersifat nonstruktural, berada di bawah dan bertanggung jawab langsung kepada bupati/walikota.

Pasal 28

TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud dalam Pasal 27 mempunyai tugas membantu bupati/walikota dalam koordinasi pengelolaan sumber daya air melalui:

- a. pembahasan rancangan pola dan rancangan rencana pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota guna perumusan bahan pertimbangan untuk penetapan pola dan rencana pengelolaan sumber daya air;
- b. pembahasan rancangan program dan rancangan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota guna perumusan bahan pertimbangan untuk penetapan program dan rencana kegiatan sumber daya air;
- c. pembahasan usulan rencana alokasi air dari setiap sumber air pada Wilayah Sungai dalam satu kabupaten/kota guna perumusan bahan pertimbangan untuk penetapan rencana alokasi air;
- d. pembahasan rencana pengelolaan sistem informasi hidrologi, hidrometeorologi, dan hidrogeologi pada Wilayah Sungai dalam satu kabupaten/kota untuk mencapai keterpaduan pengelolaan sistem informasi;
- e. pembahasan rancangan pendayagunaan kelembagaan pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota; dan

- f. pemberian pertimbangan kepada bupati/walikota mengenai pelaksanaan pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota.

#### Pasal 29

Untuk melaksanakan tugas sebagaimana dimaksud dalam Pasal 28, TKPSDA WS dalam Satu Kabupaten/Kota menyelenggarakan fungsi koordinasi melalui:

- a. konsultasi dengan pihak terkait yang diperlukan guna keterpaduan pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota serta tercapainya kesepahaman antarsektor, antarwilayah dan antarpemilik kepentingan;
- b. pengintegrasian dan penyelarasan kepentingan antarsektor, antarwilayah serta antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota; dan
- c. kegiatan pemantauan dan evaluasi pelaksanaan program dan rencana kegiatan pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota.

#### Pasal 30

Dalam melaksanakan tugas sebagaimana dimaksud dalam Pasal 28, TKPSDA WS dalam Satu Kabupaten/Kota harus menyampaikan laporan tertulis kepada bupati/walikota paling sedikit 2 (dua) kali dalam 1 (satu) tahun.

## BAB IV SUSUNAN ORGANISASI DAN TATA KERJA

### Bagian Kesatu TKPSDA WS Lintas Negara

#### Paragraf 1 Susunan Organisasi, Keanggotaan, Pengangkatan dan Pemberhentian

##### Pasal 31

- (1) Susunan organisasi TKPSDA WS Lintas Negara terdiri atas:
  - a. ketua merangkap anggota;
  - b. ketua harian merangkap anggota; dan
  - c. anggota.
- (2) Ketua TKPSDA WS Lintas Negara dijabat oleh kepala badan perencanaan pembangunan daerah provinsi di lokasi Wilayah Sungai lintas negara.
- (3) Ketua Harian TKPSDA WS Lintas Negara dijabat oleh kepala dinas yang membidangi sumber daya air pada provinsi lokasi Wilayah Sungai lintas negara.
- (4) Anggota TKPSDA WS Lintas Negara dapat dikelompokkan ke dalam komisi-komisi kecuali ketua dan ketua harian.
- (5) Keanggotaan TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (4) berasal dari Unsur Pemerintah dan Unsur Nonpemerintah dalam jumlah yang seimbang atas dasar prinsip keterwakilan.
- (6) Anggota TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (5) ditetapkan dengan Keputusan Menteri.

##### Pasal 32

- (1) Keanggotaan TKPSDA WS Lintas Negara yang berasal dari Unsur Pemerintah terdiri atas wakil instansi Pemerintah Pusat, wakil instansi Pemerintah Daerah

provinsi dan wakil instansi Pemerintah Daerah kabupaten/kota pada Wilayah Sungai.

- (2) Keanggotaan TKPSDA WS Lintas Negara yang berasal dari unsur Pemerintah Pusat sebagaimana dimaksud pada ayat (1) diwakili oleh unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai.
- (3) Wakil instansi Pemerintah Daerah provinsi sebagaimana dimaksud pada ayat (1) diusulkan oleh gubernur paling banyak 5 (lima) orang yang berasal dari 5 (lima) instansi Pemerintah Daerah provinsi yang terkait dengan pengelolaan sumber daya air.
- (4) Keanggotaan TKPSDA WS Lintas Negara yang berasal dari wakil instansi Pemerintah Daerah kabupaten/kota sebagaimana dimaksud pada ayat (1) jumlahnya diatur oleh sekretariat TKPSDA WS Lintas Negara.

### Pasal 33

- (1) Keanggotaan TKPSDA WS Lintas Negara yang berasal dari nonpemerintah terdiri atas unsur:
  - a. organisasi/asosiasi masyarakat adat;
  - b. organisasi/asosiasi pengguna air untuk pertanian;
  - c. organisasi/asosiasi pengusaha air minum;
  - d. organisasi/asosiasi industri pengguna air;
  - e. organisasi/asosiasi pengguna air untuk perikanan;
  - f. organisasi/asosiasi konservasi sumber daya air;
  - g. organisasi/asosiasi pengguna sumber daya air untuk energi listrik;
  - h. organisasi/asosiasi pengguna sumber daya air untuk transportasi;
  - i. organisasi/asosiasi pengguna sumber daya air untuk pariwisata/olahraga;
  - j. organisasi/asosiasi pengguna sumber daya air untuk pertambangan;
  - k. organisasi/asosiasi pengusaha bidang kehutanan;
  - dan
  - l. organisasi/asosiasi pengendali daya rusak air.

- (2) Anggota TKPSDA WS Lintas Negara dari Unsur Nonpemerintah diangkat dan diberhentikan oleh Menteri atas usulan kelompok organisasi/asosiasi yang diwakilinya.
- (3) Pengusulan anggota TKPSDA WS Lintas Negara dari Unsur Nonpemerintah sebagaimana dimaksud pada ayat (1) diselenggarakan melalui tata cara pemilihan secara demokratis.
- (4) Pemilihan anggota TKPSDA WS Lintas Negara dari Unsur Nonpemerintah diselenggarakan paling lama 6 (enam) bulan sebelum berakhirnya masa kerja anggota TKPSDA WS Lintas Negara dari Unsur Nonpemerintah.
- (5) Penyelenggaraan pemilihan sebagaimana dimaksud pada ayat (3) difasilitasi oleh sekretariat TKPSDA WS Lintas Negara.

#### Pasal 34

- (1) Keanggotaan TKPSDA WS Lintas Negara dari Unsur Nonpemerintah berlaku selama 5 (lima) tahun.
- (2) Dalam masa keanggotaan sebagaimana dimaksud pada ayat (1) dapat dilakukan penggantian antarwaktu anggota TKPSDA WS Lintas Negara, apabila yang bersangkutan:
  - a. mengundurkan diri;
  - b. meninggal dunia;
  - c. tidak melaksanakan tugasnya karena berhalangan tetap paling sedikit 1 (satu) tahun;
  - d. dinyatakan bersalah melakukan tindak pidana berdasarkan putusan pengadilan yang telah mempunyai kekuatan hukum yang tetap; atau
  - e. ditarik kembali oleh unsur yang diwakilinya.

Paragraf 2

Tata Kerja

Pasal 35

- (1) TKPSDA WS Lintas Negara bersidang paling sedikit 4 (empat) kali dalam 1 (satu) tahun.
- (2) Sidang TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (1) dipimpin oleh Ketua TKPSDA WS Lintas Negara dan dihadiri para anggota.
- (3) Dalam hal ketua TKPSDA WS Lintas Negara berhalangan, sidang TKPSDA WS Lintas Negara dipimpin oleh Ketua Harian TKPSDA WS Lintas Negara.
- (4) Dalam melaksanakan persidangan, TKPSDA WS Lintas Negara dapat mengundang narasumber dari instansi pemerintah, perguruan tinggi, lembaga swadaya masyarakat, atau masyarakat terkait.
- (5) Tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (1) diatur lebih lanjut oleh Ketua TKPSDA WS Lintas Negara.

Pasal 36

- (1) Ketua TKPSDA WS Lintas Negara berwenang:
  - a. menetapkan rencana kerja TKPSDA WS Lintas Negara;
  - b. menetapkan tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Lintas Negara;
  - c. memimpin rapat TKPSDA WS Lintas Negara sesuai dengan ketentuan tata tertib persidangan dan tata cara pengambilan keputusan; dan
  - d. menetapkan keputusan berdasarkan hasil persidangan TKPSDA WS Lintas Negara.
- (2) Ketua Harian TKPSDA WS Lintas Negara bertugas:
  - a. melaksanakan koordinasi dan konsultasi antarsektor, antarwilayah dan antarpemilik

kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai lintas negara;

- b. melaksanakan tugas Ketua TKPSDA WS Lintas Negara dalam hal Ketua TKPSDA WS Lintas Negara berhalangan;
- c. mengoordinasikan pembahasan rancangan pola, rancangan rencana, rancangan program dan rencana kegiatan pengelolaan sumber daya air Wilayah Sungai lintas negara;
- d. mengawasi pelaksanaan tugas sekretariat TKPSDA WS Lintas Negara; dan
- e. menyiapkan laporan TKPSDA WS Lintas Negara kepada Menteri tentang hasil pelaksanaan tugas dan fungsi TKPSDA WS Lintas Negara.

### Paragraf 3

#### Sekretariat TKPSDA WS Lintas Negara

### Pasal 37

- (1) Untuk membantu tugas TKPSDA WS Lintas Negara, dibentuk sekretariat TKPSDA WS Lintas Negara.
- (2) Sekretariat TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (1) bertugas:
  - a. mendukung pelaksanaan tugas dan fungsi TKPSDA WS Lintas Negara;
  - b. mengumpulkan data organisasi/asosiasi yang terdapat di Wilayah Sungai lintas negara;
  - c. memfasilitasi penyediaan tenaga ahli/pakar/narasumber yang diperlukan oleh TKPSDA WS Lintas Negara;
  - d. menyelenggarakan administrasi kesekretariatan;
  - e. menyelenggarakan administrasi keuangan;
  - f. memfasilitasi penyelenggaraan pemilihan anggota TKPSDA WS Lintas Negara dari Unsur Nonpemerintah;

- g. melakukan pemantauan terhadap tindak lanjut rekomendasi yang telah disepakati oleh TKPSDA WS Lintas Negara dan pelaporan hasil pemantauan kepada Ketua TKPSDA WS Lintas Negara.

#### Pasal 38

- (1) Susunan organisasi dan tata kerja sekretariat TKPSDA WS Lintas Negara ditetapkan oleh ketua harian TKPSDA WS Lintas Negara.
- (2) Sekretariat TKPSDA WS Lintas Negara dipimpin oleh Kepala Sekretariat TKPSDA WS Lintas Negara.
- (3) Kepala Sekretariat TKPSDA WS Lintas Negara sebagaimana dimaksud pada ayat (2) dijabat oleh salah satu kepala bidang atau salah satu kepala seksi pada unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai yang bersangkutan.

#### Bagian Kedua

#### TKPSDA WS Lintas Provinsi

#### Paragraf 1

Susunan Organisasi, Keanggotaan, Pengangkatan dan Pemberhentian

#### Pasal 39

- (1) Susunan organisasi TKPSDA WS Lintas Provinsi terdiri atas:
  - a. ketua merangkap anggota;
  - b. ketua harian merangkap anggota; dan
  - c. anggota.
- (2) Ketua TKPSDA WS Lintas Provinsi dijabat oleh kepala badan perencanaan pembangunan daerah provinsi secara bergantian berdasarkan kesepakatan antarprovinsi.

- (3) Ketua Harian TKPSDA WS Lintas Provinsi dijabat oleh kepala dinas yang membidangi sumber daya air pada salah satu provinsi secara bergantian berdasarkan kesepakatan antarprovinsi.
- (4) Anggota TKPSDA WS Lintas Provinsi dapat dikelompokkan ke dalam komisi-komisi kecuali ketua dan ketua harian.
- (5) Keanggotaan TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (4) berasal dari Unsur Pemerintah dan Unsur Nonpemerintah dalam jumlah yang seimbang atas dasar prinsip keterwakilan.
- (6) Anggota TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (5) ditetapkan dengan Keputusan Menteri.

#### Pasal 40

- (1) Keanggotaan TKPSDA WS Lintas Provinsi yang berasal dari Unsur Pemerintah terdiri atas wakil instansi Pemerintah Pusat, wakil instansi Pemerintah Daerah provinsi dan wakil instansi Pemerintah Daerah kabupaten/kota pada Wilayah Sungai.
- (2) Keanggotaan TKPSDA WS Lintas Provinsi yang berasal dari unsur Pemerintah Pusat sebagaimana dimaksud pada ayat (1) diwakili oleh unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai.
- (3) Wakil instansi Pemerintah Daerah provinsi sebagaimana dimaksud pada ayat (1) diusulkan oleh gubernur paling banyak 5 (lima) orang yang berasal dari 5 (lima) instansi pemerintah provinsi yang terkait dengan pengelolaan sumber daya air.
- (4) Keanggotaan TKPSDA WS Lintas Provinsi yang berasal dari wakil instansi Pemerintah Daerah kabupaten/kota sebagaimana dimaksud pada ayat (1) jumlahnya diatur oleh sekretariat TKPSDA WS Lintas Provinsi.

Pasal 41

- (1) Keanggotaan TKPSDA WS Lintas Provinsi yang berasal dari Unsur Nonpemerintah terdiri atas unsur:
  - a. organisasi/asosiasi masyarakat adat;
  - b. organisasi/asosiasi pengguna air untuk pertanian;
  - c. organisasi/asosiasi pengusaha air minum;
  - d. organisasi/asosiasi industri pengguna air;
  - e. organisasi/asosiasi pengguna air untuk perikanan;
  - f. organisasi/asosiasi konservasi sumber daya air;
  - g. organisasi/asosiasi pengguna sumber daya air untuk energi listrik;
  - h. organisasi/asosiasi pengguna sumber daya air untuk transportasi;
  - i. organisasi/asosiasi pengguna sumber daya air untuk pariwisata/olahraga;
  - j. organisasi/asosiasi pengguna sumber daya air untuk pertambangan;
  - k. organisasi/asosiasi pengusaha bidang kehutanan; dan
  - l. organisasi/asosiasi pengendali daya rusak air.
- (2) Anggota TKPSDA WS Lintas Provinsi dari Unsur Nonpemerintah diangkat dan diberhentikan oleh Menteri atas usulan kelompok organisasi/asosiasi yang diwakilinya.
- (3) Pengusulan anggota TKPSDA WS Lintas Provinsi dari Unsur Nonpemerintah sebagaimana dimaksud pada ayat (1) diselenggarakan melalui tata cara pemilihan secara demokratis.
- (4) Pemilihan anggota TKPSDA WS Lintas Provinsi dari Unsur Nonpemerintah diselenggarakan paling lama 6 (enam) bulan sebelum berakhirnya masa kerja anggota TKPSDA WS Lintas Provinsi dari unsur nonpemerintah.
- (5) Penyelenggaraan pemilihan sebagaimana dimaksud pada ayat (3) difasilitasi oleh sekretariat TKPSDA WS Lintas Provinsi.

#### Pasal 42

- (1) Keanggotaan TKPSDA WS Lintas Provinsi dari Unsur Nonpemerintah berlaku 5 (lima) tahun.
- (2) Dalam masa keanggotaan sebagaimana dimaksud pada ayat (1) dapat dilakukan penggantian antarwaktu anggota TKPSDA WS Lintas Provinsi, apabila yang bersangkutan:
  - a. mengundurkan diri;
  - b. meninggal dunia;
  - c. tidak melaksanakan tugasnya karena berhalangan tetap paling sedikit 1 (satu) tahun;
  - d. dinyatakan bersalah melakukan tindak pidana berdasarkan putusan pengadilan yang telah mempunyai kekuatan hukum yang tetap; atau
  - e. ditarik kembali oleh unsur yang diwakilinya.

#### Paragraf 2

#### Tata Kerja

#### Pasal 43

- (1) TKPSDA WS Lintas Provinsi bersidang paling sedikit 4 (empat) kali dalam 1 (satu) tahun.
- (2) Sidang TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (1) dipimpin oleh Ketua TKPSDA WS Lintas Provinsi dan dihadiri para anggota.
- (3) Dalam hal Ketua TKPSDA WS Lintas Provinsi berhalangan, sidang TKPSDA WS Lintas Provinsi dipimpin oleh Ketua Harian TKPSDA WS Lintas Provinsi.
- (4) Dalam melaksanakan persidangan, TKPSDA WS Lintas Provinsi dapat mengundang narasumber dari instansi pemerintah, perguruan tinggi, lembaga swadaya masyarakat, atau masyarakat terkait.
- (5) Tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (1) diatur lebih lanjut oleh Ketua TKPSDA WS Lintas Provinsi.

#### Pasal 44

- (1) Ketua TKPSDA WS Lintas Provinsi berwenang:
  - a. menetapkan rencana kerja TKPSDA WS Lintas Provinsi;
  - b. menetapkan tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Lintas Provinsi;
  - c. memimpin rapat TKPSDA WS Lintas Provinsi sesuai dengan ketentuan tata tertib persidangan dan tata cara pengambilan keputusan; dan
  - d. menetapkan keputusan berdasarkan hasil persidangan TKPSDA WS Lintas Provinsi.
- (2) Ketua Harian TKPSDA WS Lintas Provinsi bertugas:
  - a. melaksanakan koordinasi dan konsultasi antarsektor, antarwilayah dan antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai lintas provinsi;
  - b. melaksanakan tugas Ketua TKPSDA WS Lintas Provinsi dalam hal Ketua TKPSDA WS Lintas Provinsi berhalangan;
  - c. mengoordinasikan pembahasan rancangan pola, rancangan rencana, rancangan program dan rencana kegiatan pengelolaan sumber daya air Wilayah Sungai lintas provinsi;
  - d. mengawasi pelaksanaan tugas sekretariat TKPSDA WS Lintas Provinsi; dan
  - e. menyiapkan laporan TKPSDA WS Lintas Provinsi kepada Menteri tentang hasil pelaksanaan tugas dan fungsi TKPSDA WS Lintas Provinsi.

#### Paragraf 3

Sekretariat TKPSDA WS Lintas Provinsi

#### Pasal 45

- (1) Untuk membantu tugas TKPSDA WS Lintas Provinsi, dibentuk sekretariat TKPSDA WS Lintas Provinsi.

- (2) Sekretariat TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (1) bertugas:
- a. mendukung pelaksanaan tugas dan fungsi TKPSDA WS Lintas Provinsi;
  - b. mengumpulkan data organisasi/asosiasi yang terdapat di Wilayah Sungai lintas provinsi;
  - c. memfasilitasi penyediaan tenaga ahli/pakar/narasumber yang diperlukan oleh TKPSDA WS Lintas Provinsi;
  - d. menyelenggarakan administrasi kesekretariatan;
  - e. menyelenggarakan administrasi keuangan;
  - f. memfasilitasi penyelenggaraan pemilihan anggota TKPSDA WS Lintas Provinsi dari Unsur Nonpemerintah; dan
  - g. melakukan pemantauan terhadap tindak lanjut rekomendasi yang telah disepakati oleh TKPSDA WS Lintas Provinsi dan pelaporan hasil pemantauan kepada Ketua TKPSDA WS Lintas Provinsi.

#### Pasal 46

- (1) Susunan organisasi dan tata kerja sekretariat TKPSDA WS Lintas Provinsi ditetapkan oleh ketua harian TKPSDA WS Lintas Provinsi.
- (2) Sekretariat TKPSDA WS Lintas Provinsi dipimpin oleh Kepala Sekretariat TKPSDA WS Lintas Provinsi.
- (3) Kepala Sekretariat TKPSDA WS Lintas Provinsi sebagaimana dimaksud pada ayat (2) dijabat oleh salah satu kepala bidang atau salah satu kepala seksi pada unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai yang bersangkutan.

Bagian Ketiga  
TKPSDA WS Strategis Nasional

Paragraf 1

Susunan Organisasi, Keanggotaan, Pengangkatan dan  
Pemberhentian

Pasal 47

- (1) Susunan organisasi TKPSDA WS Strategis Nasional terdiri atas:
  - a. ketua merangkap anggota;
  - b. ketua harian merangkap anggota; dan
  - c. anggota.
- (2) Ketua TKPSDA WS Strategis Nasional dijabat oleh ketua kepala badan perencanaan pembangunan daerah provinsi.
- (3) Ketua harian TKPSDA WS Strategis Nasional dijabat oleh kepala dinas yang membidangi sumber daya air.
- (4) Anggota TKPSDA WS Strategis Nasional dapat dikelompokkan ke dalam komisi-komisi kecuali ketua dan ketua harian.
- (5) Keanggotaan TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (4) berasal dari Unsur Pemerintah dan Unsur Nonpemerintah atas dasar prinsip keterwakilan.
- (6) Anggota TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (5) ditetapkan dengan Keputusan Menteri.

Pasal 48

- (1) Keanggotaan TKPSDA WS Strategis Nasional yang berasal dari Unsur Pemerintah terdiri atas wakil instansi Pemerintah Pusat, wakil instansi Pemerintah Daerah provinsi dan wakil instansi Pemerintah Daerah kabupaten/kota pada Wilayah Sungai.

- (2) Keanggotaan TKPSDA WS Strategis Nasional yang berasal dari unsur Pemerintah Pusat sebagaimana dimaksud pada ayat (1) diwakili unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai.
- (3) Wakil instansi Pemerintah Daerah provinsi sebagaimana dimaksud pada ayat (1) diusulkan oleh Gubernur paling banyak berjumlah 5 (lima) orang yang berasal dari 5 (lima) instansi pemerintah provinsi yang terkait dengan pengelolaan sumber daya air.
- (4) Keanggotaan TKPSDA WS Strategis Nasional yang berasal dari wakil instansi Pemerintah Daerah kabupaten/kota sebagaimana dimaksud pada ayat (1) jumlahnya diatur oleh sekretariat TKPSDA WS Strategis Nasional.

#### Pasal 49

- (1) Keanggotaan TKPSDA WS Strategis Nasional yang berasal dari Unsur Nonpemerintah terdiri atas unsur:
  - a. organisasi/asosiasi masyarakat adat;
  - b. organisasi/asosiasi pengguna air untuk pertanian;
  - c. organisasi/asosiasi pengusaha air minum;
  - d. organisasi/asosiasi industri pengguna air;
  - e. organisasi/asosiasi pengguna air untuk perikanan;
  - f. organisasi/asosiasi konservasi sumber daya air;
  - g. organisasi/asosiasi pengguna sumber daya air untuk energi listrik;
  - h. organisasi/asosiasi pengguna sumber daya air untuk transportasi;
  - i. organisasi/asosiasi pengguna sumber daya air untuk pariwisata/olahraga;
  - j. organisasi/asosiasi pengguna sumber daya air untuk pertambangan;
  - k. organisasi/asosiasi pengusaha bidang kehutanan; dan
  - l. organisasi/asosiasi pengendali daya rusak air.

- (2) Anggota TKPSDA WS Strategis Nasional dari Unsur Nonpemerintah diangkat dan diberhentikan oleh Menteri atas usulan kelompok organisasi/asosiasi yang diwakilinya.
- (3) Pengusulan anggota TKPSDA WS Strategis Nasional dari Unsur Nonpemerintah sebagaimana dimaksud pada ayat (1) diselenggarakan melalui tata cara pemilihan secara demokratis.
- (4) Pemilihan anggota TKPSDA WS Strategis Nasional dari Unsur Nonpemerintah diselenggarakan paling lama 6 (enam) bulan sebelum berakhirnya masa kerja anggota TKPSDA WS Strategis Nasional dari Unsur Nonpemerintah.
- (5) Penyelenggaraan pemilihan sebagaimana dimaksud pada ayat (3) difasilitasi/dilaksanakan oleh sekretariat TKPSDA WS Strategis Nasional.

#### Pasal 50

- (1) Keanggotaan TKPSDA WS Strategis Nasional dari Unsur Nonpemerintah berlaku 5 (lima) tahun.
- (2) Dalam masa keanggotaan sebagaimana dimaksud pada ayat (1) dapat dilakukan penggantian antarwaktu anggota TKPSDA WS Strategis Nasional apabila yang bersangkutan:
  - a. mengundurkan diri;
  - b. meninggal dunia;
  - c. tidak melaksanakan tugasnya karena berhalangan tetap paling sedikit 1 (satu) tahun;
  - d. dinyatakan bersalah melakukan tindak pidana berdasarkan putusan pengadilan yang telah mempunyai kekuatan hukum yang tetap; atau
  - e. ditarik kembali oleh unsur yang diwakilinya.

Paragraf 2

Tata Kerja

Pasal 51

- (1) TKPSDA WS Strategis Nasional bersidang paling sedikit 4 (empat) kali dalam 1 (satu) tahun.
- (2) Sidang TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (1) dipimpin oleh Ketua TKPSDA WS Strategis Nasional dan dihadiri para anggota.
- (3) Dalam hal Ketua TKPSDA WS Strategis Nasional berhalangan, sidang TKPSDA WS Strategis Nasional dipimpin oleh Ketua Harian TKPSDA WS Strategis Nasional.
- (4) Dalam melaksanakan persidangan, TKPSDA WS Strategis Nasional dapat mengundang narasumber yang berasal dari instansi pemerintah, perguruan tinggi, lembaga swadaya masyarakat, atau masyarakat terkait.
- (5) Tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (1) diatur lebih lanjut oleh Ketua TKPSDA WS Strategis Nasional.

Pasal 52

- (1) Ketua TKPSDA WS Strategis Nasional berwenang:
  - a. menetapkan rencana kerja TKPSDA WS Strategis Nasional;
  - b. menetapkan tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Strategis Nasional;
  - c. memimpin rapat TKPSDA WS Strategis Nasional sesuai dengan ketentuan tata tertib persidangan dan tata cara pengambilan keputusan; dan
  - d. menetapkan keputusan berdasarkan hasil persidangan TKPSDA WS Strategis Nasional.

- (2) TKPSDA WS Strategis Nasional bertugas:
- a. melaksanakan koordinasi dan konsultasi antarsektor, antarwilayah dan antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai strategis nasional;
  - b. melaksanakan tugas Ketua TKPSDA WS Strategis Nasional dalam hal Ketua TKPSDA WS Strategis Nasional berhalangan;
  - c. mengoordinasikan pembahasan rancangan pola, rancangan rencana, rancangan program dan rencana kegiatan pengelolaan sumber daya air Wilayah Sungai strategis nasional;
  - d. mengawasi pelaksanaan tugas sekretariat TKPSDA WS Strategis Nasional; dan
  - e. menyiapkan laporan TKPSDA WS Strategis Nasional kepada Menteri tentang hasil pelaksanaan tugas dan fungsi TKPSDA WS Strategis Nasional.

### Paragraf 3

#### Sekretariat TKPSDA WS Strategis Nasional

### Pasal 53

- (1) Untuk membantu tugas TKPSDA WS Strategis Nasional, dibentuk sekretariat TKPSDA WS Strategis Nasional.
- (2) Sekretariat TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (1) bertugas:
  - a. mendukung pelaksanaan tugas dan fungsi TKPSDA WS Strategis Nasional;
  - b. mengumpulkan data organisasi/asosiasi yang terdapat di Wilayah Sungai strategis nasional;
  - c. memfasilitasi penyediaan tenaga ahli/pakar/narasumber yang diperlukan oleh TKPSDA WS Strategis Nasional;
  - d. menyelenggarakan administrasi kesekretariatan;
  - e. menyelenggarakan administrasi keuangan;

- f. memfasilitasi penyelenggaraan pemilihan anggota TKPSDA WS Strategis Nasional dari Unsur Nonpemerintah; dan
- g. melakukan pemantauan terhadap tindak lanjut rekomendasi yang telah disepakati oleh TKPSDA WS Strategis Nasional dan pelaporan hasil pemantauan kepada Ketua TKPSDA WS Strategis Nasional.

#### Pasal 54

- (1) Susunan organisasi dan tata kerja sekretariat TKPSDA WS Strategis Nasional ditetapkan oleh Ketua Harian TKPSDA WS Strategis Nasional.
- (2) Sekretariat TKPSDA WS Strategis Nasional dipimpin oleh Kepala Sekretariat TKPSDA WS Strategis Nasional.
- (3) Kepala Sekretariat TKPSDA WS Strategis Nasional sebagaimana dimaksud pada ayat (2) dijabat oleh salah satu kepala bidang atau salah satu kepala seksi pada unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai yang bersangkutan.

#### Bagian Keempat TKPSDA WS Lintas Kabupaten/Kota

##### Paragraf 1

Susunan Organisasi, Keanggotaan, Pengangkatan dan Pemberhentian

#### Pasal 55

- (1) Susunan organisasi TKPSDA WS Lintas Kabupaten/Kota terdiri atas:
  - a. ketua merangkap anggota;
  - b. ketua harian merangkap anggota; dan
  - c. anggota.

- (2) Ketua TKPSDA WS Lintas Kabupaten/Kota dijabat oleh kepala badan perencanaan pembangunan daerah provinsi.
- (3) Ketua Harian TKPSDA WS Lintas Kabupaten/Kota dijabat oleh kepala dinas yang membidangi sumber daya air provinsi.
- (4) Anggota TKPSDA WS Lintas Kabupaten/Kota dapat dikelompokkan ke dalam komisi- komisi kecuali ketua dan ketua harian.
- (5) Keanggotaan TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (4) berasal dari Unsur Pemerintah dan Unsur Nonpemerintah dalam jumlah yang seimbang atas dasar prinsip keterwakilan.
- (6) Anggota TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (5) ditetapkan dengan Keputusan Gubernur.

#### Pasal 56

- (1) Keanggotaan TKPSDA WS Lintas Kabupaten/Kota yang berasal dari Unsur Pemerintah terdiri atas wakil instansi Pemerintah Daerah provinsi dan wakil instansi Pemerintah Daerah kabupaten/kota pada Wilayah Sungai yang bersangkutan.
- (2) Wakil instansi Pemerintah Daerah provinsi sebagaimana dimaksud pada ayat (1) paling banyak 5 (lima) orang yang berasal dari 5 (lima) instansi Pemerintah Daerah provinsi yang terkait dengan pengelolaan sumber daya air.
- (3) Wakil instansi Pemerintah Daerah provinsi sebagaimana dimaksud pada ayat (1) diusulkan oleh gubernur paling banyak berjumlah 5 (lima) orang yang berasal dari 5 (lima) instansi Pemerintah Daerah provinsi yang terkait dengan pengelolaan sumber daya air.
- (4) Keanggotaan TKPSDA WS Lintas Kabupaten/Kota yang berasal dari wakil instansi Pemerintah Daerah kabupaten/kota sebagaimana dimaksud pada ayat (1) jumlahnya diatur oleh sekretariat TKPSDA WS Lintas

Kabupaten/Kota dengan tetap mengutamakan pertimbangan jumlah anggota dewan sumber daya air yang efektif dan efisien.

Pasal 57

- (1) Keanggotaan TKPSDA WS Lintas Kabupaten/Kota yang berasal dari Unsur Nonpemerintah terdiri atas unsur:
  - a. organisasi/asosiasi masyarakat adat;
  - b. organisasi/asosiasi pengguna air untuk pertanian;
  - c. organisasi/asosiasi pengusaha air minum;
  - d. organisasi/asosiasi industri pengguna air;
  - e. organisasi/asosiasi pengguna air untuk perikanan;
  - f. organisasi/asosiasi konservasi sumber daya air;
  - g. organisasi/asosiasi pengguna sumber daya air untuk energi listrik;
  - h. organisasi/asosiasi pengguna sumber daya air untuk transportasi;
  - i. organisasi/asosiasi pengguna sumber daya air untuk pariwisata/olahraga;
  - j. organisasi/asosiasi pengguna sumber daya air untuk pertambangan;
  - k. organisasi/asosiasi pengusaha bidang kehutanan; dan
  - l. organisasi/asosiasi pengendali daya rusak air.
- (2) Anggota TKPSDA WS Lintas Kabupaten/Kota dari Unsur Nonpemerintah diangkat dan diberhentikan oleh gubernur atas usulan kelompok organisasi/asosiasi yang diwakilinya.
- (3) Pengusulan anggota TKPSDA WS Lintas Kabupaten/Kota dari Unsur Nonpemerintah sebagaimana dimaksud pada ayat (1) diselenggarakan melalui tata cara pemilihan secara demokratis.
- (4) Pemilihan anggota TKPSDA WS Lintas Kabupaten/Kota dari Unsur Nonpemerintah diselenggarakan paling lama 6 (enam) bulan sebelum berakhirnya masa kerja anggota

TKPSDA WS Lintas Kabupaten/Kota dari Unsur Nonpemerintah.

- (5) Penyelenggaraan pemilihan sebagaimana dimaksud pada ayat (3) difasilitasi oleh sekretariat TKPSDA WS Lintas Kabupaten/Kota.

#### Pasal 58

- (1) Keanggotaan TKPSDA WS Lintas Kabupaten/Kota dari Unsur Nonpemerintah berlaku 5 (lima) tahun.
- (2) Dalam masa keanggotaan sebagaimana dimaksud pada ayat (1) dapat dilakukan penggantian antarwaktu anggota TKPSDA WS Lintas Kabupaten/Kota apabila yang bersangkutan:
  - a. mengundurkan diri;
  - b. meninggal dunia;
  - c. tidak melaksanakan tugasnya karena berhalangan tetap paling sedikit 1 (satu) tahun;
  - d. dinyatakan bersalah melakukan tindak pidana berdasarkan putusan pengadilan yang telah mempunyai kekuatan hukum yang tetap; atau
  - e. ditarik kembali oleh unsur yang diwakilinya.

#### Paragraf 2

#### Tata Kerja

#### Pasal 59

- (1) TKPSDA WS Lintas Kabupaten/Kota bersidang paling sedikit 4 (empat) kali dalam 1 (satu) tahun.
- (2) Sidang TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (1) dipimpin oleh Ketua TKPSDA WS Lintas Kabupaten/Kota dan dihadiri para anggota.
- (3) Dalam hal Ketua TKPSDA WS Lintas Kabupaten/Kota berhalangan, sidang TKPSDA WS Lintas Kabupaten/Kota dipimpin oleh Ketua Harian TKPSDA WS Lintas Kabupaten/Kota.

- (4) Dalam melaksanakan persidangan, TKPSDA WS Lintas Kabupaten/Kota dapat mengundang narasumber dari instansi pemerintah, perguruan tinggi, lembaga swadaya masyarakat, atau masyarakat terkait.
- (5) Tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (1) diatur lebih lanjut oleh Ketua TKPSDA WS Lintas Kabupaten/Kota.

#### Pasal 60

- (1) Ketua TKPSDA WS Lintas Kabupaten/Kota berwenang:
  - a. menetapkan rencana kerja TKPSDA WS Lintas Kabupaten/Kota;
  - b. menetapkan tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS Lintas Kabupaten/Kota;
  - c. memimpin rapat TKPSDA WS Lintas Kabupaten/Kota sesuai dengan ketentuan tata tertib persidangan dan tata cara pengambilan keputusan; dan
  - d. menetapkan keputusan berdasarkan hasil persidangan TKPSDA WS Lintas Kabupaten/Kota.
- (2) Ketua Harian TKPSDA WS Lintas Kabupaten/Kota bertugas:
  - a. melaksanakan koordinasi dan konsultasi antarsektor, antarwilayah dan antarpemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai lintas kabupaten/kota;
  - b. melaksanakan tugas Ketua TKPSDA WS Lintas Kabupaten/Kota dalam hal Ketua TKPSDA WS Lintas Kabupaten/Kota berhalangan;
  - c. mengoordinasikan pembahasan rancangan pola, rancangan rencana, rancangan program dan rencana kegiatan pengelolaan sumber daya air Wilayah Sungai lintas kabupaten/kota;
  - d. mengawasi pelaksanaan tugas Sekretariat TKPSDA WS Lintas Kabupaten/Kota; dan

- e. menyiapkan laporan TKPSDA WS Lintas Kabupaten/Kota kepada gubernur tentang hasil pelaksanaan tugas dan fungsi TKPSDA WS Lintas Kabupaten/Kota.

### Paragraf 3

#### Sekretariat TKPSDA WS Lintas Kabupaten/Kota

### Pasal 61

- (1) Untuk membantu tugas TKPSDA WS Lintas Kabupaten/Kota, dibentuk sekretariat TKPSDA WS Lintas Kabupaten/Kota.
- (2) Sekretariat TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (1) bertugas:
  - a. mendukung pelaksanaan tugas dan fungsi TKPSDA WS Lintas Kabupaten/Kota;
  - b. mengumpulkan data organisasi/asosiasi yang terdapat di Wilayah Sungai lintas kabupaten/kota;
  - c. memfasilitasi penyediaan tenaga ahli/pakar/narasumber yang diperlukan oleh TKPSDA WS Lintas Kabupaten/Kota;
  - d. menyelenggarakan administrasi kesekretariatan;
  - e. menyelenggarakan administrasi keuangan;
  - f. memfasilitasi penyelenggaraan pemilihan anggota TKPSDA WS Lintas Kabupaten/Kota dari Unsur Nonpemerintah; dan
  - g. melakukan pemantauan terhadap tindak lanjut rekomendasi yang telah disepakati oleh TKPSDA WS Lintas Kabupaten/Kota dan pelaporan hasil pemantauan kepada Ketua TKPSDA WS Lintas Kabupaten/Kota.

### Pasal 62

- (1) Susunan organisasi dan tata kerja sekretariat TKPSDA WS Lintas Kabupaten/Kota ditetapkan oleh ketua harian TKPSDA WS Lintas Kabupaten/Kota.

- (2) Sekretariat TKPSDA WS Lintas Kabupaten/Kota dipimpin oleh Kepala Sekretariat TKPSDA WS Lintas Kabupaten/Kota.
- (3) Kepala Sekretariat TKPSDA WS Lintas Kabupaten/Kota sebagaimana dimaksud pada ayat (2) dijabat oleh salah satu kepala unit pelaksana teknis dinas yang membidangi sumber daya air pada provinsi yang bersangkutan.

#### Bagian Kelima

#### TKPSDA WS dalam Satu Kabupaten/Kota

#### Paragraf 1

#### Susunan Organisasi, Keanggotaan, Pengangkatan dan Pemberhentian

#### Pasal 63

- (1) Susunan organisasi TKPSDA WS dalam Satu Kabupaten/Kota terdiri atas:
  - a. ketua merangkap anggota;
  - b. ketua harian merangkap anggota; dan
  - c. anggota.
- (2) Ketua TKPSDA WS dalam Satu Kabupaten/Kota dijabat oleh kepala badan perencanaan pembangunan daerah kabupaten/kota.
- (3) Ketua harian TKPSDA WS dalam Satu Kabupaten/Kota dijabat oleh kepala dinas yang membidangi sumber daya air kabupaten/kota.
- (4) Anggota TKPSDA WS dalam Satu Kabupaten/Kota dapat dikelompokkan ke dalam komisi-komisi kecuali ketua dan ketua harian.
- (5) Keanggotaan TKPSDA WS Dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (4) berasal dari Unsur Pemerintah dan Unsur Nonpemerintah dalam jumlah yang seimbang atas dasar prinsip keterwakilan.

- (6) Anggota TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (5) ditetapkan dengan Keputusan Bupati/Walikota.

#### Pasal 64

- (1) Keanggotaan TKPSDA WS Dalam Satu Kabupaten/Kota yang berasal dari Unsur Pemerintah terdiri atas wakil instansi pemerintah daerah kabupaten/kota dan camat pada Wilayah Sungai dalam satu kabupaten/kota.
- (2) Wakil instansi pemerintah daerah kabupaten/kota sebagaimana dimaksud pada ayat (1) diusulkan oleh bupati/walikota paling banyak 5 (lima) orang yang berasal dari 5 (lima) instansi pemerintah daerah kabupaten/kota yang terkait dengan pengelolaan sumber daya air.

#### Pasal 65

- (1) Keanggotaan TKPSDA WS dalam Satu Kabupaten/Kota yang berasal dari nonpemerintah terdiri atas unsur:
  - a. organisasi/asosiasi masyarakat adat;
  - b. organisasi/asosiasi pengguna air untuk pertanian;
  - c. organisasi/asosiasi pengusaha air minum;
  - d. organisasi/asosiasi industri pengguna air;
  - e. organisasi/asosiasi pengguna air untuk perikanan;
  - f. organisasi/asosiasi konservasi sumber daya air;
  - g. organisasi/asosiasi pengguna sumber daya air untuk energi listrik;
  - h. organisasi/asosiasi pengguna sumber daya air untuk transportasi;
  - i. organisasi/asosiasi pengguna sumber daya air untuk pariwisata/olahraga;
  - j. organisasi/asosiasi pengguna sumber daya air untuk pertambangan;
  - k. organisasi/asosiasi pengusaha bidang kehutanan; dan
  - l. organisasi/asosiasi pengendali daya rusak air.

- (2) Anggota TKPSDA WS Dalam Satu Kabupaten/Kota dari Unsur Nonpemerintah diangkat dan diberhentikan oleh bupati/walikota atas usulan kelompok organisasi/asosiasi yang diwakilinya.
- (3) Pengusulan anggota TKPSDA WS Dalam Satu Kabupaten/Kota dari Unsur Nonpemerintah sebagaimana dimaksud pada ayat (1) diselenggarakan melalui tata cara pemilihan secara demokratis.
- (4) Pemilihan anggota TKPSDA WS Dalam Satu Kabupaten/Kota dari Unsur Nonpemerintah diselenggarakan paling lama 6 (enam) bulan sebelum berakhirnya masa kerja anggota TKPSDA WS Dalam Satu Kabupaten/Kota dari Unsur Nonpemerintah.
- (5) Penyelenggaraan pemilihan sebagaimana dimaksud pada ayat (3) difasilitasi oleh sekretariat TKPSDA WS dalam Satu Kabupaten/Kota.

#### Pasal 66

- (1) Keanggotaan TKPSDA WS dalam Satu Kabupaten/Kota dari Unsur Nonpemerintah berlaku 5 (lima) tahun.
- (2) Dalam masa keanggotaan sebagaimana dimaksud pada ayat (1) dapat dilakukan penggantian antar waktu anggota TKPSDA WS dalam Satu Kabupaten/Kota apabila yang bersangkutan:
  - a. mengundurkan diri;
  - b. meninggal dunia;
  - c. tidak melaksanakan tugasnya karena berhalangan tetap paling sedikit 1 (satu) tahun;
  - d. dinyatakan bersalah melakukan tindak pidana berdasarkan putusan pengadilan yang telah mempunyai kekuatan hukum yang tetap; atau
  - e. ditarik kembali oleh unsur yang diwakilinya.

Paragraf 2

Tata Kerja

Pasal 67

- (1) TKPSDA WS dalam Satu Kabupaten/Kota bersidang paling sedikit 4 (empat) kali dalam 1 (satu) tahun.
- (2) Sidang TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (1) dipimpin oleh Ketua TKPSDA WS dalam Satu Kabupaten/Kota dan dihadiri para anggota.
- (3) Dalam hal Ketua TKPSDA WS dalam Satu Kabupaten/Kota berhalangan, sidang TKPSDA WS dalam Satu Kabupaten/Kota dipimpin oleh Ketua Harian TKPSDA WS dalam Satu Kabupaten/Kota.
- (4) Dalam melaksanakan persidangan, TKPSDA WS dalam Satu Kabupaten/Kota dapat mengundang narasumber dari instansi pemerintah, perguruan tinggi, lembaga swadaya masyarakat, atau masyarakat terkait.
- (5) Tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (1) diatur lebih lanjut oleh Ketua TKPSDA WS dalam Satu Kabupaten/Kota.

Pasal 68

- (1) Ketua TKPSDA WS dalam Satu Kabupaten/Kota berwenang:
  - a. menetapkan rencana kerja TKPSDA WS dalam Satu Kabupaten/Kota;
  - b. menetapkan tata tertib persidangan dan tata cara pengambilan keputusan TKPSDA WS dalam Satu Kabupaten/Kota;
  - c. memimpin rapat TKPSDA WS dalam Satu Kabupaten/Kota sesuai dengan ketentuan tata tertib persidangan dan tata cara pengambilan keputusan; dan
  - d. menetapkan keputusan berdasarkan hasil

persidangan TKPSDA WS dalam Satu Kabupaten/Kota.

- (2) Ketua Harian TKPSDA WS dalam Satu Kabupaten/Kota bertugas:
- a. melaksanakan koordinasi dan konsultasi antarsektor, antarwilayah kecamatan dan antarpemilik pemilik kepentingan dalam pengelolaan sumber daya air pada Wilayah Sungai dalam satu kabupaten/kota;
  - b. melaksanakan tugas Ketua TKPSDA WS dalam Satu Kabupaten/Kota dalam hal Ketua TKPSDA WS dalam Satu Kabupaten/Kota berhalangan;
  - c. mengoordinasikan pembahasan rancangan pola, rancangan rencana, rancangan program dan rencana kegiatan pengelolaan sumber daya air Wilayah Sungai dalam satu kabupaten/kota;
  - d. mengawasi pelaksanaan tugas sekretariat TKPSDA WS dalam Satu Kabupaten/Kota; dan
  - e. menyiapkan laporan TKPSDA WS dalam Satu Kabupaten/Kota kepada bupati/walikota tentang hasil pelaksanaan tugas dan fungsi TKPSDA WS dalam Satu Kabupaten/Kota.

### Paragraf 3

Sekretariat TKPSDA WS dalam Satu Kabupaten/Kota

### Pasal 69

- (1) Untuk membantu tugas TKPSDA WS dalam Satu Kabupaten/Kota, dibentuk sekretariat TKPSDA WS dalam Satu Kabupaten/Kota.
- (2) Sekretariat TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (1) bertugas:
  - a. mendukung pelaksanaan tugas dan fungsi TKPSDA WS dalam Satu Kabupaten/Kota;
  - b. mengumpulkan data organisasi/asosiasi yang terdapat di WS dalam Satu Kabupaten/Kota;

- c. memfasilitasi penyediaan tenaga ahli/pakar/narasumber yang diperlukan oleh TKPSDA WS dalam Satu Kabupaten/Kota;
- d. menyelenggarakan administrasi kesekretariatan;
- e. menyelenggarakan administrasi keuangan;
- f. memfasilitasi penyelenggaraan pemilihan anggota TKPSDA WS dalam Satu Kabupaten/Kota dari Unsur Nonpemerintah; dan
- g. melakukan pemantauan terhadap tindak lanjut rekomendasi yang telah disepakati oleh TKPSDA WS dalam Satu Kabupaten/Kota dan pelaporan hasil pemantauan kepada Ketua TKPSDA WS dalam Satu Kabupaten/Kota.

Pasal 70

- (1) Susunan organisasi dan tata kerja sekretariat TKPSDA WS dalam Satu Kabupaten/Kota ditetapkan oleh Ketua Harian TKPSDA WS dalam Satu Kabupaten/Kota.
- (2) Sekretariat TKPSDA WS dalam Satu Kabupaten/Kota dipimpin oleh kepala sekretariat TKPSDA WS dalam Satu Kabupaten/Kota.
- (3) Kepala sekretariat TKPSDA WS dalam Satu Kabupaten/Kota sebagaimana dimaksud pada ayat (2) dijabat oleh salah satu kepala unit pelaksana teknis dinas kabupaten/kota yang membidangi sumber daya air Wilayah Sungai yang bersangkutan.

BAB V  
KRITERIA DAN MEKANISME PEMILIHAN ANGGOTA

Bagian Kesatu  
TKPSDA WS Lintas Negara

Paragraf 1  
Kriteria Pemilihan Anggota

Pasal 71

- (1) Pengajuan anggota TKPSDA WS Lintas Negara dari Unsur Pemerintah sebagaimana dimaksud dalam Pasal 24 ayat (1) didasarkan kriteria sebagai berikut:
  - a. pejabat wakil instansi Pemerintah Pusat sebagai pengelola sumber daya air pada Wilayah Sungai yang bersangkutan adalah pejabat setingkat eselon II atau setingkat eselon III pada unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai;
  - b. pejabat wakil instansi Pemerintah Daerah provinsi setingkat eselon II atau setingkat eselon III terkait; dan
  - c. pejabat wakil instansi Pemerintah Daerah kabupaten/kota terkait setingkat eselon II atau setingkat eselon III yang membidangi sumber daya air dan/atau yang terkait langsung dengan sumber daya air.
- (2) Anggota dari Unsur Nonpemerintah didasarkan kriteria sebagai berikut:
  - a. wakil yang diusulkan oleh kelompok organisasi/asosiasi sebagaimana dimaksud dalam Pasal 25 ayat (1);
  - b. organisasi/asosiasi yang sudah berbadan hukum dan terdaftar pada pemerintah provinsi serta telah berperan aktif dibidang sumber daya air paling sedikit 2 (dua) tahun; dan
  - c. organisasi/asosiasi berkedudukan di negara

Republik Indonesia pada Wilayah Sungai yang bersangkutan.

Paragraf 2

Mekanisme Pemilihan Anggota

Pasal 72

- (1) Sekretariat TKPSDA WS Lintas Negara menetapkan jumlah anggota TKPSDA WS Lintas Negara dari Unsur Pemerintah dan Unsur Nonpemerintah sebagaimana dimaksud dalam Pasal 29.
- (2) Sekretariat menentukan kuota setiap kelompok organisasi/asosiasi calon anggota TKPSDA WS Lintas Negara.
- (3) Sekretariat TKPSDA WS Lintas Negara melakukan fasilitasi proses seleksi calon anggota dari Unsur Nonpemerintah melalui tahap:
  - a. pengumuman secara terbuka melalui media cetak dan/atau elektronik;
  - b. pendaftaran calon anggota;
  - c. Pengelompokan organisasi/asosiasi berdasarkan ruang lingkup organisasi yang diwakili;
  - d. penjelasan tentang wadah koordinasi pengelolaan sumber daya air kepada calon anggota TKPSDA WS Lintas Negara;
  - e. fasilitasi pertemuan penetapan calon anggota antar kelompok; dan
  - f. pengajuan calon anggota dari masing-masing kelompok organisasi/ asosiasi.
- (4) Sekretariat TKPSDA WS Lintas Negara melaporkan hasil fasilitasi seleksi calon anggota TKPSDA WS Lintas Negara kepada Menteri dan menyiapkan rancangan Keputusan Menteri mengenai pengangkatan anggota TKPSDA WS Lintas Negara untuk mendapatkan penetapan.
- (5) Dalam hal sekretariat TKPSDA WS Lintas Negara belum terbentuk, penyelenggaraan pemilihan calon anggota

TKPSDA WS Lintas Negara dilakukan oleh Tim Pemilihan Anggota TKPSDA WS Lintas Negara.

- (6) Tim pemilihan sebagaimana dimaksud pada ayat (5) ditetapkan oleh Menteri.
- (7) Tim pemilihan TKPSDA WS Lintas Negara, paling sedikit beranggotakan 5 (lima) orang yang terdiri atas unsur instansi yang membidangi sumber daya air, membidangi kehutanan, membidangi pertanian, membidangi lingkungan hidup, dan membidangi perencanaan daerah provinsi terkait.

## Bagian Kedua

### TKPSDA WS Lintas Provinsi

#### Paragraf 1

#### Kriteria Pemilihan Anggota

#### Pasal 73

- (1) Pengajuan anggota TKPSDA WS Lintas Provinsi dari Unsur Pemerintah sebagaimana dimaksud dalam Pasal 32 ayat (1) didasarkan kriteria sebagai berikut:
  - a. pejabat wakil instansi Pemerintah Pusat sebagai pengelola sumber daya air pada Wilayah Sungai yang bersangkutan adalah pejabat setingkat eselon II pada unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai;
  - b. pejabat wakil instansi Pemerintah Daerah provinsi setingkat eselon II terkait; dan
  - c. pejabat wakil instansi Pemerintah Daerah kabupaten/kota terkait setingkat eselon II yang membidangi sumber daya air dan/atau yang terkait langsung dengan sumber daya air.
- (2) Anggota dari Unsur Nonpemerintah didasarkan kriteria sebagai berikut:
  - a. wakil yang diusulkan oleh kelompok organisasi/asosiasi sebagaimana dimaksud dalam

Pasal 33 ayat (1);

- b. organisasi/asosiasi yang sudah berbadan hukum dan terdaftar pada Pemerintah Daerah provinsi serta telah berperan aktif dibidang sumber daya air paling sedikit 2 (dua) tahun; dan
- c. organisasi/asosiasi berkedudukan di provinsi pada Wilayah Sungai yang bersangkutan.

## Paragraf 2

### Mekanisme Pemilihan Anggota

#### Pasal 74

- (1) Sekretariat TKPSDA WS Lintas Provinsi menetapkan jumlah anggota TKPSDA WS Lintas Provinsi dari Unsur Pemerintah dan Unsur Nonpemerintah sebagaimana dimaksud dalam Pasal 37.
- (2) Sekretariat menentukan kuota setiap kelompok organisasi/asosiasi calon anggota TKPSDA WS Lintas Provinsi.
- (3) Sekretariat TKPSDA WS Lintas Provinsi melakukan fasilitasi proses seleksi calon anggota dewan sumber daya air provinsi dari Unsur Nonpemerintah melalui tahap:
  - a. pengumuman secara terbuka melalui media cetak dan/atau elektronik;
  - b. pendaftaran calon anggota;
  - c. pengelompokan organisasi/asosiasi berdasarkan ruang lingkup organisasi yang diwakili;
  - d. penjelasan tentang wadah koordinasi pengelolaan sumber daya air kepada calon anggota TKPSDA WS Lintas Provinsi;
  - e. fasilitasi pertemuan penetapan calon anggota antar kelompok; dan
  - f. pengajuan calon anggota dari masing-masing kelompok organisasi/ asosiasi.
- (4) Sekretariat TKPSDA WS Lintas Provinsi melaporkan hasil fasilitasi seleksi calon anggota TKPSDA WS Lintas

Provinsi kepada Menteri dan menyiapkan rancangan Keputusan Menteri mengenai pengangkatan anggota TKPSDA WS Lintas Provinsi untuk mendapatkan penetapan.

- (5) Dalam hal sekretariat TKPSDA WS Lintas Provinsi belum terbentuk, penyelenggaraan pemilihan calon anggota TKPSDA WS Lintas Provinsi dilakukan oleh Tim Pemilihan Anggota TKPSDA WS Lintas Provinsi.
- (6) Tim pemilihan sebagaimana dimaksud pada ayat (1) ditetapkan oleh Menteri.
- (7) Tim pemilihan TKPSDA WS Lintas Provinsi, paling sedikit beranggotakan 5 (lima) orang yang terdiri atas unsur instansi yang membidangi sumber daya air, membidangi kehutanan, membidangi pertanian, membidangi lingkungan hidup, dan membidangi perencanaan daerah provinsi terkait.

#### Bagian Ketiga

#### TKPSDA WS Strategis Nasional

#### Paragraf 1

#### Kriteria Pemilihan Anggota

#### Pasal 75

- (1) Pengajuan anggota TKPSDA WS Strategis Nasional dari Unsur Pemerintah sebagaimana dimaksud dalam Pasal 40 ayat (1) didasarkan kriteria sebagai berikut:
  - a. pejabat wakil instansi Pemerintah Pusat sebagai pengelola sumber daya air pada Wilayah Sungai yang bersangkutan adalah pejabat setingkat eselon II pada unit pelaksana teknis yang membidangi sumber daya air;
  - b. pejabat wakil instansi Pemerintah Daerah provinsi setingkat eselon II terkait; dan
  - c. pejabat wakil instansi Pemerintah Daerah kabupaten/kota setingkat eselon II pada wilayah

sungai yang bersangkutan yang membidangi sumber daya air dan/atau yang terkait langsung dengan sumber daya air.

- (2) Anggota dari Unsur Nonpemerintah didasarkan kriteria sebagai berikut:
- a. wakil yang diusulkan oleh kelompok organisasi/asosiasi pengguna, pengusaha sumber daya air, lembaga masyarakat adat atau lembaga masyarakat pelestari lingkungan sumber daya air sebagaimana dimaksud dalam Pasal 41 ayat (1);
  - b. organisasi/asosiasi yang sudah berbadan hukum dan terdaftar pada pemerintah provinsi serta telah berperan aktif di bidang sumber daya air paling sedikit 2 (dua) tahun; dan
  - c. organisasi/asosiasi berkedudukan di provinsi pada Wilayah Sungai yang bersangkutan.

#### Paragraf 2

#### Mekanisme Pemilihan Anggota

#### Pasal 76

- (1) Sekretariat TKPSDA WS Strategis Nasional menetapkan jumlah anggota TKPSDA Strategis Nasional dari Unsur Pemerintah dan Unsur Nonpemerintah sebagaimana dimaksud dalam Pasal 45.
- (2) Sekretariat menentukan kuota setiap kelompok organisasi/asosiasi calon anggota TKPSDA WS Strategis Nasional.
- (3) Sekretariat TKPSDA WS Strategis Nasional melakukan fasilitasi proses seleksi calon anggota dewan sumber daya air provinsi dari Unsur Nonpemerintah melalui tahap:
  - a. pengumuman secara terbuka melalui media cetak dan/atau elektronik;
  - b. pendaftaran calon anggota;
  - c. pengelompokan organisasi/asosiasi berdasarkan ruang lingkup organisasi yang diwakili;

- d. penjelasan tentang wadah koordinasi pengelolaan sumber daya air kepada calon anggota TKPSDA WS Strategis Nasional;
  - e. fasilitasi pertemuan penetapan calon anggota antarkelompok; dan
  - f. pengajuan calon anggota dari masing-masing kelompok organisasi/ asosiasi.
- (4) Sekretariat TKPSDA WS Strategis Nasional melaporkan hasil fasilitasi seleksi calon anggota TKPSDA WS Strategis Nasional kepada Menteri dan menyiapkan rancangan Keputusan Menteri mengenai pengangkatan anggota TKPSDA WS Strategis Nasional untuk mendapatkan penetapan.
  - (5) Dalam hal sekretariat TKPSDA WS Strategis Nasional belum terbentuk, penyelenggaraan pemilihan calon anggota TKPSDA WS Strategis Nasional dilakukan oleh Tim Pemilihan Anggota TKPSDA WS Strategis Nasional.
  - (6) Tim pemilihan sebagaimana dimaksud pada ayat (1) ditetapkan oleh Menteri.
  - (7) Tim pemilihan TKPSDA WS Strategis Nasional paling sedikit beranggotakan 5 (lima) orang yang terdiri atas unsur instansi yang membidangi sumber daya air, membidangi kehutanan, membidangi pertanian, membidangi lingkungan hidup, dan membidangi perencanaan daerah provinsi yang bersangkutan.

Bagian Keempat  
TKPSDA WS Lintas Kabupaten/Kota

Paragraf 1  
Kriteria Pemilihan Anggota

Pasal 77

- (1) Pengajuan anggota TKPSDA WS Lintas Kabupaten/Kota dari Unsur Pemerintah sebagaimana dimaksud dalam Pasal 47 ayat (1) didasarkan kriteria sebagai berikut:

- a. pejabat wakil instansi Pemerintah Daerah provinsi setingkat eselon II terkait; dan
  - b. pejabat instansi Pemerintah Daerah kabupaten/kota setingkat eselon II pada Wilayah Sungai yang bersangkutan yang membidangi sumber daya air.
- (2) Anggota dari Unsur Nonpemerintah didasarkan kriteria sebagai berikut:
- a. wakil yang diusulkan oleh kelompok organisasi/asosiasi pengguna, pengusaha sumber daya air, lembaga masyarakat adat atau lembaga masyarakat pelestari lingkungan sumber daya air sebagaimana dimaksud dalam Pasal 48 ayat (1);
  - b. organisasi/asosiasi berkedudukan di kabupaten/kota pada Wilayah Sungai yang bersangkutan; dan
  - c. organisasi/asosiasi yang sudah berbadan hukum dan terdaftar pada pemerintah provinsi serta telah berperan aktif dibidang sumber daya air paling sedikit 2 (dua) tahun.

#### Paragraf 2

#### Mekanisme Pemilihan Anggota

#### Pasal 78

- (1) Sekretariat TKPSDA WS Lintas Kabupaten/Kota menetapkan jumlah anggota TKPSDA Lintas Kabupaten/Kota dari Unsur Pemerintah dan Unsur Nonpemerintah sebagaimana dimaksud dalam Pasal 77.
- (2) Sekretariat menentukan kuota setiap kelompok organisasi/asosiasi calon anggota TKPSDA WS Lintas Kabupaten/Kota.
- (3) Sekretariat TKPSDA WS Lintas Kabupaten/Kota melakukan fasilitasi proses seleksi calon anggota dewan sumber daya air provinsi dari Unsur Nonpemerintah melalui tahap:
  - a. pengumuman secara terbuka melalui media cetak

- dan/atau elektronik;
- b. pendaftaran calon anggota;
  - c. pengelompokan organisasi/asosiasi berdasarkan ruang lingkup organisasi yang diwakili;
  - d. penjelasan tentang wadah koordinasi pengelolaan sumber daya air kepada calon anggota TKPSDA WS Lintas Kabupaten/Kota;
  - e. fasilitasi pertemuan penetapan calon anggota antarkelompok organisasi/asosiasi; dan
  - f. pengajuan calon anggota dari masing-masing kelompok.
- (4) Sekretariat TKPSDA WS Lintas Kabupaten/Kota melaporkan hasil fasilitasi seleksi calon anggota TKPSDA WS Lintas Kabupaten/Kota kepada gubernur dan menyiapkan rancangan Keputusan Gubernur mengenai pengangkatan anggota TKPSDA WS Lintas Kabupaten/Kota untuk mendapatkan penetapan.
- (5) Dalam hal sekretariat TKPSDA WS Lintas Kabupaten/Kota belum terbentuk, penyelenggaraan pemilihan calon anggota TKPSDA WS Lintas Kabupaten/Kota dilakukan oleh Tim Pemilihan Anggota TKPSDA WS lintas kabupaten/kota.
- (6) Tim pemilihan sebagaimana dimaksud pada ayat (1) ditetapkan oleh gubernur.
- (7) Tim pemilihan TKPSDA WS Lintas Kabupaten/Kota paling sedikit beranggotakan 5 (lima) orang yang terdiri atas unsur instansi yang membidangi sumber daya air, membidangi kehutanan, membidangi pertanian, membidangi lingkungan hidup, dan membidangi perencanaan daerah provinsi yang bersangkutan.

Bagian Kelima  
TKPSDA WS dalam Satu Kabupaten/Kota

Paragraf 1  
Kriteria Pemilihan Anggota

Pasal 79

- (1) Pengajuan anggota TKPSDA WS dalam Satu Kabupaten/Kota dari Unsur Pemerintah sebagaimana dimaksud dalam Pasal 55 ayat (1) adalah pejabat instansi Pemerintah Daerah kabupaten/kota setingkat eselon II terkait.
- (2) Anggota dari Unsur Nonpemerintah didasarkan kriteria sebagai berikut:
  - a. wakil yang diusulkan oleh kelompok organisasi/asosiasi pengguna, pengusaha sumber daya air, lembaga masyarakat adat atau lembaga masyarakat pelestari lingkungan sumber daya air sebagaimana dimaksud dalam Pasal 56 ayat (1);
  - b. organisasi/asosiasi berkedudukan di kabupaten/kota yang bersangkutan; dan
  - c. organisasi/asosiasi yang sudah berbadan hukum dan terdaftar pada pemerintah kabupaten/kota serta telah berperan aktif dibidang sumber daya air paling sedikit 2 (dua) tahun.

Paragraf 2  
Mekanisme Pemilihan Anggota

Pasal 80

- (1) Sekretariat TKPSDA WS dalam Satu Kabupaten/Kota menetapkan jumlah anggota TKPSDA dalam Satu Kabupaten/Kota dari Unsur Pemerintah dan Unsur Nonpemerintah sebagaimana dimaksud dalam Pasal 72.

- (2) Sekretariat menentukan kuota setiap kelompok organisasi/asosiasi calon anggota TKPSDA WS dalam Satu Kabupaten/Kota.
- (3) Sekretariat TKPSDA WS dalam Satu Kabupaten/Kota melakukan fasilitasi proses seleksi calon anggota TKPSDA dalam Satu Kabupaten/Kota dari unsur nonpemerintah melalui tahap:
  - a. pengumuman secara terbuka melalui media cetak dan/atau elektronik;
  - b. pendaftaran calon anggota;
  - c. pengelompokan organisasi/asosiasi berdasarkan ruang lingkup organisasi yang diwakili;
  - d. penjelasan tentang wadah koordinasi pengelolaan sumber daya air kepada calon anggota TKPSDA WS dalam Satu Kabupaten/Kota;
  - e. fasilitasi pertemuan penetapan calon anggota antarkelompok organisasi/asosiasi; dan
  - f. pengajuan calon anggota dari masing-masing kelompok organisasi/asosiasi.
- (4) Sekretariat TKPSDA WS dalam Satu Kabupaten/Kota melaporkan hasil fasilitasi seleksi calon anggota TKPSDA WS dalam Satu Kabupaten/Kota kepada bupati/walikota dan menyiapkan rancangan Keputusan Bupati/Walikota mengenai pengangkatan anggota TKPSDA WS dalam Satu Kabupaten/Kota untuk mendapatkan penetapan
- (5) Dalam hal sekretariat TKPSDA WS dalam Satu Kabupaten/Kota belum terbentuk, penyelenggaraan pemilihan calon anggota TKPSDA WS dalam Satu Kabupaten/Kota dilakukan oleh Tim Pemilihan Anggota TKPSDA WS dalam Satu Kabupaten/Kota.
- (6) Tim pemilihan sebagaimana dimaksud pada ayat (1) ditetapkan oleh bupati/walikota.
- (7) Tim pemilihan TKPSDA WS Dalam Satu Kabupaten/Kota paling sedikit beranggotakan 5 (lima) orang yang terdiri atas unsur instansi yang membidangi sumber daya air, membidangi kehutanan, membidangi pertanian,

membidangi lingkungan hidup, dan membidangi perencanaan daerah kabupaten/kota yang bersangkutan.

## BAB V

### HUBUNGAN KERJA ANTARWADAH KOORDINASI PENGELOLAAN SUMBER DAYA AIR

#### Pasal 81

- (1) Hubungan kerja antar TKPSDA WS bersifat koordinatif dan konsultatif.
- (2) Hubungan kerja yang bersifat koordinatif dan konsultatif sebagaimana dimaksud pada ayat (1) meliputi urusan yang bersifat teknis operasional dalam pembahasan rancangan pola, rancangan rencana, rancangan program dan rancangan kegiatan pengelolaan sumber daya air Wilayah Sungai.

## BAB VI

### PEMBIAYAAN

#### Pasal 82

- (1) Pembiayaan operasional TKPSDA WS Lintas Negara dibebankan kepada Anggaran Pendapatan dan Belanja Negara dan dianggarkan dalam anggaran unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai.
- (2) Pembiayaan operasional TKPSDA WS Lintas Provinsi dibebankan kepada Anggaran Pendapatan dan Belanja Negara dan dianggarkan dalam anggaran unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai.
- (3) Pembiayaan operasional TKPSDA WS Strategis Nasional dibebankan kepada Anggaran Pendapatan dan Belanja Negara dan dianggarkan dalam anggaran unit pelaksana teknis yang membidangi sumber daya air Wilayah Sungai.

- (4) Pembiayaan operasional TKPSDA WS Lintas Kabupaten/Kota dibebankan kepada Anggaran Pendapatan dan Belanja Daerah provinsi dan dianggarkan dalam anggaran dinas yang membidangi sumber daya air.
- (5) Pembiayaan operasional TKPSDA WS Dalam Satu Kabupaten/Kota dibebankan kepada Anggaran Pendapatan dan Belanja Daerah kabupaten/kota dan dianggarkan dalam anggaran dinas yang membidangi sumber daya air.

## BAB VII

### KETENTUAN PERALIHAN

#### Pasal 83

Dengan berlakunya Peraturan Menteri ini:

- a. TKPSDA WS yang telah dibentuk sebelum diundangkannya Peraturan Menteri ini wajib menyesuaikan dengan ketentuan yang tercantum dalam Peraturan Menteri ini; dan
- b. TKPSDA WS yang masih dalam proses pembentukan dilaksanakan sesuai dengan ketentuan yang tercantum dalam Peraturan Menteri ini.

## BAB VIII

### KETENTUAN PENUTUP

#### Pasal 84

Peraturan Menteri ini mulai berlaku pada tanggal diundangkan.

Agar setiap orang mengetahuinya, memerintahkan pengundangan peraturan Menteri ini dengan penempatannya dalam Berita Negara Republik Indonesia.

Ditetapkan di Jakarta  
pada tanggal 15 September 2017

MENTERI PEKERJAAN UMUM  
DAN PERUMAHAN RAKYAT  
REPUBLIK INDONESIA,

ttd.

M. BASUKI HADIMULJONO

Diundangkan di Jakarta  
pada tanggal 22 September 2017

DIREKTUR JENDERAL  
PERATURAN PERUNDANG-UNDANGAN  
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA  
REPUBLIK INDONESIA,

ttd.

WIDODO EKATJAHJANA

BERITA NEGARA REPUBLIK INDONESIA TAHUN 2017 NOMOR 1304

Salinan sesuai dengan aslinya  
KEMENTERIAN PEKERJAAN UMUM DAN  
PERUMAHAN RAKYAT  
Kepala Biro Hukum,  
  
Siti Martini  
NIP. 195803311984122001



## **ANNEX 6-5**

Reviewed Module as Certificated Official Regulation/Standard No.002

Ministerial Regulation 27/PRT/M/2015 on Dam Output 3





MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT  
REPUBLIK INDONESIA

**PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT**

**REPUBLIK INDONESIA**

**NOMOR 27/PRT/M/2015**

**TENTANG**

**BENDUNGAN**

**DENGAN RAHMAT TUHAN YANG MAHA ESA**

**MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT**

**REPUBLIK INDONESIA,**

- Menimbang : a. bahwa untuk menyimpan air yang berlebih pada saat musim penghujan agar dapat dimanfaatkan guna pemenuhan kebutuhan air dan daya air pada waktu diperlukan, serta mengendalikan daya rusak air, yang ditujukan untuk kesejahteraan dan keselamatan umum berdasarkan Pasal 15 Peraturan Pemerintah Nomor 35 Tahun 1991 tentang Sungai, perlu membentuk waduk yang dapat menampung air sebagai bagian dari pengembangan sumber daya air;
- b. bahwa waduk sebagaimana dimaksud pada huruf a, selain berfungsi menampung air dapat pula untuk menampung limbah tambang atau menampung lumpur dalam rangka menjaga keamanan serta keselamatan lingkungan hidup;
- c. bahwa untuk membentuk waduk yang dapat menampung air, limbah tambang, atau lumpur sebagaimana dimaksud pada huruf a dan huruf b, perlu membangun bendungan;
- d. bahwa untuk membangun bendungan sebagaimana dimaksud pada huruf c, yang secara teknis dapat berfungsi sesuai dengan tujuan pembangunan sekaligus dapat menjamin keamanan bendungan, perlu pengaturan mengenai bendungan;

- e. bahwa untuk menjaga kelangsungan fungsi waduk sesuai dengan tujuan pembangunan berdasarkan Pasal 16 Peraturan Pemerintah Nomor 35 Tahun 1991 tentang Sungai, perlu dilakukan pengelolaan yang meliputi eksploitasi dan pemeliharaan waduk;
- f. bahwa sesuai maksud pada huruf a, huruf b, huruf c, dan huruf d serta sesuai dengan Undang-Undang Nomor 11 Tahun 1974 tentang Pengairan, Menteri Pekerjaan Umum dan Perumahan Rakyat memiliki wewenang dan tanggung jawab dalam mengatur dan melaksanakan pengelolaan serta pengembangan sumber daya air;
- g. bahwa guna memberikan dasar dan tuntunan dalam pembangunan dan pengelolaan waduk sebagaimana dimaksud pada huruf a dan huruf e, perlu disusun pedoman pembangunan dan pengelolaan bendungan beserta waduknya;
- h. bahwa berdasarkan pertimbangan sebagaimana dimaksud pada huruf a, huruf b, huruf c, huruf d, huruf e, huruf f, dan huruf g, perlu menetapkan Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat tentang Bendungan;

Mengingat : 1. Undang-Undang Nomor 11 Tahun 1974 tentang Pengairan (Lembaran Negara Republik Indonesia Tahun 1974 Nomor 65, Tambahan Lembaran Negara Republik Indonesia Nomor 3046);

2. Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Tahun 2014 Nomor 244, Tambahan Lembaran Negara Republik Indonesia Nomor 5587);

3. Peraturan Pemerintah Nomor 22 Tahun 1982 tentang Tata Pengaturan Air (Lembaran Negara Republik Indonesia Tahun 1982 Nomor 37, Tambahan Lembaran Negara Republik Indonesia Nomor 3225);

4. Peraturan Presiden Republik Indonesia Nomor 7 Tahun 2015 tentang Organisasi Kementerian Negara (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 8);

5. Peraturan Presiden Republik Indonesia Nomor 15 Tahun 2015 tentang Kementerian Pekerjaan Umum dan Perumahan Rakyat (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 16);
6. Peraturan Menteri Pekerjaan Umum Nomor 08/PRT/M/2010 tentang Organisasi dan Tata Kerja Kementerian Pekerjaan Umum (Berita Negara Republik Indonesia Tahun 2010 Nomor 1304);

**MEMUTUSKAN :**

**Menetapkan : PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT TENTANG BENDUNGAN.**

BAB I

KETENTUAN UMUM

Pasal 1

Dalam Peraturan Menteri ini, yang dimaksud dengan :

1. Bendungan adalah bangunan yang berupa urukan tanah, urukan batu, dan beton, yang dibangun selain untuk menahan dan menampung air, dapat pula dibangun untuk menahan dan menampung limbah tambang, atau menampung lumpur sehingga terbentuk waduk.
2. Waduk adalah wadah buatan yang terbentuk sebagai akibat dibangunnya bendungan.
3. Bangunan pelengkap adalah bangunan berikut komponen dan fasilitasnya yang secara fungsional menjadi satu kesatuan dengan bendungan.
4. Kegagalan bendungan adalah keruntuhan sebagian atau seluruh bendungan atau bangunan pelengkap dan/atau kerusakan yang mengakibatkan tidak berfungsinya bendungan.
5. Pengamanan bendungan adalah kegiatan yang secara sistematis dilakukan untuk mencegah atau menghindari kemungkinan terjadinya kegagalan bendungan.

6. Pemerintah Pusat adalah Presiden Republik Indonesia yang memegang kekuasaan pemerintahan negara Republik Indonesia yang dibantu oleh Wakil Presiden dan menteri sebagaimana dimaksud dalam Undang-Undang Dasar Negara Republik Indonesia Tahun 1945.
7. Pemerintah Daerah adalah kepala daerah sebagai unsur penyelenggara Pemerintahan Daerah yang memimpin pelaksanaan urusan pemerintahan yang menjadi kewenangan daerah otonom.
8. Pemilik bendungan adalah Pemerintah Pusat, pemerintah daerah provinsi, pemerintah daerah kabupaten/kota, atau badan usaha, yang bertanggung jawab atas pembangunan bendungan dan pengelolaan bendungan beserta waduknya.
9. Pembangun bendungan adalah instansi pemerintah yang ditunjuk oleh Pemilik bendungan, badan usaha yang ditunjuk oleh Pemilik bendungan, atau Pemilik bendungan untuk menyelenggarakan pembangunan bendungan.
10. Pengelola bendungan adalah instansi pemerintah yang ditunjuk oleh Pemilik bendungan, badan usaha yang ditunjuk oleh Pemilik bendungan, atau Pemilik bendungan untuk menyelenggarakan pengelolaan bendungan beserta waduknya.
11. Unit pengelola bendungan adalah unit yang merupakan bagian dari Pengelola bendungan yang ditetapkan oleh Pemilik bendungan untuk melaksanakan pengelolaan bendungan beserta waduknya.
12. Komisi Keamanan Bendungan adalah instansi yang bertugas membantu Menteri dalam penanganan keamanan bendungan.
13. Unit pelaksana teknis bidang bendungan adalah unit yang dibentuk untuk memberikan dukungan teknis kepada Komisi Keamanan Bendungan.
14. Daya dukung lingkungan hidup adalah kemampuan lingkungan hidup untuk mendukung peri kehidupan manusia dan makhluk hidup lain.
15. Dokumen pengelolaan lingkungan hidup adalah dokumen yang berisi upaya pengelolaan dan pemantauan lingkungan hidup yang terdiri atas dokumen analisis mengenai dampak lingkungan hidup atau dokumen upaya pengelolaan lingkungan hidup dan upaya pemantauan lingkungan hidup.
16. Menteri adalah menteri yang menyelenggarakan urusan pemerintahan di bidang pengelolaan sumber daya air.

17. Gubernur adalah kepala daerah sebagai unsur penyelenggara Pemerintahan Daerah tingkat provinsi.
18. Bupati/Walikota adalah kepala daerah sebagai unsur penyelenggara Pemerintahan Daerah tingkat kabupaten/kota.

#### Pasal 2

- (1) Peraturan Menteri ini dimaksudkan sebagai pedoman bagi Pemerintah Pusat dan pemerintah daerah dalam penyelenggaraan pembangunan bendungan dan pengelolaan bendungan beserta waduknya.
- (2) Peraturan Menteri ini bertujuan agar pembangunan bendungan dan pengelolaan bendungan beserta waduknya dilaksanakan secara tertib dengan memperhatikan daya dukung lingkungan hidup, kelayakan teknis, kelayakan ekonomis, kelayakan lingkungan, dan keamanan bendungan.
- (3) Pembangunan bendungan dan pengelolaan bendungan beserta waduknya sebagaimana dimaksud pada ayat (1) dan ayat (2), harus dilaksanakan berdasarkan pada konsepsi keamanan bendungan dan kaidah-kaidah keamanan bendungan yang tertuang dalam berbagai norma, standar, pedoman dan manual untuk meningkatkan kemanfaatan fungsi sumber daya air, pengawetan air, pengendalian daya rusak air, dan fungsi pengamanan tampungan limbah tambang atau tampungan lumpur.
- (4) Konsepsi keamanan bendungan sebagaimana dimaksud pada ayat (3), terdiri dari 3 (tiga) pilar yaitu:
  - a. keamanan struktur berupa aman terhadap kegagalan struktural, aman terhadap kegagalan hidraulis, dan aman terhadap kegagalan rembesan;
  - b. operasi, pemeliharaan dan pemantauan; dan
  - c. kesiapsiagaan tindak darurat.

#### Pasal 3

- (1) Ruang lingkup Peraturan Menteri ini meliputi pengaturan pembangunan bendungan dan pengelolaan bendungan beserta waduknya.
- (2) Pembangunan bendungan dan pengelolaan bendungan beserta waduknya sebagaimana dimaksud pada ayat (1), meliputi:
  - a. bendungan dengan tinggi 15 (lima belas) meter atau lebih diukur dari dasar fondasi terdalam;

- b. bendungan dengan tinggi 10 (sepuluh) meter sampai dengan 15 (lima belas) meter diukur dari dasar fondasi terdalam dengan ketentuan:
  - 1) panjang puncak bendungan paling sedikit 500 (lima ratus) meter;
  - 2) daya tampung waduk paling sedikit 500.000 (lima ratus ribu) meter kubik; atau
  - 3) debit banjir maksimal yang diperhitungkan paling sedikit 1.000 (seribu) meter kubik per detik; atau
- c. bendungan yang mempunyai kesulitan khusus pada fondasi atau bendungan yang didesain menggunakan teknologi baru dan/atau bendungan yang mempunyai kelas bahaya tinggi.

## BAB II

### PEMBANGUNAN BENDUNGAN

#### Bagian Kesatu

#### Umum

#### Pasal 4

- (1) Pembangunan bendungan dilakukan untuk pengelolaan sumber daya air.
- (2) Bendungan sebagaimana dimaksud pada ayat (1), berfungsi untuk penyediaan air baku, penyediaan air irigasi, pengendalian banjir, dan/atau pembangkit listrik tenaga air.

#### Pasal 5

Pembangunan bendungan untuk penampungan limbah tambang dan penampungan lumpur mengikuti ketentuan dalam Peraturan Menteri ini.

#### Pasal 6

Instansi pemerintah atau badan usaha dalam melaksanakan pembangunan bendungan wajib menggunakan tenaga kerja yang memiliki keahlian dan keterampilan di bidang bendungan sesuai dengan ketentuan peraturan perundang-undangan.

#### Pasal 7

- (1) Pembangunan bendungan sebagaimana dimaksud dalam Pasal 4 ayat (1) dan Pasal 5, meliputi tahapan:
  - a. persiapan pembangunan;
  - b. perencanaan pembangunan;
  - c. pelaksanaan konstruksi; dan
  - d. pengisian awal waduk.
- (2) Dalam hal pembangunan bendungan dilakukan pada kawasan hutan, pelaksanaan tahapan sebagaimana dimaksud pada ayat (1), dilakukan sesuai dengan ketentuan peraturan perundang-undangan bidang kehutanan.

#### Bagian Kedua

##### Persiapan Pembangunan

##### Paragraf 1

##### Umum

#### Pasal 8

- (1) Pembangunan bendungan untuk pengelolaan sumber daya air disusun berdasarkan rencana pengelolaan sumber daya air pada wilayah sungai yang bersangkutan.
- (2) Dalam hal rencana pengelolaan sumber daya air pada wilayah sungai yang bersangkutan belum ditetapkan, pembangunan bendungan disusun berdasarkan ketersediaan dan kebutuhan air pada wilayah sungai dan rencana tata ruang pada wilayah sungai yang bersangkutan.

#### Pasal 9

- (1) Dalam rangka pembangunan bendungan diperlukan izin penggunaan sumber daya air.
- (2) Bendungan penampung limbah tambang yang tidak memerlukan sumber daya air dan bendungan penampung lumpur tidak memerlukan izin penggunaan sumber daya air.

Paragraf 2

Izin Penggunaan Sumber Daya Air

Pasal 10

- (1) Izin penggunaan sumber daya air sebagaimana dimaksud dalam Pasal 9 ayat (1), diberikan oleh:
  - a. Menteri untuk penggunaan sumber daya air pada wilayah sungai lintas provinsi, wilayah sungai lintas negara, dan wilayah sungai strategis nasional;
  - b. gubernur untuk penggunaan sumber daya air pada wilayah sungai lintas kabupaten/kota; dan
  - c. bupati/walikota untuk penggunaan sumber daya air pada wilayah sungai dalam satu kabupaten/kota.
- (2) Izin penggunaan sumber daya air sebagaimana dimaksud pada ayat (1), diberikan berdasarkan permohonan dari pembangun bendungan.
- (3) Permohonan sebagaimana dimaksud pada ayat (2), harus memenuhi persyaratan administratif dan persyaratan teknis.
- (4) Persyaratan administratif sebagaimana dimaksud pada ayat (3), meliputi dokumen:
  - a. permohonan izin penggunaan sumber daya air;
  - b. identitas Pembangun bendungan; dan
  - c. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (5) Persyaratan teknis sebagaimana dimaksud pada ayat (3), berupa rekomendasi teknis dari unit pelaksana teknis yang membidangi sumber daya air pada wilayah sungai yang bersangkutan.

Pasal 11

- (1) Berdasarkan permohonan izin penggunaan sumber daya air sebagaimana dimaksud dalam Pasal 10 ayat (2), yang memenuhi kelengkapan persyaratan, dalam jangka waktu 30 (tiga puluh) hari sejak permohonan diterima, Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya dalam pengelolaan sumber daya air harus mengeluarkan keputusan untuk memberikan izin atau menolak permohonan izin.

- (2) Dalam hal permohonan izin sebagaimana dimaksud pada ayat (1), disetujui, Menteri, gubernur, atau bupati/walikota memberikan izin penggunaan sumber daya air.
- (3) Dalam hal permohonan izin sebagaimana dimaksud pada ayat (1) ditolak, Menteri, gubernur, atau bupati/walikota harus menyampaikan alasan penolakan secara tertulis.

#### Pasal 12

- (1) Izin sebagaimana dimaksud dalam Pasal 11 ayat (2), paling sedikit memuat:
  - a. identitas Pembangun bendungan;
  - b. lokasi penggunaan sumber daya air;
  - c. maksud dan tujuan pembangunan dan pengelolaan bendungan;
  - d. jenis dan tipe bendungan yang akan dibangun;
  - e. volume air dan/atau jumlah daya air;
  - f. rencana penggunaan sumber daya air;
  - g. ketentuan hak dan kewajiban; dan
  - h. jangka waktu berlakunya izin.
- (2) Jangka waktu sebagaimana dimaksud pada ayat (1) huruf h, dipertimbangkan berdasarkan rencana keuangan investasi pembangunan bendungan dan pengelolaan bendungan beserta waduknya.

#### Pasal 13

- (1) Jangka waktu izin penggunaan sumber daya air sebagaimana dimaksud dalam Pasal 12 ayat (1) huruf h, dapat diperpanjang dengan mengajukan permohonan secara tertulis paling lambat 3 (tiga) bulan sebelum jangka waktu izin berakhir.
- (2) Dalam jangka waktu paling lama 5 (lima) tahun setelah mendapat izin penggunaan sumber daya air, pembangun bendungan harus mengajukan permohonan persetujuan prinsip pembangunan bendungan.

### Bagian Ketiga

#### Persetujuan Prinsip Pembangunan

##### Pasal 14

- (1) Permohonan persetujuan prinsip pembangunan bendungan sebagaimana dimaksud dalam Pasal 13 ayat (2), diajukan oleh Pembangun bendungan kepada:
  - a. Menteri untuk pembangunan bendungan pada wilayah sungai lintas provinsi, wilayah sungai lintas negara, dan wilayah sungai strategis nasional;
  - b. gubernur untuk pembangunan bendungan pada wilayah sungai lintas kabupaten/ kota; dan
  - c. bupati/walikota untuk pembangunan bendungan pada wilayah sungai dalam satu kabupaten/kota.
- (2) Persetujuan prinsip pembangunan sebagaimana dimaksud pada ayat (1), diberikan setelah Pembangun bendungan memperoleh izin penggunaan sumber daya air sebagaimana dimaksud dalam Pasal 10 ayat (1).

##### Pasal 15

- (1) Permohonan persetujuan prinsip pembangunan bendungan sebagaimana dimaksud dalam Pasal 14 ayat (1), harus memenuhi persyaratan administratif dan persyaratan teknis.
- (2) Persyaratan administratif sebagaimana dimaksud pada ayat (1), meliputi dokumen:
  - a. permohonan persetujuan prinsip pembangunan;
  - b. identitas Pembangun bendungan; dan
  - c. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (3) Persyaratan teknis sebagaimana dimaksud pada ayat (1), meliputi:
  - a. rekomendasi teknis dari unit pelaksana teknis yang membidangi sumber daya air pada wilayah sungai yang bersangkutan;
  - b. dokumen studi kelayakan; dan
  - c. dokumen pengelolaan lingkungan hidup.

- (4) Dalam hal bendungan ditujukan untuk penampungan limbah tambang, persyaratan teknis sebagaimana dimaksud pada ayat (3), ditambah dengan rekomendasi teknis dari instansi yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup dan di bidang pertambangan.

#### Pasal 16

- (1) Berdasarkan permohonan persetujuan prinsip pembangunan sebagaimana dimaksud dalam Pasal 14 ayat (1), yang memenuhi kelengkapan persyaratan, dalam jangka waktu 3 (tiga) bulan sejak permohonan diterima, Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya mengeluarkan keputusan untuk memberikan persetujuan atau menolak permohonan persetujuan.
- (2) Penolakan permohonan persetujuan prinsip pembangunan sebagaimana dimaksud pada ayat (1), harus disampaikan secara tertulis disertai dengan alasan penolakan.
- (3) Dalam hal setelah lewat jangka waktu 3 (tiga) bulan, Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya tidak mengeluarkan keputusan, permohonan dinyatakan ditolak.
- (4) Permohonan persetujuan prinsip pembangunan yang ditolak sebagaimana dimaksud pada ayat (3), tidak menghilangkan kewajiban Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya untuk memberikan alasan tertulis.

#### Pasal 17

- (1) Persetujuan prinsip pembangunan bendungan paling sedikit memuat:
  - a. identitas Pembangun bendungan;
  - b. lokasi bendungan yang akan dibangun;
  - c. maksud dan tujuan pembangunan bendungan;
  - d. jenis dan tipe bendungan yang akan dibangun;
  - e. ketentuan hak dan kewajiban; dan
  - f. jangka waktu berlakunya izin.
- (2) Persetujuan prinsip pembangunan bendungan diberikan untuk jangka waktu paling lama 5 (lima) tahun dan dapat diperpanjang 1 (satu) kali untuk jangka waktu 5 (lima) tahun.

- (3) Perpanjangan persetujuan prinsip pembangunan bendungan sebagaimana dimaksud pada ayat (2), diberikan berdasarkan rekomendasi teknis yang dikeluarkan oleh unit pelaksana teknis yang membidangi sumber daya air pada wilayah sungai yang bersangkutan.
- (4) Dalam hal pembangunan bendungan dilakukan untuk penampungan limbah tambang, perpanjangan persetujuan prinsip pembangunan diberikan selain berdasarkan rekomendasi sebagaimana dimaksud pada ayat (3), ditambah dengan rekomendasi teknis dari instansi yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup dan di bidang pertambangan.

#### Pasal 18

Tata cara pemberian persetujuan prinsip pembangunan bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Bagian Keempat

#### Perencanaan Pembangunan

#### Pasal 19

- (1) Perencanaan pembangunan bendungan sebagaimana dimaksud dalam Pasal 7 ayat (1) huruf b meliputi:
  - a. studi kelayakan;
  - b. penyusunan desain; dan
  - c. studi pengadaan tanah.
- (2) Perencanaan pembangunan bendungan sebagaimana dimaksud pada ayat (1), disusun dengan memperhatikan:
  - a. kondisi sumber daya air;
  - b. keberadaan masyarakat;
  - c. benda bersejarah;
  - d. daya dukung lingkungan hidup; dan
  - e. rencana tata ruang wilayah.
- (3) Dalam perencanaan pembangunan bendungan harus dilakukan pertemuan konsultasi publik dengan mengikutsertakan instansi dan masyarakat terkait.

#### Pasal 20

- (1) Untuk perencanaan pembangunan bendungan penampung limbah tambang, kegiatan studi kelayakan dan studi pengadaan tanah sebagaimana dimaksud dalam Pasal 19 ayat (1) huruf a dan huruf c, dapat merupakan bagian dari studi kelayakan dan studi pengadaan tanah kegiatan usaha.
- (2) Dalam hal studi kelayakan dan studi pengadaan tanah kegiatan usaha sebagaimana dimaksud pada ayat (1), tidak mencakup studi kelayakan dan studi pengadaan tanah untuk bendungan, harus dilakukan studi kelayakan dan studi pengadaan tanah khusus untuk bendungan.

#### Pasal 21

- (1) Studi kelayakan sebagaimana dimaksud dalam Pasal 19 ayat (1) huruf a, mencakup pra-studi kelayakan.
- (2) Studi kelayakan sebagaimana dimaksud pada ayat (1), harus disertai dengan studi analisis mengenai dampak lingkungan.
- (3) Studi kelayakan untuk pembangunan bendungan pengelolaan sumber daya air dituangkan dalam dokumen studi kelayakan yang paling sedikit memuat:
  - a. analisis kondisi topografi untuk tapak rencana bendungan, jalan akses, *quarry* dan *borrow area*, penyimpanan material, tempat pembuangan galian, dan daerah genangan;
  - b. analisis geologi yang berkaitan dengan tapak bendungan, lokasi material bahan bendungan dan daerah genangan;
  - c. analisis hidrologi daerah tangkapan air;
  - d. analisis kependudukan di daerah tapak bendungan dan rencana genangan serta daerah penerima manfaat bendungan;
  - e. analisis sosial, ekonomi, dan budaya pada daerah tapak bendungan dan rencana genangan serta daerah penerima manfaat bendungan;
  - f. analisis kelayakan teknis, ekonomis termasuk umur layan bendungan, dan lingkungan untuk setiap alternatif rencana bendungan;
  - g. rencana bendungan yang paling layak dipilih;
  - h. desain pendahuluan bendungan yang paling layak dipilih; dan
  - i. rencana penggunaan sumber daya air.

- (4) Studi kelayakan sebagaimana dimaksud pada ayat (2) dan ayat (3), dilakukan melalui kegiatan survai dan investigasi.
- (5) Kegiatan survai dan investigasi sebagaimana dimaksud pada ayat (4), dilakukan untuk mengumpulkan data dan informasi mengenai topografi, kondisi geologi, hidrologi, hidroorologi, tutupan vegetasi, erositivitas, kependudukan, sosial, ekonomi, dan budaya.
- (6) Kegiatan survai dan investigasi sebagaimana dimaksud pada ayat (5), dilakukan Pembangun bendungan sesuai dengan ketentuan peraturan perundang-undangan.

#### Pasal 22

Dalam hal studi kelayakan dilakukan untuk pembangunan bendungan penampung limbah tambang atau penampung lumpur, harus dilakukan sesuai dengan ketentuan sebagaimana dimaksud dalam Pasal 21 ayat (3) kecuali huruf i.

#### Pasal 23

- (1) Penyusunan desain sebagaimana dimaksud dalam Pasal 19 ayat (1) huruf b, dilakukan melalui kegiatan survai dan investigasi.
- (2) Kegiatan survai dan investigasi sebagaimana dimaksud pada ayat (1), dilakukan oleh Pembangun bendungan sesuai dengan ketentuan peraturan perundang-undangan.
- (3) Desain sebagaimana dimaksud pada ayat (1), dituangkan dalam dokumen yang paling sedikit memuat:
  - a. gambar teknis rencana bendungan beserta bangunan pelengkapannya dan fasilitas yang berkaitan dengan pembangunan bendungan dan peta genangan;
  - b. nota desain yang meliputi kriteria yang dipergunakan dalam menyusun desain dan perhitungan gambar teknis sebagaimana dimaksud pada huruf a;
  - c. spesifikasi teknis yang meliputi ukuran yang harus dipenuhi untuk mencapai kualitas pekerjaan yang disyaratkan dan peralatan yang dipergunakan dalam pelaksanaan konstruksi;

- d. metode pelaksanaan yang paling sedikit meliputi cara pengelakan aliran sungai, penimbunan tubuh bendungan, dan pemasangan peralatan hidromekanikal; dan
- e. rencana anggaran biaya pelaksanaan konstruksi bendungan yang meliputi perhitungan volume pekerjaan dan biaya.

Pasal 24

- (1) Desain sebagaimana dimaksud dalam Pasal 23 ayat (3), diajukan oleh Pembangun bendungan kepada Menteri untuk memperoleh persetujuan desain.
- (2) Persetujuan desain sebagaimana dimaksud pada ayat (1), diberikan Menteri setelah mendapat rekomendasi dari Komisi Keamanan Bendungan.

Pasal 25

- (1) Pengajuan persetujuan desain sebagaimana dimaksud dalam Pasal 24 ayat (1), harus memenuhi persyaratan administratif dan persyaratan teknis.
- (2) Persyaratan administratif sebagaimana dimaksud pada ayat (1), meliputi dokumen:
  - a. permohonan persetujuan desain;
  - b. identitas Pembangun bendungan; dan
  - c. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (3) Persyaratan teknis sebagaimana dimaksud pada ayat (1), meliputi dokumen:
  - a. gambar teknis rencana bendungan beserta bangunan pelengkap dan fasilitas yang berkaitan dengan pembangunan bendungan serta peta genangan;
  - b. nota desain yang meliputi kriteria yang dipergunakan dalam menyusun desain dan perhitungan gambar teknis sebagaimana dimaksud pada huruf a;
  - c. spesifikasi teknis yang meliputi ukuran yang harus dipenuhi untuk mencapai kualitas pekerjaan yang disyaratkan dan peralatan yang dipergunakan dalam pelaksanaan konstruksi;

- d. metode pelaksanaan yang paling sedikit meliputi cara pengelakan aliran sungai, penimbunan tubuh bendungan, dan pemasangan peralatan hidromekanikal; dan
  - e. rencana anggaran biaya pelaksanaan konstruksi bendungan yang meliputi perhitungan volume pekerjaan dan biaya.
- (4) Dalam surat permohonan persetujuan sebagaimana dimaksud pada ayat (2) huruf a, harus dijelaskan maksud dan tujuan pembangunan bendungan.

#### Pasal 26

- (1) Studi pengadaan tanah sebagaimana dimaksud dalam Pasal 19 ayat (1) huruf c, dituangkan dalam dokumen studi pengadaan tanah yang paling sedikit memuat:
- a. lokasi tanah yang diperlukan;
  - b. peta dan luasan tanah;
  - c. status dan kondisi tanah; dan
  - d. rencana pembiayaan.
- (2) Dalam hal pembangunan bendungan memerlukan lahan pada kawasan permukiman, perencanaan pembangunan bendungan perlu dilengkapi dengan studi pemukiman kembali penduduk.

#### Pasal 27

Studi pemukiman kembali penduduk sebagaimana dimaksud dalam Pasal 26 ayat (2), paling sedikit memuat:

- a. data jumlah penduduk yang akan dimukimkan kembali;
- b. kondisi sosial, ekonomi, dan budaya penduduk yang akan dimukimkan kembali;
- c. kondisi lokasi rencana pemukiman kembali penduduk;
- d. kondisi sosial, ekonomi, dan budaya penduduk sekitar lokasi rencana pemukiman kembali;
- e. rencana tindak;
- f. rencana pembiayaan; dan
- g. pemberian ganti rugi berupa uang dan/atau tanah pengganti.

#### Pasal 28

Tata cara penyusunan studi kelayakan, desain, studi pengadaan tanah, dan studi pemukiman kembali penduduk sebagaimana dimaksud dalam Pasal 19 sampai dengan Pasal 27, dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 29

Dalam hal perencanaan pembangunan bendungan sebagaimana dimaksud dalam Pasal 19 ayat (1) berada dalam kawasan hutan, ketentuan mengenai studi kelayakan, penyusunan desain, dan studi pengadaan tanah dilakukan sesuai dengan ketentuan peraturan perundang-undangan bidang kehutanan.

### Bagian Kelima

#### Pelaksanaan Konstruksi

#### Pasal 30

Dalam jangka waktu paling lama 5 (lima) tahun setelah mendapat persetujuan desain, pembangun bendungan harus mengajukan permohonan izin pelaksanaan konstruksi bendungan.

#### Pasal 31

- (1) Pelaksanaan konstruksi bendungan sebagaimana dimaksud dalam Pasal 7 ayat (1) huruf c, wajib dilakukan berdasarkan izin pelaksanaan konstruksi yang diberikan oleh Menteri.
- (2) Izin pelaksanaan konstruksi bendungan sebagaimana dimaksud pada ayat (1), diberikan berdasarkan permohonan yang diajukan oleh Pembangun bendungan.
- (3) Pengajuan permohonan izin pelaksanaan konstruksi bendungan oleh pembangun bendungan sebagaimana dimaksud pada ayat (2), dilakukan paling lama 5 (lima) tahun sejak diberikannya persetujuan desain oleh Menteri.
- (4) Permohonan sebagaimana dimaksud pada ayat (3), harus memenuhi persyaratan administratif dan persyaratan teknis.

#### Pasal 32

- (1) Persyaratan administratif sebagaimana dimaksud dalam Pasal 31 ayat (4), meliputi dokumen:
  - a. permohonan izin pelaksanaan konstruksi;
  - b. pernyataan dari pembangun bendungan mengenai tersedianya lahan untuk lokasi bendungan, sumber material, dan jalan akses menuju lokasi bendungan; dan
  - c. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (2) Persyaratan teknis sebagaimana dimaksud dalam Pasal 31 ayat (4), meliputi dokumen:
  - a. desain bendungan yang telah mendapat persetujuan;
  - b. studi pengadaan tanah; dan
  - c. pengelolaan lingkungan hidup.

#### Pasal 33

- (1) Berdasarkan permohonan izin pelaksanaan konstruksi sebagaimana dimaksud dalam Pasal 31 ayat (2), yang memenuhi kelengkapan persyaratan, dalam jangka waktu paling lama 6 (enam) bulan sejak permohonan diterima, Menteri memberikan izin atau menolak permohonan izin.
- (2) Penolakan permohonan izin pelaksanaan konstruksi sebagaimana dimaksud pada ayat (1), harus disampaikan secara tertulis disertai dengan alasan penolakan.

#### Pasal 34

Izin pelaksanaan konstruksi untuk bendungan penampung limbah tambang diberikan oleh Menteri setelah adanya rekomendasi teknis dari instansi yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup dan di bidang pertambangan.

#### Pasal 35

Izin pelaksanaan konstruksi sebagaimana dimaksud dalam Pasal 33 ayat (1) dan Pasal 34 paling sedikit memuat:

- a. identitas Pembangun bendungan;

- b. lokasi bendungan yang akan dibangun;
- c. maksud dan tujuan pembangunan bendungan;
- d. jenis dan tipe bendungan yang akan dibangun;
- e. gambar dan spesifikasi teknis;
- f. jadwal pelaksanaan konstruksi;
- g. metode pelaksanaan konstruksi;
- h. ketentuan hak dan kewajiban; dan
- i. jangka waktu berlakunya izin.

#### Pasal 36

- (1) Dalam jangka waktu 3 (tiga) tahun sejak diterbitkannya izin pelaksanaan konstruksi, Pembangun bendungan wajib melakukan pelaksanaan konstruksi sesuai dengan jadwal pelaksanaan konstruksi.
- (2) Dalam hal terjadi keadaan tertentu yang mengakibatkan penyelesaian konstruksi tidak dapat dipenuhi sesuai dengan jadwal pelaksanaan konstruksi, pemberi izin dapat memberikan perpanjangan waktu pelaksanaan konstruksi.
- (3) Tata cara pemberian izin pelaksanaan konstruksi bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 37

- (1) Berdasarkan izin pelaksanaan konstruksi dilakukan pelaksanaan konstruksi.
- (2) Pelaksanaan konstruksi sebagaimana dimaksud pada ayat (1), dimulai dengan persiapan pelaksanaan konstruksi yang meliputi:
  - a. pengadaan tanah; dan
  - b. mobilisasi sumber daya.
- (3) Pengadaan tanah sebagaimana dimaksud pada ayat (2) huruf a, dilakukan oleh Pembangun bendungan sesuai dengan hasil studi pengadaan tanah sebagaimana dimaksud dalam Pasal 26 ayat (1), dan dilakukan sesuai dengan ketentuan peraturan perundang-undangan.

- (4) Mobilisasi sumber daya sebagaimana dimaksud pada ayat (2) huruf b, meliputi penyediaan tenaga kerja, peralatan, dan fasilitas pendukung.
- (5) Mobilisasi sumber daya sebagaimana dimaksud pada ayat (4), harus dilaksanakan sesuai dengan ketentuan peraturan perundang-undangan.

#### Pasal 38

- (1) Pelaksanaan konstruksi bendungan dilakukan sesuai dengan desain bendungan yang telah mendapat persetujuan desain sebagaimana dimaksud dalam Pasal 24 ayat (2).
- (2) Pelaksanaan konstruksi sebagaimana dimaksud pada ayat (1), harus mengutamakan teknologi dengan memanfaatkan sumber daya lokal.
- (3) Dalam pelaksanaan konstruksi sebagaimana dimaksud pada ayat (1), dilakukan kegiatan pemantauan lingkungan dan kegiatan pengelolaan lingkungan.

#### Pasal 39

- (1) Dalam hal bendungan dibangun untuk penampungan limbah tambang, pelaksanaan konstruksinya dapat dilakukan dengan cara:
  - a. sekaligus dengan menyelesaikan konstruksi bendungan terlebih dahulu kemudian diikuti penempatan awal limbah tambang; atau
  - b. bertahap yang setiap tahapnya diikuti dengan penempatan limbah tambang.
- (2) Pemeriksaan dan evaluasi dalam pelaksanaan konstruksi secara bertahap sebagaimana dimaksud pada ayat (1) huruf b, harus dilakukan pada setiap tahap oleh Pembangun bendungan.
- (3) Hasil pemeriksaan dan evaluasi sebagaimana dimaksud pada ayat (2), disampaikan oleh Pembangun bendungan kepada Komisi Keamanan Bendungan untuk mendapatkan rekomendasi.
- (4) Rekomendasi sebagaimana dimaksud pada ayat (3), merupakan persyaratan untuk dapat melanjutkan pelaksanaan konstruksi bendungan tahap berikutnya.

#### Pasal 40

- (1) Selama pelaksanaan konstruksi, Pembangun bendungan harus melakukan kegiatan:
  - a. pembersihan lahan genangan;
  - b. pemindahan penduduk dan/atau pemukiman kembali penduduk;
  - c. penyelamatan benda bersejarah; dan/atau
  - d. pemindahan satwa liar yang dilindungi dari daerah genangan.
- (2) Tata cara pelaksanaan kegiatan sebagaimana dimaksud pada ayat (1), dilaksanakan sesuai dengan ketentuan peraturan perundang-undangan.
- (3) Untuk pelaksanaan kegiatan pemindahan penduduk dan/atau pemukiman kembali penduduk sebagaimana dimaksud pada ayat (1) huruf b, harus diperhatikan pula hasil studi pemukiman kembali penduduk sebagaimana dimaksud dalam Pasal 26 ayat (2).
- (4) Kegiatan sebagaimana dimaksud pada ayat (1), harus selesai sebelum pengisian awal waduk.

#### Pasal 41

Pelaksanaan konstruksi bendungan dilakukan sesuai dengan ketentuan peraturan perundang-undangan.

#### Pasal 42

- (1) Selama pelaksanaan konstruksi, Pembangun bendungan harus menyiapkan dokumen:
  - a. rencana pengisian awal waduk;
  - b. rencana pengelolaan bendungan;
  - c. rencana pembentukan unit pengelola bendungan; dan
  - d. rencana tindak darurat.
- (2) Pada akhir pelaksanaan konstruksi, Pembangun bendungan harus membuat laporan akhir pelaksanaan konstruksi bendungan.

#### Pasal 43

- (1) Dalam hal bendungan dibangun untuk penampungan limbah tambang, Pembangun bendungan harus menyiapkan dokumen:
  - a. rencana penempatan awal limbah tambang atau rencana penempatan bertahap;
  - b. pedoman pemeliharaan bendungan dan pola pengisian limbah tambang serta pengeluaran air;
  - c. rencana pembentukan unit pengelola bendungan; dan
  - d. rencana tindak darurat.
- (2) Pembangun bendungan harus membuat laporan akhir atau laporan bertahap pelaksanaan konstruksi bendungan penampung limbah tambang.

#### Pasal 44

Rencana pengisian awal waduk sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf a, memuat:

- a. rencana pelaksanaan pengisian awal;
- b. rencana pemantauan selama pengisian awal; dan
- c. rencana pengawasan dan pengendalian.

#### Pasal 45

- (1) Rencana pengelolaan bendungan sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf b, ditujukan sebagai acuan dalam pelaksanaan operasi dan pemeliharaan bendungan beserta waduknya.
- (2) Pembangunan bendungan yang ditujukan untuk pengelolaan sumber daya air, rencana pengelolaan bendungan sebagaimana dimaksud pada ayat (1), meliputi konservasi sumber daya air pada waduk, pendayagunaan, dan pengendalian daya rusak air.
- (3) Perencanaan untuk pengendalian daya rusak air sebagaimana dimaksud pada ayat (2), disusun secara terpadu dan menyeluruh berdasarkan rencana pengelolaan sumber daya air pada wilayah sungai yang bersangkutan oleh Pembangun bendungan.
- (4) Perencanaan pengendalian daya rusak air harus diselaraskan dengan sistem peringatan dini di wilayah sungai yang bersangkutan.

- (5) Dalam hal pembangunan bendungan ditujukan untuk penampungan limbah tambang, rencana pengelolaan bendungan sebagaimana dimaksud pada ayat (1) ditujukan pula sebagai acuan untuk pelaksanaan penempatan limbah tambang, dan pengeluaran air.

#### Pasal 46

- (1) Rencana pengelolaan bendungan sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf b, memuat pedoman operasi dan pemeliharaan bendungan beserta waduknya.
- (2) Pedoman operasi dan pemeliharaan bendungan beserta waduknya sebagaimana dimaksud pada ayat (1), paling sedikit memuat tata cara pengoperasian fasilitas bendungan dan pemeliharaan bendungan beserta waduknya.
- (3) Pedoman operasi dan pemeliharaan bendungan beserta waduknya dapat ditinjau dan dievaluasi paling sedikit 1 (satu) kali dalam waktu 5 (lima) tahun.
- (4) Hasil peninjauan dan evaluasi sebagaimana dimaksud pada ayat (3), menjadi dasar penyempurnaan pedoman operasi dan pemeliharaan bendungan beserta waduknya.
- (5) Penyusunan pedoman operasi dan pemeliharaan bendungan beserta waduknya dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 47

- (1) Dalam hal rencana pengelolaan bendungan sebagaimana dimaksud dalam Pasal 46 ayat (1), diperuntukkan bagi bendungan pengelolaan sumber daya air, rencana pengelolaan bendungan dilengkapi dengan pola operasi waduk.
- (2) Pola operasi waduk sebagaimana dimaksud pada ayat (1), dilengkapi:
  - a. lengkung batas operasi normal bawah yang disusun berdasar data hidrologi tahun kering; dan
  - b. lengkung batas operasi normal atas yang disusun berdasar data hidrologi tahun basah.
- (3) Pola operasi waduk sebagaimana dimaksud pada ayat (2), paling sedikit memuat tata cara pengeluaran air dari waduk sesuai dengan kondisi volume dan/atau elevasi air waduk dan kebutuhan air serta kapasitas sungai di hilir bendungan.

- (4) Pola operasi waduk sebagaimana dimaksud pada ayat (3), disusun oleh Pembangun bendungan dengan memperoleh masukan teknis dari pengelola sumber daya air pada wilayah sungai yang bersangkutan dan instansi terkait.
- (5) Bagi bendungan seri (*cascade*), penyusunan pola operasi waduk dengan melibatkan pengelola bendungan lain yang terletak dalam satu sungai dengan bendungan yang bersangkutan.
- (6) Pola operasi waduk ditetapkan oleh Pengelola bendungan untuk jangka waktu 5 (lima) tahun.
- (7) Berdasarkan pola operasi waduk sebagaimana dimaksud ayat (6), Pengelola bendungan menyusun rencana tahunan operasi waduk.
- (8) Rencana tahunan operasi waduk sebagaimana dimaksud pada ayat (7), disusun oleh Pengelola bendungan dengan memperoleh masukan teknis dari pengelola sumber daya air pada wilayah sungai yang bersangkutan dan instansi terkait.

#### Pasal 48

- (1) Dalam rencana pengelolaan bendungan yang diperuntukkan bagi penampungan limbah tambang atau penampungan lumpur tidak diperlukan pola operasi waduk.
- (2) Tata cara pengeluaran air dari waduk bagi bendungan yang ditujukan untuk penampungan limbah tambang atau penampungan lumpur, pengeluaran air dari waduk didasarkan atas kondisi volume dan/atau elevasi air waduk.

#### Pasal 49

- (1) Dalam penyusunan rencana pengelolaan bendungan harus dilakukan pertemuan konsultasi publik.
- (2) Rencana pengelolaan bendungan dan hasil pertemuan konsultasi publik sebagaimana dimaksud pada ayat (1), dibahas dalam wadah koordinasi pengelolaan sumber daya air di wilayah sungai bersangkutan untuk mendapatkan pertimbangan.
- (3) Rencana pengelolaan bendungan yang telah mendapatkan pertimbangan sebagaimana dimaksud pada ayat (2), ditetapkan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

- (4) Dalam hal wadah koordinasi pengelolaan sumber daya air wilayah sungai sebagaimana dimaksud pada ayat (2), tidak atau belum terbentuk, rencana pengelolaan bendungan dapat langsung ditetapkan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

#### Pasal 50

Untuk bendungan penampung limbah tambang, rencana pengelolaan bendungan sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf b, ditetapkan oleh menteri yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup setelah mendapat rekomendasi dari Komisi Keamanan Bendungan dan instansi yang menyelenggarakan urusan pemerintahan di bidang pertambangan.

#### Pasal 51

Tata cara penyusunan rencana pengelolaan bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 52

- (1) Rencana pembentukan unit pengelola bendungan sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf c dan Pasal 43 ayat (1) huruf c, paling sedikit memuat:
- a. susunan organisasi;
  - b. uraian tugas;
  - c. kebutuhan sumber daya manusia; dan
  - d. sumber pendanaan.
- (2) Tata cara pembentukan unit pengelola bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 53

- (1) Kesiapsiagaan tindak darurat sebagaimana dimaksud dalam Pasal 2 ayat (4) huruf c, ditujukan agar pengelola bendungan selalu siap menghadapi kondisi terburuk dari bendungan yang dikelolanya.
- (2) Untuk memenuhi kesiapsiagaan tindak darurat sebagaimana dimaksud ayat (1), pengelola bendungan melakukan:
- a. penyusunan rencana tindak darurat;

- b. penyiapan peralatan dan material untuk tindak darurat;
- c. pemutakhiran rencana tindak darurat sesuai kondisi terkini;
- d. penyiapan personil untuk pelaksanaan tindak darurat;
- e. sosialisasi terhadap unsur masarakatmasyarakat yang terpengaruh potensi kegagalan bendungan; dan
- f. sosialisasi terhadap pemerintah daerah provinsi dan pemerintah daerah kabupaten/kota yang wilayahnya terpengaruh potensi kegagalan bendungan.

#### Pasal 54

- (1) Dalam menyusun rancangan rencana tindak darurat, pembangun bendungan memperoleh masukan teknis dari pengelola sumber daya air pada wilayah sungai dan masukan dari unsur masyarakat yang terpengaruh terhadap potensi kegagalan bendungan.
- (2) Rancangan rencana tindak darurat sebagaimana dimaksud pada ayat (1), disampaikan kepada unit pelaksana teknis bendungan untuk memperoleh saran teknis.
- (3) Rancangan rencana tindak darurat sebagaimana dimaksud pada ayat (1), paling sedikit memuat tindakan:
  - a. pengamanan bendungan; dan
  - b. penyelamatan masyarakat serta lingkungan.
- (4) Rancangan rencana tindak darurat sebagaimana dimaksud pada ayat (2), harus dilengkapi dengan analisis keruntuhan bendungan.

#### Pasal 55

- (1) Rencana tindak darurat yang telah disusun sebagaimana dimaksud dalam Pasal 54 ayat (1), dikonsultasikan kepada bupati/walikota dan gubernur yang wilayahnya terpengaruh potensi kegagalan bendungan untuk memperoleh persetujuan rencana penyelamatan masyarakat.
- (2) Dalam hal pengaruh potensi kegagalan bendungan sebagaimana dimaksud pada ayat (1), meliputi wilayah sungai lintas negara, rencana tindak darurat dikonsultasikan kepada bupati/walikota dan gubernur yang wilayahnya terpengaruh potensi kegagalan bendungan serta Menteri.

Pasal 56

- (1) Rencana tindak darurat hasil konsultasi sebagaimana dimaksud dalam Pasal 55, diajukan oleh Pembangun bendungan kepada Pemilik bendungan untuk ditetapkan.
- (2) Rencana tindak darurat sebagaimana dimaksud pada ayat (1), ditetapkan untuk setiap bendungan.

Pasal 57

- (1) Dalam hal pada satu daerah aliran sungai terdapat lebih dari satu bendungan, rencana tindak darurat untuk setiap bendungan harus merupakan satu kesatuan rencana tindak darurat.
- (2) Apabila suatu bendungan dibangun pada daerah aliran sungai yang sudah terdapat bendungan, penyusunan rencana tindak darurat untuk bendungan yang dibangun, selain mengikutsertakan instansi teknis dan unsur masyarakat sebagaimana dimaksud dalam Pasal 53 ayat (1), harus mengikutsertakan Pengelola bendungan yang sudah ada.
- (3) Rencana tindak darurat untuk bendungan yang sudah ada sebagaimana dimaksud pada ayat (2), harus disesuaikan agar menjadi satu kesatuan dengan rencana tindak darurat bendungan lainnya.
- (4) Apabila pada satu daerah aliran sungai dibangun lebih dari satu bendungan dalam waktu bersamaan, penyusunan rencana tindak darurat dilakukan secara terkoordinasi antarpada Pembangun bendungan sehingga rencana tindak darurat setiap bendungan menjadi satu kesatuan rencana tindak darurat.

Pasal 58

- (1) Tindakan pengamanan bendungan sebagaimana dimaksud dalam Pasal 54 ayat (3) huruf a, dilakukan dengan cara:
  - a. memberitahukan kepada pihak terkait dengan bendungan;
  - b. mengoperasikan peralatan hidro-elektro mekanikal bendungan; dan
  - c. melakukan upaya pencegahan keruntuhan bendungan.
- (2) Tindakan pengamanan bendungan sebagaimana dimaksud pada ayat (1), dilakukan oleh Pengelola bendungan.

- (3) Tindakan penyelamatan masyarakat sebagaimana dimaksud dalam Pasal 54 ayat (3) huruf b, dilakukan sesuai dengan ketentuan peraturan perundangundangan.

#### Pasal 59

Rencana tindak darurat yang telah ditetapkan harus disosialisasikan oleh Pembangun bendungan kepada unsur masyarakat yang terpengaruh potensi kegagalan bendungan serta pemerintah daerah provinsi dan pemerintah daerah kabupaten/kota yang wilayahnya terpengaruh potensi kegagalan bendungan.

#### Pasal 60

- (1) Pengelola bendungan harus meninjau kembali rencana tindak darurat apabila terjadi perkembangan kondisi sumber daya air, lingkungan, dan perkembangan keadaan sosial di hilir bendungan.
- (2) Berdasarkan hasil peninjauan kembali sebagaimana dimaksud pada ayat (1), rencana tindak darurat diajukan oleh Pengelola bendungan kepada Pemilik bendungan untuk ditetapkan.

#### Pasal 61

Tata cara penyusunan rencana tindak darurat dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### Bagian Keenam

#### Pengisian Awal Waduk

#### Pasal 62

- (1) Pengisian awal waduk dilakukan setelah pelaksanaan konstruksi bendungan selesai.
- (2) Pengisian awal waduk sebagaimana dimaksud pada ayat (1), wajib dilakukan berdasarkan izin pengisian awal waduk.
- (3) Permohonan izin pengisian awal waduk diajukan oleh Pembangun bendungan kepada Menteri dan tembusannya disampaikan kepada Komisi Keamanan Bendungan.
- (4) Permohonan sebagaimana dimaksud pada ayat (3), harus memenuhi persyaratan administratif dan persyaratan teknis.

- (5) Persyaratan administratif sebagaimana dimaksud pada ayat (4), meliputi dokumen:
- a. permohonan izin pengisian awal waduk;
  - b. identitas Pembangun bendungan;
  - c. rencana pembentukan unit pengelola bendungan; dan
  - d. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (6) Persyaratan teknis sebagaimana dimaksud pada ayat (4), berupa:
- a. laporan akhir pelaksanaan konstruksi;
  - b. laporan pelaksanaan penyiapan daerah genangan waduk;
  - c. rencana pengisian awal waduk;
  - d. rencana pengelolaan bendungan; dan
  - e. rencana tindak darurat.
- (7) Dalam hal Pemilik bendungan merupakan badan usaha, persyaratan administratif sebagaimana dimaksud pada ayat (5), ditambah dengan penyediaan dana amanah untuk biaya pengelolaan pasca penghapusan fungsi bendungan.

### Pasal 63

- (1) Komisi Keamanan Bendungan sebagaimana dimaksud dalam Pasal 62 ayat (3), melakukan penilaian terhadap persyaratan teknis berupa dokumen sebagaimana dimaksud dalam Pasal 62 ayat (6).
- (2) Hasil penilaian sebagaimana dimaksud pada ayat (1), harus disampaikan dalam bentuk rekomendasi kepada Menteri paling lama 3 (tiga) bulan sejak tembusan permohonan diterima.

### Pasal 64

Berdasarkan rekomendasi dari Komisi Keamanan Bendungan sebagaimana dimaksud dalam Pasal 63 ayat (2), dalam jangka waktu paling lama 10 (sepuluh) hari, Menteri memberikan izin pengisian awal waduk.

#### Pasal 65

- (1) Izin pengisian awal waduk sebagaimana dimaksud dalam Pasal 64 paling sedikit memuat:
  - a. identitas Pembangun bendungan;
  - b. lokasi bendungan yang dibangun;
  - c. jenis dan tipe bendungan yang dibangun;
  - d. rencana pengisian awal waduk;
  - e. ketentuan hak dan kewajiban; dan
  - f. data izin penggunaan sumber daya air.
- (2) Dalam jangka waktu 1 (satu) tahun sejak diterbitkannya izin pengisian awal waduk, Pembangun bendungan wajib melaksanakan pengisian awal waduk sesuai dengan rencana pengisian awal waduk sebagaimana dimaksud pada ayat (1) huruf d.

#### Pasal 66

- (1) Berdasarkan izin sebagaimana dimaksud dalam Pasal 64, Pembangun bendungan melakukan pengisian awal waduk.
- (2) Dalam waktu paling lambat 10 (sepuluh) hari sebelum dilakukan pengisian awal waduk, Pembangun bendungan memberitahukan tanggal pelaksanaan pengisian awal waduk kepada gubernur atau bupati/walikota sesuai dengan kewenangannya.

#### Pasal 67

- (1) Untuk bendungan penampung limbah tambang, izin penempatan awal limbah tambang diberikan oleh menteri yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup setelah mendapat rekomendasi dari Komisi Keamanan Bendungan dan instansi yang menyelenggarakan urusan pemerintahan di bidang pertambangan.
- (2) Dalam hal bendungan penampung limbah tambang tidak memerlukan sumber daya air, izin penempatan awal limbah tambang tidak memuat izin penggunaan sumber daya air.

#### Pasal 68

- (1) Tata cara pemberian izin pengisian awal waduk dan izin penempatan awal limbah tambang dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.
- (2) Dana amanah sebagaimana dimaksud dalam Pasal 62 ayat (7), dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri setelah berkoordinasi dengan menteri keuangan.

#### Pasal 69

- (1) Pengisian awal waduk dilaksanakan sesuai dengan rencana pelaksanaan pengisian awal waduk sebagaimana dimaksud dalam Pasal 44 huruf a.
- (2) Sebelum pelaksanaan pengisian awal waduk dimulai, Pembangun bendungan harus memberi tahu masyarakat sekitar daerah genangan waduk dalam jangka waktu paling lambat 7 (tujuh) hari.
- (3) Selama pengisian awal waduk, Pembangun bendungan harus melakukan pemantauan, pengawasan, dan pengendalian sesuai dengan rencana pengisian awal waduk sebagaimana dimaksud dalam Pasal 44.
- (4) Pelaksanaan pengisian awal waduk dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### Bagian Ketujuh

#### Kerja Sama Pembangunan Bendungan

#### Pasal 70

- (1) Pemerintah Pusat, pemerintah daerah provinsi, dan pemerintah daerah kabupaten/kota dapat melakukan kerja sama pembangunan bendungan.
- (2) Kerja sama sebagaimana dimaksud pada ayat (1), dilakukan dengan memperhatikan kepentingan provinsi dan/atau kabupaten/kota dalam wilayah sungai yang bersangkutan.

#### Pasal 71

- (1) Pemerintah Pusat, pemerintah daerah provinsi, dan pemerintah daerah kabupaten/kota dapat melakukan kerja sama pembangunan bendungan dengan badan usaha.

- (2) Kerja sama sebagaimana dimaksud pada ayat (1), dituangkan dalam perjanjian kerja sama pembangunan bendungan sesuai dengan ketentuan peraturan perundang-undangan.

#### Pasal 72

Tata cara kerjasama pembangunan bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### Bagian Kedelapan

#### Pembangunan Bendungan Lain

#### Pasal 73

- (1) Pembangunan bendungan selain bendungan sebagaimana dimaksud dalam Pasal 3 ayat (2), dilakukan sesuai dengan tahapan pembangunan sebagaimana dimaksud dalam Pasal 7.
- (2) Pembangunan bendungan sebagaimana dimaksud pada ayat (1), harus dilaporkan oleh Pembangun bendungan kepada Menteri.
- (3) Persyaratan teknis, tata cara perizinan, persetujuan, dan pelaporan dalam pembangunan bendungan sebagaimana dimaksud pada ayat (1), dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### BAB III

#### PENGELOLAAN BENDUNGAN

##### Bagian Kesatu

##### Umum

#### Pasal 74

- (1) Pengelolaan bendungan beserta waduknya untuk pengelolaan sumber daya air ditujukan untuk menjamin:
  - a. kelestarian fungsi dan manfaat bendungan beserta waduknya;
  - b. efektivitas dan efisiensi pemanfaatan air; dan
  - c. keamanan bendungan.

- (2) Pengelolaan bendungan beserta waduknya sebagaimana dimaksud pada ayat (1) dilaksanakan dengan memperhatikan keseimbangan ekosistem dan daya dukung lingkungan hidup.

#### Pasal 75

Pengelolaan bendungan untuk penampungan limbah tambang dan penampungan lumpur mengikuti ketentuan dalam Peraturan Menteri ini.

#### Pasal 76

- (1) Pengelolaan bendungan beserta waduknya sebagaimana dimaksud dalam Pasal 74 dan Pasal 75 dapat berupa tahapan:
  - a. operasi dan pemeliharaan;
  - b. perubahan atau rehabilitasi; dan
  - c. penghapusan fungsi bendungan.
- (2) Pengelolaan bendungan sebagaimana dimaksud pada ayat (1), diselenggarakan melalui kegiatan:
  - a. pelaksanaan rencana pengelolaan;
  - b. operasi dan pemeliharaan;
  - c. konservasi sumber daya air pada waduk;
  - d. pendayagunaan waduk;
  - e. pengendalian daya rusak air melalui pengendalian bendungan beserta waduknya; dan
  - f. penghapusan fungsi bendungan.
- (3) Kegiatan pengelolaan sebagaimana dimaksud pada ayat (2), dilaksanakan pada bendungan beserta waduknya termasuk daerah sempadan waduk.

#### Pasal 77

- (1) Pengelolaan bendungan beserta waduknya menjadi tanggung jawab Pemilik bendungan.
- (2) Dalam hal Pemerintah Pusat sebagai Pemilik bendungan sebagaimana dimaksud pada ayat (1), dalam pengelolaan bendungan beserta waduknya, Menteri menunjuk unit pelaksana teknis yang membidangi sumber daya air atau badan usaha milik negara sebagai Pengelola bendungan.

- (3) Pengelola bendungan sebagaimana dimaksud pada ayat (2), dalam melaksanakan pengelolaan bendungan beserta waduknya, dibantu oleh unit pengelola bendungan.
- (4) Unit pengelola bendungan sebagaimana dimaksud pada ayat (3), ditetapkan oleh pemilik atau pengelola bendungan.
- (5) Dalam hal Pengelola bendungan sebagaimana dimaksud pada ayat (2), merupakan badan usaha milik negara, penetapan unit pengelola bendungan dilakukan oleh direksi badan usaha milik negara.

#### Pasal 78

- (1) Dalam hal pemerintah daerah provinsi atau pemerintah daerah kabupaten/kota sebagai Pemilik bendungan, untuk pengelolaan bendungan beserta waduknya, gubernur atau bupati/walikota sesuai dengan kewenangannya menunjuk unit pelaksana teknis daerah yang membidangi sumber daya air atau badan usaha milik daerah sebagai Pengelola bendungan.
- (2) Pengelola bendungan sebagaimana dimaksud pada ayat (1), dalam melaksanakan pengelolaan bendungan beserta waduknya, dibantu oleh unit pengelola bendungan.
- (3) Unit pengelola bendungan sebagaimana dimaksud pada ayat (2), ditetapkan oleh pemilik atau pengelola bendungan.

#### Pasal 79

- (1) Dalam hal badan usaha sebagai Pemilik bendungan, untuk pengelolaan bendungan beserta waduknya, Pemilik bendungan menetapkan Pengelola bendungan dan unit pengelola bendungan.
- (2) Pemilik bendungan bertanggung jawab terhadap pengelolaan bendungan sebagaimana dimaksud pada ayat (1).

#### Pasal 80

- (1) Pemilik bendungan sebagaimana dimaksud dalam Pasal 79 ayat (1), yang menghentikan pengelolaan bendungan beserta waduknya harus menyerahkan pengelolaan bendungan beserta waduknya kepada Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

- (2) Dalam hal Pemilik bendungan sebagaimana dimaksud pada ayat (1), tidak menyerahkan pengelolaan sampai dengan 6 (enam) bulan terhitung sejak pengelolaan bendungan dihentikan, Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya mengambil alih pengelolaan bendungan.
- (3) Pemilik bendungan sebagaimana dimaksud pada ayat (1) dan ayat (2), harus menyediakan biaya pengelolaan bendungan sampai dengan berakhirnya umur layan bendungan.
- (4) Jumlah biaya pengelolaan sebagaimana dimaksud pada ayat (3), ditetapkan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya dan berpedoman pada peraturan perundang-undangan.
- (5) Dalam hal sampai dengan berakhirnya umur layan bendungan, Pemilik bendungan tidak menyediakan biaya pengelolaan, bendungan beserta waduknya diambil alih oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya dan berdasarkan ketentuan peraturan perundang-undangan.

#### Pasal 81

- (1) Unit pengelola bendungan sebagaimana dimaksud dalam Pasal 77 ayat (3), Pasal 78 ayat (2), dan Pasal 79 ayat (1), mempunyai tugas untuk melaksanakan pengelolaan bendungan beserta waduknya.
- (2) Unit pengelola bendungan sebagaimana dimaksud pada ayat (1), dipimpin oleh kepala unit pengelola bendungan.
- (3) Kepala unit pengelola bendungan sebagaimana dimaksud pada ayat (2), harus memenuhi persyaratan:
  - a. memiliki sertifikat keahlian bidang bendungan yang dikeluarkan oleh lembaga yang berwenang sesuai dengan ketentuan peraturan perundang-undangan; dan
  - b. memiliki kompetensi dalam pengelolaan bendungan beserta waduknya.
- (4) Persyaratan dan prosedur pembentukan unit pengelola bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

## Bagian Kedua

### Pelaksanaan Rencana Pengelolaan Bendungan

#### Pasal 82

Pelaksanaan rencana pengelolaan bendungan dilakukan sesuai dengan rencana pengelolaan bendungan sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf b.

#### Pasal 83

- (1) Pelaksanaan rencana pengelolaan bendungan dilakukan dengan memperhatikan kondisi sumber daya air dan lingkungan hidup.
- (2) Dalam hal bendungan untuk pengelolaan sumber daya air, pelaksanaan rencana pengelolaan bendungan didasarkan pada:
  - a. ketersediaan sumber daya air;
  - b. kebutuhan air;
  - c. pengendalian banjir; dan/atau
  - d. kebutuhan daya air.
- (3) Dalam hal bendungan untuk penampungan limbah tambang atau penampungan lumpur, pelaksanaan rencana pengelolaan bendungan didasarkan pada:
  - a. jenis limbah tambang atau jenis lumpur; dan
  - b. volume limbah tambang atau volume lumpur per satuan waktu.

## Bagian Ketiga

### Operasi dan Pemeliharaan

#### Pasal 84

Operasi dan pemeliharaan bendungan beserta waduknya terdiri atas:

- a. operasi dan pemeliharaan bendungan;
- b. pemeliharaan waduk; dan
- c. pemantauan bendungan;

Pasal 85

- (1) Operasi dan pemeliharaan bendungan sebagaimana dimaksud dalam Pasal 84 huruf a, dimaksudkan untuk:
  - a. mengoptimalkan pendayagunaan air dan daya air; dan
  - b. menjaga keamanan bendungan.
- (2) Operasi dan pemeliharaan bendungan untuk bendungan penampung limbah tambang ditujukan untuk menjaga keamanan bendungan.

Pasal 86

- (1) Operasi bendungan sebagaimana dimaksud dalam Pasal 84 huruf a, dilakukan dengan mengatur keluaran air waduk guna pemenuhan kebutuhan air di hilir, pengendalian banjir, dan pengamanan bendungan pada keadaan darurat atau luar biasa.
- (2) Operasi bendungan sebagaimana dimaksud pada ayat (1), meliputi:
  - a. operasi normal, untuk memenuhi kebutuhan air di hilir;
  - b. operasi banjir, untuk pengendalian muka air banjir di waduk dan pengendalian banjir daerah hilir; dan
  - c. operasi darurat, untuk penurunan muka air waduk secara cepat pada kondisi darurat.
- (3) Dalam hal terjadi keadaan darurat atau situasi luar biasa, operasi bendungan beserta waduknya diutamakan untuk tujuan keamanan bendungan dan keselamatan lingkungan hidup.

Pasal 87

- (1) Pemeliharaan sebagaimana dimaksud dalam Pasal 84 huruf a, meliputi:
  - a. pemeliharaan pencegahan, ditujukan untuk mencegah terjadinya kerusakan dan kemunduran mutu bendungan dan bangunan pelengkap, serta memperpanjang umur manfaat.
  - b. pemeliharaan luar biasa, dilakukan berdasar kebutuhan diluar jadwal pemeliharaan yang telah ditetapkan, ditujukan untuk perbaikan kerusakan yang disebabkan oleh kemunduran mutu, banjir, gempa bumi, kemacetan peralatan, kegagalan (struktural, hidrolis, rembesan, operasi, dll), vandalisme, dan lain sebagainya.

- (2) Pemeliharaan pencegahan sebagaimana dimaksud ayat (1) huruf a, dilakukan:
  - a. secara rutin (pemeliharaan rutin); dan
  - b. secara berkala atau terjadwal (pemeliharaan berkala).
- (3) Pemeliharaan luar biasa sebagaimana dimaksud ayat (1) huruf b, meliputi:
  - a. pekerjaan perbaikan (*repair, remedial work*);
  - b. pekerjaan perkuatan; dan
  - c. rehabilitasi.

#### Pasal 88

- (1) Pemeliharaan waduk sebagaimana dimaksud dalam Pasal 84 huruf b, dimaksudkan untuk:
  - a. mempertahankan fungsi waduk sesuai dengan umur layan;
  - b. menjaga kuantitas dan kualitas air waduk; dan
  - c. menjaga keamanan bendungan.
- (2) Pemeliharaan waduk untuk waduk penampung limbah tambang dimaksudkan untuk pengamanan tampungan limbah tambang.

#### Pasal 89

Pemantauan bendungan sebagaimana dimaksud dalam Pasal 84 huruf c, dilakukan dengan tujuan untuk mengetahui gejala permasalahan pada bendungan secara dini guna pengambilan tindakan oleh pengelola bendungan secara cepat dan tepat.

#### Pasal 90

- (1) Dokumen laporan akhir pelaksanaan konstruksi yang dibuat oleh pembangun bendungan dipergunakan sebagai salah satu acuan dalam pelaksanaan operasi dan pemeliharaan bendungan.
- (2) Dalam hal bendungan untuk penampungan limbah tambang, dokumen laporan akhir atau laporan bertahap pelaksanaan konstruksi yang dibuat oleh pembangun bendungan digunakan sebagai salah satu acuan dalam pelaksanaan operasi dan pemeliharaan bendungan.

#### Pasal 91

- (1) Pelaksanaan operasi bendungan wajib dilakukan berdasarkan izin operasi bendungan yang dikeluarkan oleh Menteri.
- (2) Izin operasi bendungan sebagaimana dimaksud pada ayat (1), diberikan berdasarkan permohonan yang diajukan oleh Pengelola bendungan.
- (3) Permohonan sebagaimana dimaksud pada ayat (2), harus memenuhi persyaratan administratif dan persyaratan teknis.
- (4) Persyaratan administratif sebagaimana dimaksud pada ayat (3), meliputi dokumen:
  - a. permohonan izin operasi bendungan;
  - b. identitas Pengelola bendungan;
  - c. keputusan pembentukan unit pengelola bendungan; dan
  - d. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (5) Persyaratan teknis sebagaimana dimaksud pada ayat (3), berupa:
  - a. data teknis bendungan;
  - b. laporan pengisian awal waduk;
  - c. laporan analisis perilaku bendungan;
  - d. pedoman operasi dan pemeliharaan bendungan beserta waduknya; dan
  - e. laporan kejadian khusus selama pengisian awal waduk.

#### Pasal 92

- (1) Menteri melakukan penilaian terhadap permohonan sebagaimana dimaksud dalam Pasal 91 ayat (2).
- (2) Menteri dalam melakukan penilaian terhadap substansi persyaratan teknis sebagaimana dimaksud pada ayat (1), menunjuk Komisi Keamanan Bendungan untuk melakukan penilaian dan memberikan rekomendasi.
- (3) Penilaian sebagaimana dimaksud pada ayat (2), dilaksanakan dalam jangka waktu paling lama 3 (tiga) bulan.

- (4) Dalam hal berdasarkan hasil penilaian sebagaimana dimaksud pada ayat (2), persyaratan teknis pengoperasian bendungan belum dipenuhi, Pengelola bendungan harus memperbaiki persyaratan teknis pengoperasian dan menyampaikan kembali perbaikan persyaratan teknis kepada Menteri dalam jangka waktu paling lama 1 (satu) bulan sejak permohonan izin dikembalikan kepada Pengelola bendungan.
- (5) Dalam hal dokumen sebagaimana dimaksud pada ayat (2), atau dokumen perbaikan sebagaimana dimaksud pada ayat (4), telah memenuhi persyaratan teknis, Menteri memberikan izin operasi bendungan.

#### Pasal 93

Izin operasi bendungan paling sedikit memuat:

- a. identitas Pengelola bendungan;
- b. lokasi bendungan yang dibangun;
- c. maksud dan tujuan pembangunan bendungan;
- d. jenis dan tipe bendungan yang dibangun;
- e. rencana operasi dan pemeliharaan bendungan beserta waduknya; dan
- f. ketentuan hak dan kewajiban.

#### Pasal 94

Dalam hal bendungan untuk penampungan limbah tambang, izin operasi bendungan diberikan oleh menteri yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup setelah mendapat rekomendasi dari Komisi Keamanan Bendungan dan instansi yang menyelenggarakan urusan pemerintahan di bidang pertambangan.

#### Pasal 95

- (1) Operasi dan pemeliharaan bendungan beserta waduknya dilakukan sesuai dengan rencana pengelolaan bendungan sebagaimana dimaksud dalam Pasal 42 ayat (1) huruf b.
- (2) Operasi dan pemeliharaan bendungan beserta waduknya ditujukan untuk memfungsikan dan merawat bendungan beserta waduknya termasuk memantau volume waduk agar terjaga keamanan dan fungsinya.

- (3) Untuk bendungan pengelolaan sumber daya air, pemantauan volume waduk sebagaimana dimaksud pada ayat (2), dilakukan dengan pencatatan tinggi muka air waduk, dan pengukuran sedimentasi waduk.
- (4) Pengukuran sedimentasi waduk sebagaimana dimaksud pada ayat (3), dilakukan paling sedikit 1 (satu) kali dalam 5 (lima) tahun.

#### Pasal 96

- (1) Operasi dan pemeliharaan bendungan beserta waduknya harus dilakukan setiap saat.
- (2) Dalam hal terjadi situasi luar biasa, operasi dan pemeliharaan bendungan beserta waduknya diutamakan untuk tujuan keamanan bendungan dan keselamatan lingkungan hidup.

#### Pasal 97

Pelaksanaan operasi dan pemeliharaan bendungan beserta waduknya untuk bendungan pengelolaan sumber daya air harus sesuai dengan pedoman operasi dan pemeliharaan bendungan beserta waduknya serta pola operasi waduk.

#### Pasal 98

Pelaksanaan operasi dan pemeliharaan bendungan beserta waduknya untuk bendungan penampung limbah tambang atau penampung lumpur harus sesuai dengan pedoman operasi dan pemeliharaan bendungan beserta waduknya dan tata cara pengeluaran air dari waduk.

#### Pasal 99

Tata cara pemberian izin operasi bendungan serta pelaksanaan operasi dan pemeliharaan bendungan beserta waduknya dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### Bagian Keempat

#### Konservasi Sumber Daya Air pada Waduk

##### Paragraf 1

##### Umum

#### Pasal 100

- (1) Konservasi sumber daya air pada waduk untuk pengelolaan sumber daya air ditujukan untuk menjaga kelangsungan keberadaan, daya dukung, daya tampung, dan fungsi sumber daya air pada waduk.

- (2) Untuk mencapai tujuan konservasi sumber daya air pada waduk sebagaimana dimaksud pada ayat (1), dilakukan kegiatan:
- a. perlindungan dan pelestarian waduk;
  - b. pengawetan air; dan
  - c. pengelolaan kualitas air dan pengendalian pencemaran air.

## Paragraf 2

### Perlindungan dan Pelestarian Waduk

#### Pasal 101

- (1) Perlindungan dan pelestarian waduk sebagaimana dimaksud dalam Pasal 100 ayat (2) huruf a, bertujuan untuk menjaga waduk agar terpelihara keberadaan, keberlanjutan serta menjaga fungsi waduk terhadap kerusakan atau gangguan yang disebabkan, baik oleh daya alam maupun tindakan manusia.
- (2) Perlindungan dan pelestarian waduk sebagaimana dimaksud pada ayat (1), dilaksanakan dengan cara menetapkan dan mengelola kawasan lindung waduk, vegetatif, dan/atau rekayasa teknik sipil melalui pendekatan sosial, ekonomi, dan budaya masyarakat sekitar.
- (3) Perlindungan dan pelestarian waduk sebagaimana dimaksud pada ayat (1), dilakukan melalui:
- a. pemeliharaan kelangsungan fungsi daerah tangkapan air;
  - b. pengawasan penggunaan lahan pada daerah tangkapan air;
  - c. pembuatan bangunan pengendali erosi dan sedimentasi;
  - d. pengendalian pemanfaatan ruang pada waduk;
  - e. pengendalian pengolahan tanah pada kawasan hulu waduk;
  - f. pengaturan daerah sempadan waduk; dan
  - g. peningkatan kesadaran, partisipasi, dan pemberdayaan pemilik kepentingan dalam pelestarian waduk dan lingkungannya.

#### Pasal 102

- (1) Pemeliharaan kelangsungan fungsi daerah tangkapan air sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf a, dilakukan pada kawasan hulu waduk.
- (2) Dalam pemeliharaan kelangsungan fungsi daerah tangkapan air, Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya menetapkan:
  - a. kawasan yang berfungsi sebagai daerah tangkapan air;
  - b. norma, standar, dan prosedur pelestarian fungsi daerah tangkapan air;
  - c. tata cara pengelolaan kawasan daerah tangkapan air;
  - d. penyelenggaraan program pelestarian fungsi daerah tangkapan air; dan
  - e. pemberdayaan masyarakat dalam pelestarian fungsi daerah tangkapan air.
- (3) Dalam hal Pemilik bendungan merupakan badan usaha, penyelenggaraan program pelestarian fungsi daerah tangkapan air dan pemberdayaan masyarakat dalam pelestarian fungsi daerah tangkapan air sebagaimana dimaksud pada ayat (2) huruf d dan huruf e, dilakukan oleh Pemilik bendungan.
- (4) Dalam pelaksanaan kegiatan sebagaimana dimaksud pada ayat (3), Pemilik bendungan dapat meminta bantuan kepada Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya untuk mengoordinasikan penyelenggaraannya.

#### Pasal 103

- (1) Pengawasan penggunaan lahan pada daerah tangkapan air sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf b, dilakukan oleh menteri yang menyelenggarakan urusan pemerintahan yang terkait dengan bidang sumber daya air, gubernur, atau bupati/walikota sesuai dengan kewenangannya.
- (2) Dalam hal Pemilik bendungan merupakan badan usaha, pengawasan sebagaimana dimaksud pada ayat (1), dilakukan oleh menteri yang menyelenggarakan urusan pemerintahan yang terkait dengan bidang sumber daya air, gubernur, atau bupati/walikota sesuai dengan kewenangannya serta Pemilik bendungan.

- (3) Dalam hal bendungan sebagaimana dimaksud pada ayat (1), dimiliki oleh badan usaha, Pemilik bendungan melakukan pemantauan penggunaan lahan pada daerah tangkapan air.
- (4) Apabila dari hasil pemantauan sebagaimana dimaksud pada ayat (3), menunjukkan terjadinya perubahan penggunaan lahan pada daerah tangkapan air, Pemilik bendungan harus melaporkan kepada menteri yang menyelenggarakan urusan pemerintahan yang terkait dengan bidang sumber daya air, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

#### Pasal 104

- (1) Pembuatan bangunan pengendali erosi dan sedimentasi sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf c, menjadi tanggung jawab Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.
- (2) Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya menetapkan:
  - a. lokasi bangunan pengendali erosi dan sedimentasi;
  - b. pelaksanaan pembangunan pengendali erosi dan sedimentasi; dan
  - c. pemberdayaan masyarakat dalam rangka pembangunan pengendali erosi dan sedimentasi.
- (3) Dalam hal Pemilik bendungan merupakan badan usaha, pelaksanaan pembangunan pengendali erosi dan sedimentasi serta pemberdayaan masyarakat sebagaimana dimaksud pada ayat (2) huruf b dan huruf c, dilakukan oleh Pemilik bendungan.
- (4) Dalam pelaksanaan pembangunan pengendali erosi dan sedimentasi serta pemberdayaan masyarakat sebagaimana dimaksud pada ayat (3), Pemilik bendungan dapat meminta bantuan kepada Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya untuk mengoordinasikan penyelenggaraannya.

#### Pasal 105

- (1) Pengendalian pemanfaatan ruang pada waduk sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf d, meliputi daerah genangan waduk dan daerah sempadan waduk.

- (2) Dalam rangka pengendalian pemanfaatan ruang pada waduk sebagaimana dimaksud pada ayat (1), Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya menetapkan:
  - a. pemanfaatan ruang pada waduk;
  - b. pengelolaan ruang pada waduk; dan
  - c. pemberdayaan masyarakat dalam pengendalian pemanfaatan ruang pada waduk.
- (3) Pemanfaatan ruang pada daerah genangan waduk hanya dapat dilakukan untuk:
  - a. kegiatan pariwisata;
  - b. kegiatan olahraga; dan/atau
  - c. budi daya perikanan.
- (4) Pemanfaatan ruang pada daerah sempadan waduk hanya dapat dilakukan untuk:
  - a. kegiatan penelitian;
  - b. kegiatan pengembangan ilmu pengetahuan; dan/atau
  - c. upaya mempertahankan fungsi daerah sempadan waduk.
- (5) Penggunaan ruang di daerah sempadan waduk dilakukan dengan memperhatikan:
  - a. fungsi waduk agar tidak terganggu oleh aktivitas yang berkembang di sekitarnya;
  - b. kondisi sosial, ekonomi, dan budaya setiap daerah; dan
  - c. daya rusak air waduk terhadap lingkungannya.
- (6) Pemanfaatan ruang pada daerah genangan waduk sebagaimana dimaksud pada ayat (3), dan daerah sempadan waduk sebagaimana dimaksud pada ayat (4), hanya dapat dilakukan berdasarkan izin dari Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya setelah mendapat rekomendasi dari unit pelaksana teknis yang membidangi sumber daya air pada wilayah sungai yang bersangkutan.

- (7) Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya menyelenggarakan pengawasan dan pemantauan pemanfaatan ruang.
- (8) Pemanfaatan ruang untuk budi daya perikanan sebagaimana dimaksud pada ayat (3) huruf c, dengan menggunakan karamba atau jaring apung harus berdasarkan hasil kajian yang dilakukan oleh Pengelola bendungan.
- (9) Hasil kajian sebagaimana dimaksud pada ayat (8), paling sedikit meliputi substansi:
  - a. fungsi sumber air;
  - b. daya tampung waduk;
  - c. daya dukung lingkungan; dan
  - d. tingkat kekokohan/daya tahan struktur bendungan beserta bangunan pelengkap.
- (10) Hasil kajian sebagaimana dimaksud pada ayat (8) dan ayat (9) sebagai dasar dalam pemberian izin pemanfaatan ruang untuk budi daya perikanan dengan menggunakan karamba atau jaring apung.
- (11) Persyaratan dan tata cara permohonan serta pengkajian pemanfaatan ruang pada waduk dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 106

- (1) Dalam hal Pemilik bendungan merupakan badan usaha, pelaksanaan kegiatan pengembangan ilmu pengetahuan sebagaimana dimaksud dalam Pasal 105 ayat (4) huruf b, serta upaya mempertahankan fungsi daerah sempadan waduk sebagaimana dimaksud dalam Pasal 105 ayat (4) huruf c, dilakukan oleh Pemilik bendungan.
- (2) Pelaksanaan kegiatan oleh Pemilik bendungan sebagaimana dimaksud pada ayat (1), dikoordinasikan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

#### Pasal 107

- (1) Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya menyelenggarakan pengendalian pengolahan tanah pada kawasan hulu waduk sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf e.

- (2) Penyelenggaraan pengendalian pengolahan tanah pada kawasan hulu waduk sebagaimana dimaksud pada ayat (1) dilakukan melalui kegiatan:
  - a. pencegahan kelongsoran;
  - b. pengendalian laju erosi tanah;
  - c. pengendalian tingkat sedimentasi pada waduk; dan/atau
  - d. peningkatan peresapan air ke dalam tanah.
- (3) Pengendalian pengolahan tanah sebagaimana dimaksud pada ayat (2), dilakukan dengan memperhatikan kaidah konservasi dan fungsi lindung sesuai dengan ketentuan peraturan perundang-undangan.
- (4) Kaidah konservasi sebagaimana dimaksud pada ayat (3), meliputi:
  - a. perlindungan sistem penyangga kehidupan;
  - b. pengawetan keanekaragaman jenis tumbuhan dan satwa beserta ekosistemnya; dan
  - c. pemanfaatan secara lestari sumber daya alam hayati dan ekosistemnya.
- (5) Dalam hal Pemilik bendungan merupakan badan usaha, pelaksanaan kegiatan sebagaimana dimaksud pada ayat (2), dilakukan oleh Pemilik bendungan.
- (6) Pelaksanaan kegiatan oleh Pemilik bendungan sebagaimana dimaksud pada ayat (5), dikoordinasikan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

#### Pasal 108

- (1) Pengaturan daerah sempadan waduk sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf f, merupakan pengaturan kawasan perlindungan waduk.
- (2) Kawasan perlindungan waduk sebagaimana dimaksud pada ayat (1), meliputi ruang antara garis muka air waduk tertinggi dan garis sempadan waduk.
- (3) Garis sempadan waduk sebagaimana dimaksud pada ayat (2), merupakan batas luar perlindungan waduk.

#### Pasal 109

- (1) Garis sempadan waduk ditetapkan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya berdasarkan usulan dari Pengelola bendungan.

- (2) Usulan sebagaimana dimaksud pada ayat (1), harus didasarkan pada kriteria penetapan garis sempadan waduk.
- (3) Kriteria penetapan garis sempadan waduk sebagaimana dimaksud pada ayat (2), meliputi:
  - a. karakteristik waduk, dimensi waduk, morfologi waduk, dan ekologi waduk;
  - b. operasi dan pemeliharaan bendungan beserta waduknya; dan
  - c. tinggi jagaan bendungan.
- (4) Tata cara penetapan garis sempadan waduk dan pemanfaatan daerah sempadan waduk termasuk sabuk hijau waduk dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 110

- (1) Dalam rangka mempertahankan fungsi daerah sempadan waduk, Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya menyelenggarakan pengawasan dan pemantauan pelaksanaan pengaturan daerah sempadan waduk.
- (2) Dalam hal Pemilik bendungan merupakan badan usaha, penyelenggaraan pengawasan dan pemantauan pengaturan daerah sempadan waduk sebagaimana dimaksud pada ayat (1), dilakukan oleh Pemilik bendungan.
- (3) Penyelenggaraan oleh Pemilik bendungan sebagaimana dimaksud pada ayat (2), dikoordinasikan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

#### Pasal 111

Untuk mempertahankan kawasan perlindungan waduk, setiap orang dilarang:

- a. membuang air limbah yang tidak memenuhi baku mutu, limbah padat, dan/atau limbah cair; dan/atau
- b. mendirikan bangunan dan memanfaatkan lahan yang dapat mengganggu aliran air, mengurangi kapasitas tampung waduk, atau tidak sesuai dengan peruntukannya.

#### Pasal 112

- (1) Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya melakukan upaya peningkatan kesadaran, partisipasi, dan pemberdayaan pemilik kepentingan dalam pelestarian waduk dan lingkungannya sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf g.
- (2) Dalam hal Pemilik bendungan merupakan badan usaha, upaya peningkatan kesadaran, partisipasi, dan pemberdayaan pemilik kepentingan dalam pelestarian waduk dan lingkungannya sebagaimana dimaksud dalam Pasal 101 ayat (3) huruf g, dilakukan oleh Pemilik bendungan.

#### Paragraf 3

##### Pengawetan Air

#### Pasal 113

- (1) Pengawetan air pada waduk sebagaimana dimaksud dalam Pasal 100 ayat (2) huruf b, ditujukan untuk memelihara keberadaan dan ketersediaan air atau kuantitas air sesuai dengan fungsi dan manfaatnya.
- (2) Pengawetan air pada waduk sebagaimana dimaksud pada ayat (1), dilakukan dengan cara:
  - a. menyimpan air yang berlebih pada waduk untuk dimanfaatkan pada waktu diperlukan;
  - b. menghemat air melalui pemakaian yang efisien dan efektif; dan/atau
  - c. mengendalikan penggunaan air pada waduk.

#### Paragraf 4

##### Pengelolaan Kualitas Air dan

##### Pengendalian Pencemaran Air

#### Pasal 114

- (1) Pengelolaan kualitas air dilakukan untuk mempertahankan atau memulihkan kualitas air yang masuk dan yang berada di dalam waduk.
- (2) Pengelolaan kualitas air untuk air yang masuk sebagaimana dimaksud pada ayat (1), dilakukan oleh Pengelola bendungan melalui kegiatan perbaikan kualitas air.

- (3) Pengelolaan kualitas air untuk air yang berada di dalam waduk sebagaimana dimaksud pada ayat (1), dilakukan oleh Pengelola bendungan melalui kegiatan:
- a. pemantauan kualitas air pada waduk terkait dengan pemanfaatan air dan kesehatan lingkungan;
  - b. pengendalian kerusakan waduk;
  - c. aerasi pada waduk;
  - d. pemanfaatan organisme dan mikroorganisme yang dapat menyerap bahan pencemar pada waduk; dan
  - e. pengendalian gulma air.

#### Pasal 115

- (1) Pengendalian pencemaran air dilakukan untuk mempertahankan kualitas air yang masuk dan yang berada di dalam waduk.
- (2) Pengendalian pencemaran air untuk air yang masuk sebagaimana dimaksud pada ayat (1), dilakukan oleh Pengelola bendungan melalui kegiatan pencegahan masuknya pencemar ke dalam air yang akan masuk ke waduk.
- (3) Pengendalian pencemaran air untuk air yang berada di dalam waduk sebagaimana dimaksud pada ayat (1), dilakukan oleh Pengelola bendungan melalui kegiatan:
- a. pencegahan masuknya pencemar ke dalam waduk; dan
  - b. penanggulangan pencemaran air pada waduk.

#### Bagian Kelima

#### Pendayagunaan Waduk

#### Pasal 116

- (1) Pendayagunaan waduk untuk pengelolaan sumber daya air ditujukan untuk meningkatkan kemanfaatan sumber daya air guna kepentingan wilayah sekitar atau lingkungan waduk serta pada kawasan hilir waduk.
- (2) Pendayagunaan waduk sebagaimana dimaksud pada ayat (1), meliputi pendayagunaan ruang waduk untuk:
- a. penyimpanan air; dan

- b. pengendalian banjir.
- (3) Pendayagunaan waduk sebagaimana dimaksud pada ayat (2), dilakukan melalui kegiatan:
  - a. penatagunaan waduk;
  - b. penyediaan air dan/atau daya air pada waduk;
  - c. penggunaan atau pengusaha air dan/atau daya air pada waduk; dan
  - d. pengusaha kawasan bendungan beserta waduknya.

#### Pasal 117

Pendayagunaan waduk untuk penampungan limbah tambang atau penampungan lumpur ditujukan untuk penyediaan ruang waduk guna penampungan limbah tambang atau penampungan lumpur.

#### Pasal 118

- (1) Penatagunaan waduk sebagaimana dimaksud dalam Pasal 116 ayat (3) huruf a, dilakukan apabila terjadi perubahan ruang dalam waduk akibat adanya sedimen dan/atau pemanfaatan air waduk dan daya air waduk untuk keperluan lain.
- (2) Penatagunaan waduk sebagaimana dimaksud pada ayat (1) ditujukan untuk menetapkan zona pemanfaatan waduk dan peruntukan air pada waduk.

#### Pasal 119

- (1) Zona pemanfaatan waduk sebagaimana dimaksud dalam Pasal 118 ayat (2), meliputi ruang waduk sampai dengan garis sempadan waduk sebagai fungsi lindung dan fungsi budi daya.
- (2) Zona pemanfaatan waduk ditetapkan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya berdasarkan usulan Pengelola bendungan.
- (3) Penetapan zona sebagaimana dimaksud pada ayat (2), dilakukan dengan memperhatikan:
  - a. fluktuasi air yang dipengaruhi oleh musim;
  - b. kepentingan berbagai jenis pemanfaatan;
  - c. peran masyarakat sekitar waduk dan pihak lain yang berkepentingan;

- d. fungsi kawasan dan fungsi waduk; dan
- e. keamanan bendungan beserta bangunan pelengkap.

Pasal 120

- (1) Peruntukan air pada waduk sebagaimana dimaksud dalam Pasal 118 ayat (2), ditetapkan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya berdasarkan usulan Pengelola bendungan.
- (2) Penetapan peruntukan air pada waduk sebagaimana dimaksud pada ayat (1), dilakukan dengan memperhatikan:
  - a. daya tampung waduk;
  - b. perhitungan dan proyeksi aliran air masuk waduk; dan
  - c. kebutuhan air dan/atau daya air.

Pasal 121

- (1) Penyediaan air dan/atau daya air pada waduk sebagaimana dimaksud dalam Pasal 116 ayat (3) huruf b, ditujukan untuk pemenuhan kebutuhan air dan daya air sesuai tujuan pengelolaan bendungan beserta waduknya.
- (2) Penyediaan air dan daya air dilaksanakan sesuai dengan pola operasi waduk sebagaimana dimaksud dalam Pasal 47.

Pasal 122

- (1) Penggunaan atau pengusahaan air dan/atau daya air pada waduk sebagaimana dimaksud dalam Pasal 116 ayat (3) huruf c, ditujukan untuk pemenuhan kebutuhan air dan/atau daya air sesuai dengan tujuan pembangunan bendungan beserta waduknya.
- (2) Penggunaan atau pengusahaan air dan/atau daya air pada waduk sebagaimana dimaksud pada ayat (1), dilakukan berdasarkan pedoman operasi dan pemeliharaan bendungan beserta waduknya termasuk pola operasi waduk.

Pasal 123

- (1) Penggunaan atau pengusahaan air dan/atau daya air pada waduk oleh selain Pemilik atau Pengelola bendungan harus mendapat izin penggunaan sumber daya air untuk penggunaan atau pengusahaan air dan/atau daya air dari Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.

- (2) Pemberian izin penggunaan sumber daya air atau pengusahaan air dan/atau daya air sebagaimana dimaksud pada ayat (1), dilakukan dengan ketentuan:
  - a. sesuai dengan zona pemanfaatan waduk dan peruntukan air pada waduk sebagaimana dimaksud dalam Pasal 118 ayat (2);
  - b. sesuai dengan rekomendasi teknis dari unit pelaksana teknis yang membidangi sumber daya air pada wilayah sungai yang bersangkutan; dan
  - c. menjamin keamanan dan kelestarian bendungan.
- (3) Pemberian rekomendasi teknis sebagaimana dimaksud pada ayat (2) huruf b dilakukan oleh unit pelaksana teknis berdasarkan pertimbangan tertulis dari Pengelola bendungan.

#### Pasal 124

- (1) Pengusahaan kawasan bendungan beserta waduknya sebagaimana dimaksud dalam Pasal 116 ayat (3) huruf d, merupakan pemanfaatan kawasan bendungan beserta waduknya.
- (2) Pengusahaan kawasan sebagaimana dimaksud pada ayat (1), diselenggarakan dengan memperhatikan fungsi sosial, daya dukung lingkungan hidup, kesehatan lingkungan, dan kelestarian fungsi lingkungan hidup.
- (3) Pengusahaan kawasan sebagaimana dimaksud pada ayat (1), dapat dilakukan oleh perseorangan atau badan usaha, atau kerja sama antar badan usaha berdasarkan persetujuan pengusahaan dari Pemilik bendungan.
- (4) Dalam hal bendungan dimiliki oleh Pemerintah Pusat, pemerintah daerah provinsi, atau pemerintah daerah kabupaten/kota, pengusahaan kawasannya dilakukan sesuai dengan ketentuan peraturan perundang-undangan.
- (5) Tata cara pengajuan permohonan pengusahaan kawasan bendungan beserta waduknya dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Bagian Keenam

#### Pengendalian Daya Rusak Air

#### Pasal 125

- (1) Pengendalian daya rusak air melalui pengendalian bendungan beserta waduknya meliputi:
  - a. pengendalian terhadap keutuhan fisik dan keamanan bendungan; dan

b. pengendalian terhadap fungsi bendungan beserta waduknya.

- (2) Pengendalian daya rusak air sebagaimana dimaksud pada ayat (1), dilakukan berdasarkan peringatan dini pada wilayah sungai yang bersangkutan.

#### Pasal 126

- (1) Pengendalian daya rusak air sebagaimana dimaksud dalam Pasal 125 ayat (1), terutama dilakukan dengan mengurangi besaran banjir agar daya rusak air terkendali.
- (2) Pengendalian daya rusak air dilakukan dengan cara mengatur pembukaan dan penutupan pintu bendungan.
- (3) Pembukaan pintu bendungan sebagaimana dimaksud pada ayat (2), ditujukan untuk mengatur pelepasan air guna pengendalian daya rusak air pada kawasan hilir.
- (4) Pelepasan air sebagaimana dimaksud pada ayat (3), harus tetap memperhatikan keperluan pencegahan kegagalan bendungan terkait ruang waduk untuk pengendalian banjir.
- (5) Pembukaan dan penutupan pintu bendungan sebagaimana dimaksud pada ayat (2), dilakukan berdasarkan pedoman operasi bendungan pada bendungan yang bersangkutan.

#### Pasal 127

Dalam hal pelepasan air sebagaimana dimaksud dalam Pasal 126 ayat (4), pada bendungan untuk penampungan limbah tambang, air yang akan dialirkan ke perairan umum harus memenuhi baku mutu air sesuai ketentuan peraturan perundang-undangan di bidang lingkungan hidup.

#### Pasal 128

Pengendalian daya rusak air yang dilakukan karena terjadinya kegagalan bendungan, pelaksanaannya harus berdasarkan rencana tindak darurat dan pedoman operasi bendungan pada bendungan yang bersangkutan.

Bagian Ketujuh  
Perubahan atau Rehabilitasi

Pasal 129

- (1) Perubahan bendungan ditujukan untuk keamanan bendungan dan meningkatkan fungsi bendungan.
- (2) Perubahan bendungan dilakukan dengan cara melakukan perubahan struktur bendungan.
- (3) Dalam hal diperlukan perubahan bendungan untuk tindakan pengamanan bendungan, Pengelola bendungan wajib melakukan perubahan struktur bendungan.
- (4) Dalam hal diperlukan peningkatan fungsi bendungan, Pengelola bendungan dapat melakukan perubahan struktur bendungan.

Pasal 130

- (1) Dalam melakukan perubahan struktur bendungan sebagaimana dimaksud dalam Pasal 129 ayat (2), Pengelola bendungan harus terlebih dahulu memperoleh persetujuan desain perubahan bendungan dari Menteri.
- (2) Persetujuan desain perubahan sebagaimana dimaksud pada ayat (1), diberikan berdasarkan permohonan dari Pengelola bendungan dan rekomendasi dari Komisi Keamanan Bendungan.

Pasal 131

- (1) Rehabilitasi bendungan merupakan tindakan perbaikan yang meliputi perekrasan, pelaksanaan perbaikan, dan uji perilaku bendungan yang mengalami kerusakan.
- (2) Dalam hal diperlukan tindakan pengamanan bendungan, Pengelola bendungan wajib melakukan rehabilitasi bendungan.
- (3) Dalam melakukan rehabilitasi bendungan sebagaimana dimaksud pada ayat (2), Pengelola bendungan harus terlebih dahulu memperoleh persetujuan desain rehabilitasi dari Menteri.
- (4) Persetujuan desain rehabilitasi sebagaimana dimaksud pada ayat (3), diberikan berdasarkan permohonan dari Pengelola bendungan dan rekomendasi dari Komisi Keamanan Bendungan.

#### Pasal 132

- (1) Pelaksanaan perubahan bendungan sebagaimana dimaksud dalam Pasal 129 dan pelaksanaan rehabilitasi bendungan sebagaimana dimaksud dalam Pasal 131, dilakukan setelah memperoleh izin perubahan atau izin rehabilitasi bendungan dari Menteri.
- (2) Izin perubahan atau izin rehabilitasi bendungan sebagaimana dimaksud pada ayat (1), diberikan berdasarkan permohonan dari Pengelola bendungan.
- (3) Permohonan sebagaimana dimaksud pada ayat (2), harus memenuhi persyaratan administratif dan persyaratan teknis.
- (4) Persyaratan administratif sebagaimana dimaksud pada ayat (3), meliputi dokumen:
  - a. surat permohonan izin perubahan atau izin rehabilitasi bendungan;
  - b. identitas Pengelola bendungan; dan
  - c. izin atau persyaratan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (5) Persyaratan teknis sebagaimana dimaksud pada ayat (1), berupa dokumen:
  - a. persetujuan desain perubahan bendungan atau persetujuan desain rehabilitasi bendungan; dan
  - b. dokumen pengelolaan lingkungan hidup.
- (6) Berdasarkan permohonan izin perubahan atau rehabilitasi bendungan sebagaimana dimaksud pada ayat (2), Menteri memberikan izin atau menolak permohonan izin dalam jangka waktu paling lambat 6 (enam) bulan sejak dokumen persyaratan lengkap.
- (7) Penolakan permohonan izin perubahan atau izin rehabilitasi bendungan sebagaimana dimaksud pada ayat (6), harus disampaikan secara tertulis disertai dengan alasan penolakan.

#### Pasal 133

Izin perubahan atau izin rehabilitasi bendungan untuk bendungan penampung limbah tambang, diberikan oleh Menteri berdasarkan rekomendasi teknis dari instansi yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup dan di bidang pertambangan.

Pasal 134

- (1) Izin perubahan atau izin rehabilitasi bendungan paling sedikit memuat:
  - a. identitas Pengelola bendungan;
  - b. lokasi bendungan yang akan dilakukan perubahan atau rehabilitasi bendungan;
  - c. jenis dan tipe bendungan yang akan dilakukan perubahan atau rehabilitasi bendungan;
  - d. gambar dan spesifikasi teknis;
  - e. jadwal pelaksanaan perubahan atau rehabilitasi bendungan;
  - f. metode pelaksanaan perubahan atau rehabilitasi bendungan;
  - g. ketentuan hak dan kewajiban; dan
  - h. jangka waktu berlakunya izin.
- (2) Dalam jangka waktu 3 (tiga) tahun sejak diterbitkannya izin perubahan atau izin rehabilitasi bendungan, Pengelola bendungan wajib melaksanakan perubahan atau rehabilitasi bendungan sesuai dengan jadwal pelaksanaan perubahan atau rehabilitasi bendungan.
- (3) Dalam hal terjadi keadaan tertentu yang mengakibatkan perubahan atau rehabilitasi bendungan tidak dapat dipenuhi sesuai dengan jadwal pelaksanaan perubahan atau rehabilitasi bendungan, pemberi izin dapat memberikan perpanjangan waktu izin perubahan atau izin rehabilitasi bendungan.

Pasal 135

Pelaksanaan perubahan atau rehabilitasi bendungan dilakukan sesuai dengan ketentuan peraturan perundangundangan.

Pasal 136

Tata cara perubahan atau rehabilitasi bendungan dan pemberian izin perubahan atau izin rehabilitasi bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

Bagian Kedelapan  
Penghapusan Fungsi Bendungan

Pasal 137

- (1) Bendungan yang tidak mempunyai manfaat lagi atau terjadi kegagalan bendungan yang mengancam keselamatan masyarakat, Pemilik bendungan wajib melakukan penghapusan fungsi bendungan.
- (2) Penghapusan fungsi bendungan sebagaimana dimaksud pada ayat (1), dilakukan dengan cara membongkar bendungan oleh Pemilik bendungan.
- (3) Dalam hal Pemilik bendungan sebagaimana dimaksud pada ayat (2), tidak melaksanakan pembongkaran bendungan, pembongkaran bendungan dilakukan oleh Menteri, gubernur, atau bupati/walikota sesuai dengan kewenangannya.
- (4) Biaya untuk pelaksanaan pembongkaran bendungan sebagaimana dimaksud pada ayat (3), menjadi tanggung jawab Pemilik bendungan.

Pasal 138

- (1) Dalam hal pembongkaran bendungan sebagaimana dimaksud dalam Pasal 137 ayat (2), dapat menimbulkan bahaya terhadap keamanan dan kelestarian fungsi lingkungan, baik di sekitar kawasan bendungan maupun hilir bendungan, Pemilik bendungan wajib mempertahankan fisik bendungan.
- (2) Dalam mempertahankan fisik bendungan sebagaimana dimaksud pada ayat (1), Pemilik bendungan wajib menjaga, memelihara, dan mempertahankan keamanan bendungan serta lingkungannya.

Pasal 139

- (1) Penghapusan fungsi bendungan sebagaimana dimaksud dalam Pasal 137 ayat (2) dan Pasal 138 ayat (1), dilakukan berdasarkan izin penghapusan fungsi bendungan dari Menteri.
- (2) Izin penghapusan fungsi bendungan sebagaimana dimaksud pada ayat (1), diberikan berdasarkan rekomendasi dari Komisi Keamanan Bendungan dan instansi terkait lainnya.

#### Pasal 140

- (1) Dalam hal fungsi bendungan telah dihapus, Pemilik bendungan bertanggung jawab terhadap bahaya yang ditimbulkan akibat penghapusan fungsi bendungan.
- (2) Dalam pelaksanaan tanggung jawab sebagaimana dimaksud pada ayat (1), Pemilik bendungan wajib menyelenggaraan pengelolaan pasca penghapusan fungsi bendungan.

#### Pasal 141

Dalam hal bendungan yang dihapus fungsinya sebagaimana dimaksud dalam Pasal 137 ayat (2) dan Pasal 138 ayat (1), merupakan barang milik negara/daerah, penghapusannya dilakukan sesuai dengan ketentuan peraturan perundangundangan.

#### Pasal 142

Tata cara penghapusan fungsi bendungan, tata cara pemberian izin penghapusan fungsi bendungan, dan pengelolaan pasca penghapusan fungsi bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### Bagian Kesembilan

#### Kerja Sama Pengelolaan Bendungan

#### Pasal 143

- (1) Dalam pengelolaan bendungan beserta waduknya, Pemerintah Pusat, pemerintah daerah provinsi, pemerintah daerah kabupaten/kota, dan badan usaha dapat melakukan kerja sama.
- (2) Kerja sama sebagaimana dimaksud pada ayat (1), dilakukan dengan ketentuan:
  - a. memperhatikan kepentingan Pemerintah Pusat, pemerintah daerah provinsi, dan/atau pemerintah daerah kabupaten/kota dalam wilayah sungai yang bersangkutan;
  - b. dituangkan dalam perjanjian kerja sama pengelolaan bendungan beserta waduknya; dan

- c. dilaksanakan sesuai dengan ketentuan peraturan perundang-undangan.

#### Pasal 144

Tata cara kerjasama pengelolaan bendungan beserta waduknya dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### Bagian Kesepuluh

#### Pengelolaan Bendungan Lain

#### Pasal 145

- (1) Pengelolaan bendungan selain bendungan sebagaimana dimaksud dalam Pasal 3 ayat (2), dilakukan sesuai dengan tahapan pengelolaan sebagaimana dimaksud dalam Pasal 76.
- (2) Pelaksanaan pengelolaan bendungan sebagaimana dimaksud pada ayat (1), harus dilaporkan kepada Menteri.
- (3) Persyaratan teknis, tata cara perizinan, persetujuan dan pelaporan dalam pengelolaan bendungan sebagaimana dimaksud pada ayat (1), dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

### BAB IV

#### ORGANISASI

##### Bagian Kesatu

#### Organisasi Pelaksana

#### Pasal 146

Dalam melaksanakan pengaturan keamanan bendungan, Menteri dibantu oleh organisasi pelaksana yang susunannya terdiri dari:

- a. komisi keamanan bendungan; dan
- b. unit pelaksanaan teknis bidang bendungan.

Bagian Kedua

Komisi Keamanan Bendungan

Pasal 147

- (1) Komisi Keamanan Bendungan sebagaimana dimaksud dalam Pasal 146 huruf a, bertugas:
  - a. melakukan pengkajian terhadap hasil evaluasi keamanan bendungan;
  - b. memberikan rekomendasi mengenai keamanan bendungan; dan
  - c. menyelenggarakan inspeksi bendungan.
- (2) Dalam melaksanakan tugas sebagaimana dimaksud pada ayat (1), Komisi Keamanan Bendungan menyelenggarakan fungsi:
  - a. pemberian rekomendasi kepada Menteri dalam rangka pemberian persetujuan desain, izin pengisian awal, izin operasi, persetujuan desain perubahan atau persetujuan desain rehabilitasi, dan izin penghapusan fungsi bendungan;
  - b. pemberian rekomendasi kepada menteri yang menyelenggarakan urusan pemerintahan di bidang lingkungan hidup dalam rangka pemberian izin penempatan awal limbah tambang dan izin operasi untuk bendungan penampung limbah tambang;
  - c. pemberian saran teknis bendungan.
  - d. evaluasi terhadap hasil kegiatan yang dilakukan oleh unit pelaksana teknis bidang keamanan bendungan; dan
  - e. penyelenggaraan inspeksi bendungan.
- (3) Organisasi dan tata kerja Komisi Keamanan Bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

Bagian Kedua

Unit Pelaksana Teknis Bidang Bendungan

Pasal 148

- (1) Unit pelaksana teknis bidang bendungan sebagaimana dimaksud dalam Pasal 146 huruf b, bertugas memberikan dukungan teknis dan administrasi kepada Komisi Keamanan Bendungan.

- (2) Dalam memberikan dukungan teknis sebagaimana dimaksud pada ayat (1), unit pelaksana teknis bidang bendungan melakukan kegiatan:
  - a. pengumpulan dan pengolahan data bendungan;
  - b. pengkajian pembangunan dan pengelolaan bendungan;
  - c. penyelenggaraan inspeksi bendungan;
  - d. pemberian saran teknis bendungan;
  - e. pemantauan pelaksanaan konstruksi dalam aspek keamanan bendungan;
  - f. inventarisasi dan registrasi bendungan serta klasifikasi bahaya bendungan; dan
  - g. pengelolaan arsip bendungan.
- (3) Organisasi Unit pelaksana teknis bidang bendungan dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri.

#### Pasal 149

- (1) Penyelenggaraan inspeksi bendungan sebagaimana dimaksud pasal 147 ayat (1) huruf c, meliputi kegiatan:
  - a. pengumpulan data untuk bahan pertimbangan kajian dan pemberian rekomendasi; dan
  - b. klarifikasi terhadap laporan pelaksanaan pembangunan dan laporan pengelolaan bendungan.
- (2) Penyelenggaraan inspeksi bendungan sebagaimana dimaksud pasal pasal 148 ayat (2) huruf c, meliputi kegiatan:
  - a. pengumpulan data untuk: bahan pertimbangan kajian, penyiapan saran teknis, dan inventarisasi bendungan;
  - b. pemantauan pelaksanaan konstruksi dalam aspek keamanan bendungan; dan
  - c. klarifikasi terhadap laporan pelaksanaan pembangunan dan laporan pengelolaan bendungan.
- (3) Penyelenggaraan inspeksi sebagaimana dimaksud pasal 147 ayat (1) huruf c dan pasal 148 ayat (2) huruf c, meliputi inspeksi calon lokasi bendungan, inspeksi pemantauan pelaksanaan konstruksi, inspeksi pelaksanaan pengisian awal waduk, inspeksi besar, inspeksi luar biasa, inspeksi khusus, inspeksi sesuai permintaan pembangun, pengelola atau pemilik bendungan.

BAB V  
PANEL AHLI BEBAS

Pasal 150

- (1) Dalam pelaksanaan pembangunan dan pengelolaan bendungan dengan kriteria tertentu, Pembangun dan Pengelola bendungan berkewajiban menunjuk panel ahli bebas.
- (2) Bendungan dengan kriteria tertentu sebagaimana dimaksud pada ayat (1), meliputi:
  - a. bendungan dengan tinggi 75 (tujuh puluh lima) meter atau lebih diukur dari lembah terdalam dengan daya tampung waduk sekurang-kurangnya 100.000.000 (seratus juta) meter kubik;
  - b. bendungan yang mempunyai permasalahan teknik yang kompleks; atau
  - c. bendungan yang menerapkan teknologi baru sesuai dengan rekomendasi Komisi Keamanan Bendungan.
- (3) Panel ahli bebas sebagaimana dimaksud pada ayat (1), mempunyai tugas memberikan pertimbangan teknis yang lebih mendalam mengenai keamanan bendungan.

Pasal 151

- (1) Panel ahli bebas sebagaimana dimaksud dalam Pasal 150 dapat terdiri atas:
  - a. ahli desain atau ahli konstruksi bendungan;
  - b. ahli geologi atau ahli geologi teknik bendungan;
  - c. ahli hidro-mekanik bendungan; dan
  - d. ahli lain yang diperlukan sesuai dengan kebutuhan.
- (2) Panel ahli bebas sebagaimana dimaksud pada ayat (1), harus memenuhi persyaratan paling sedikit:
  - a. memiliki sertifikat keahlian bendungan utama yang dikeluarkan oleh lembaga yang berwenang sesuai dengan ketentuan peraturan perundang-undangan;
  - b. mempunyai pengalaman dalam bidang perencanaan, pelaksanaan atau operasi dan pemeliharaan sesuai dengan bidang yang akan ditangani;

- c. mempunyai pengalaman dalam penanganan permasalahan yang sama dengan permasalahan bendungan yang akan ditangani; atau
- d. ahli lain yang memiliki sertifikat keahlian utama di bidangnya.

#### Pasal 152

- (1) Panel ahli bebas sebagaimana dimaksud dalam Pasal 150, pada setiap tahap penugasan harus menyiapkan laporan hasil penugasan.
- (2) (Laporan hasil penugasan sebagaimana dimaksud pada ayat (1), disampaikan kepada:
  - a. pembangun bendungan, Pengelola bendungan atau Pemilik bendungan; dan
  - b. Komisi Keamanan Bendungan dan Unit Pelaksana Teknis Bidang Bendungan.

### BAB VI

#### PEMBIAYAAN

#### Pasal 153

- (1) Pembiayaan bendungan beserta waduknya meliputi biaya:
  - a. pembangunan bendungan; dan
  - b. pengelolaan bendungan beserta waduknya.
- (2) Biaya pembangunan bendungan sebagaimana dimaksud pada ayat (1) huruf a, meliputi biaya:
  - a. persiapan pembangunan;
  - b. perencanaan pembangunan;
  - c. pengadaan tanah;
  - d. pemindahan dan pemukiman kembali penduduk;
  - e. persiapan pelaksanaan konstruksi;
  - f. pelaksanaan konstruksi dan pengawasan konstruksi; dan
  - g. pengisian awal waduk.

- (3) Biaya pengelolaan bendungan beserta waduknya sebagaimana dimaksud pada ayat (1) huruf b meliputi biaya:
- a. operasi dan pemeliharaan;
  - b. konservasi pada waduk;
  - c. perubahan bendungan atau rehabilitasi bendungan;
  - d. penghapusan fungsi bendungan; dan
  - e. pengelolaan pasca penghapusan fungsi bendungan.

Pasal 154

- (1) Biaya pembangunan bendungan dan biaya pengelolaan bendungan beserta waduknya disediakan oleh Pemilik bendungan.
- (2) Dalam hal Pemilik bendungan sebagaimana dimaksud pada ayat (1), merupakan Pemerintah Pusat, pemerintah daerah provinsi, atau pemerintah daerah kabupaten/kota, biaya pembangunan bendungan dan biaya pengelolaan bendungan beserta waduknya dapat bersumber dari:
- a. anggaran pendapatan dan belanja negara;
  - b. anggaran pendapatan dan belanja daerah provinsi;
  - c. anggaran pendapatan dan belanja daerah kabupaten/kota; dan/atau
  - d. sumber pembiayaan lain sesuai dengan ketentuan peraturan perundang-undangan.
- (3) Sumber pembiayaan lain sebagaimana dimaksud pada ayat (2) huruf d, antara lain hasil penerimaan biaya jasa pengelolaan sumber daya air pada waduk.

Pasal 155

- (1) Dalam hal badan usaha selaku Pemilik bendungan menyerahkan pengelolaan bendungan sebagaimana dimaksud dalam Pasal 80 ayat (1), Pemilik bendungan harus menyediakan biaya pengelolaan dalam bentuk dana amanah.
- (2) Dana amanah sebagaimana dimaksud pada ayat (1), harus diserahkan oleh Pemilik bendungan sebelum bendungan beserta waduknya diserahkan.
- (3) Pelaksanaan mengenai dana amanah sebagaimana dimaksud pada ayat (1), dilakukan sesuai dengan ketentuan peraturan perundang-undangan.

## Pasal 156

Dana Amanah sebagaimana dimaksud dalam Pasal 145, dilakukan sesuai dengan pedoman yang ditetapkan oleh Menteri setelah berkoordinasi dengan menteri keuangan.

## BAB VII

### DOKUMENTASI DAN INFORMASI

## Pasal 157

- (1) Pemilik bendungan, pengelola bendungan, unit pengelola bendungan, dan unit pelaksana teknis bidang bendungan harus menyimpan dan memelihara dokumen pembangunan bendungan dan pengelolaan bendungan beserta waduknya.
- (2) Dokumen sebagaimana dimaksud pada ayat (1), meliputi dokumen:
  - a. perencanaan;
  - b. pengelolaan lingkungan hidup;
  - c. pengadaan tanah;
  - d. pelaksanaan konstruksi termasuk gambar terbangun;
  - e. petunjuk operasi dan pemeliharaan, pemantauan perilaku bendungan, riwayat operasi bendungan, serta rencana tindak darurat; dan
  - f. laporan pelaksanaan pengelolaan lingkungan dan pemantauan lingkungan.
- (3) Dokumen sebagaimana dimaksud pada ayat (2), harus disimpan selama 10 (sepuluh) tahun sejak penghapusan fungsi bendungan.
- (4) Dokumen yang telah mencapai waktu sebagaimana dimaksud pada ayat (3), harus diserahkan Pemilik bendungan kepada instansi yang menyelenggarakan urusan penyimpanan arsip secara nasional atau daerah.

## Pasal 158

- (1) Pengelola bendungan harus menyampaikan laporan secara berkala mengenai informasi kondisi bendungan beserta waduknya kepada instansi terkait.
- (2) Informasi kondisi bendungan beserta waduknya sebagaimana dimaksud pada ayat (1), meliputi:
  - a. perilaku struktural dan operasional;

- b. hasil pembacaan instrumen beserta interpretasinya, hasil inspeksi, dan evaluasi keamanan;
- c. perubahan atau rehabilitasi;
- d. kejadian yang berhubungan dengan keamanan bendungan dan kejadian luar biasa; dan
- e. kondisi air waduk termasuk alokasi air.

#### Pasal 159

- (1) Pengelola bendungan harus menyelenggarakan system informasi bendungan beserta waduknya yang dapat diakses oleh masyarakat.
- (2) Dalam menyelenggarakan sistem informasi sebagaimana dimaksud pada ayat (1), Pengelola bendungan melakukan:
  - a. pengumpulan, pengolahan, dan penyediaan data dan informasi bendungan beserta waduknya; dan
  - b. pemutakhiran informasi bendungan beserta waduknya secara berkala.

### BAB VIII

#### PENGAWASAN

#### Pasal 160

- (1) Menteri, gubernur, dan bupati/walikota sesuai dengan kewenangannya serta masyarakat melakukan pengawasan atas penyelenggaraan pembangunan bendungan dan pengelolaan bendungan beserta waduknya.
- (2) Pengawasan oleh Menteri sebagaimana dimaksud pada ayat (1), dilakukan terhadap pembangunan bendungan dan pengelolaan bendungan beserta waduknya yang dilaksanakan oleh Pemerintah Pusat, pemerintah daerah provinsi, pemerintah daerah kabupaten/kota, dan badan usaha.
- (3) Pengawasan oleh gubernur sebagaimana dimaksud pada ayat (1), dilakukan terhadap pembangunan bendungan dan pengelolaan bendungan beserta waduknya yang dilaksanakan oleh pemerintah daerah provinsi, pemerintah daerah kabupaten/kota, dan badan usaha.

- (4) Pengawasan oleh bupati/walikota sebagaimana dimaksud pada ayat (1) dilakukan terhadap pembangunan bendungan dan pengelolaan bendungan beserta waduknya yang dilaksanakan oleh pemerintah daerah kabupaten/kota dan badan usaha.
- (5) Pengawasan oleh masyarakat sebagaimana dimaksud pada ayat (1), dilakukan terhadap pembangunan bendungan dan pengelolaan bendungan beserta waduknya yang diwujudkan dalam bentuk laporan atau pengaduan kepada Menteri, gubernur, atau bupati/walikota.
- (6) Menteri, gubernur, atau bupati/walikota menindaklanjuti laporan hasil pengawasan atau pengaduan sebagaimana dimaksud pada ayat (5), untuk perbaikan dan penyempurnaan penyelenggaraan pembangunan bendungan dan pengelolaan bendungan beserta waduknya.

## BAB IX

### PERAN MASYARAKAT

#### Pasal 161

- (1) Masyarakat mempunyai kesempatan yang sama untuk berperan dalam proses pembangunan bendungan dan pengelolaan bendungan beserta waduknya.
- (2) Peran masyarakat sebagaimana dimaksud pada ayat (1), dapat dilakukan dengan cara:
  - a. memberikan masukan dan saran dalam pembangunan bendungan dan pengelolaan bendungan beserta waduknya;
  - b. mengikuti program pemberdayaan masyarakat; dan/atau
  - c. mengikuti pertemuan konsultasi publik dan sosialisasi.
- (3) Dalam melaksanakan peran sebagaimana dimaksud pada ayat (2), masyarakat mempunyai hak untuk:
  - a. memperoleh informasi mengenai rencana pembangunan bendungan dan pengelolaan bendungan beserta waduknya;
  - b. menyatakan keberatan terhadap rencana pembangunan bendungan dan pengelolaan bendungan beserta waduknya yang sudah diumumkan disertai alasannya;

- c. memperoleh manfaat atas pembangunan bendungan dan pengelolaan bendungan beserta waduknya;
- d. mengajukan pengaduan kepada Pembangun bendungan atau Pengelola bendungan atas kerugian yang menimpa dirinya berkaitan dengan penyelenggaraan pembangunan bendungan dan pengelolaan bendungan beserta waduknya; dan/atau
- e. mengajukan gugatan kepada pengadilan terhadap berbagai masalah akibat pembangunan bendungan dan pengelolaan bendungan beserta waduknya yang merugikan kehidupannya.

## BAB X

### KETENTUAN PERALIHAN

#### Pasal 162

Dengan ditetapkannya Peraturan Menteri ini:

- a. persetujuan atau izin yang berkaitan dengan pembangunan dan pengelolaan bendungan yang telah diterbitkan sebelum ditetapkannya Peraturan Menteri ini dinyatakan tetap berlaku sampai dengan masa berlakunya berakhir;
- b. pengelolaan bendungan yang telah dilaksanakan sebelum ditetapkannya Peraturan Menteri ini yang belum dilengkapi dengan persetujuan dan perizinan, izin operasi bendungan harus dipenuhi paling lambat 2 (dua) tahun setelah Peraturan Menteri ini ditetapkan; dan
- c. kerjasama pembangunan bendungan yang telah ada sebelum ditetapkannya Peraturan Menteri ini dinyatakan tetap berlaku sampai dengan berakhirnya kerja sama.

#### Pasal 163

Ketentuan peraturan perundang-undangan mengenai bendungan yang telah ada dinyatakan tetap berlaku sepanjang tidak bertentangan dan belum diganti dengan yang baru berdasarkan peraturan menteri ini.

BAB XI

KETENTUAN PENUTUP

Pasal 164

Pada saat Peraturan Menteri ini mulai berlaku, Peraturan Menteri Pekerjaan Umum Nomor 72/PRT/M/1997 tentang Keamanan Bendungan dicabut dan dinyatakan tidak berlaku.

Pasal 165

Peraturan Menteri ini mulai berlaku pada tanggal diundangkan.

Agar setiap orang mengetahuinya, memerintahkan pengundangan Peraturan Menteri ini dengan penempatannya dalam Berita Negara Republik Indonesia.

Ditetapkan di Jakarta  
pada tanggal 20 Mei 2015

**MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT  
REPUBLIK INDONESIA,**

**ttd.**

**M. BASUKI HADIMULJONO**

Diundangkan di Jakarta  
pada tanggal 25 Mei 2015

**MENTERI HUKUM DAN HAK ASASI MANUSIA  
REPUBLIK INDONESIA,**

**ttd.**

**YASONNA H. LAOLY**

BERITA NEGARA REPUBLIK INDONESIA TAHUN 2015 NOMOR 771



## **ANNEX 6-5**

Reviewed Module as Certificated Official Regulation/Standard No.003

SNI 7847:2012 on Waste Water, Specification on Processing Result Part 1: Mud  
from Pulp and Paper Factories



**Limbah – Spesifikasi hasil pengolahan – Bagian 1 :  
Lumpur (*sludge*) Instalasi Pengolahan Air Limbah  
(IPAL) industri pulp dan kertas sebagai pembenah  
tanah organik**



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Diterbitkan di Jakarta

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## Prakata

Standar Nasional Indonesia (SNI) Spesifikasi Hasil Pengolahan Lumpur (*sludge*) Instalasi Pengolahan Air Limbah (IPAL) Industri Pulp dan Kertas sebagai Pembenh Tanah Organik merupakan SNI baru yang disusun untuk mendukung pengelolaan limbah B3 sesuai peraturan perundang-undangan yang berlaku. Pembenh tanah organik merupakan hasil dekomposisi campuran *sludge* primer dan sekunder industri pulp dan kertas, yang digunakan untuk tanaman HTI.

Standar ini disusun oleh Panitia Teknis 13-07 Manajemen Lingkungan, yang berkedudukan di Kementerian Lingkungan Hidup dan telah dibahas dalam rapat konsensus lingkup Panitia Teknis pada tanggal 13 Desember 2011 di Jakarta yang dihadiri oleh wakil-wakil dari pemerintah, produsen, konsumen, tenaga ahli, Asosiasi Pulp dan Kertas Indonesia dan institusi terkait lainnya. SNI ini juga telah melalui konsensus nasional yaitu jajak pendapat pada tanggal 26 September 2012 s.d tanggal 26 November 2012.



**Limbah – Spesifikasi hasil pengolahan – Bagian 1 :  
Lumpur (*sludge*) Instalasi Pengolahan Air Limbah (IPAL) industri pulp dan  
kertas sebagai pembenah tanah organik**

## **1 Ruang lingkup**

Standar ini menetapkan persyaratan mutu, pengambilan contoh, cara uji, penandaan dan pelabelan pembenah tanah organik dari hasil pengolahan campuran lumpur primer dan sekunder Instalasi Pengolahan Air limbah (IPAL) industri pulp dan kertas *non deinking* melalui proses dekomposisi. Pemanfaatan pembenah tanah organik tersebut hanya digunakan untuk Hutan Tanaman Industri (HTI).

## **2 Acuan normatif**

SNI 19-0428 – 1998 *Petunjuk pengambilan contoh padatan*

SNI 3423-2008 - *Cara uji analisis ukuran butir tanah*

SNI 1965-2008 *Cara uji Penentuan Kadar air untuk Tanah dan batuan*

SNI 13-4720-1998 *Tata penentuan kadar karbon organik dalam tanah.*

SNI 13-4721-1998, *Tata penentuan kadar nitrogen total dalam tanah*

SNI 7228-2:2011, *Cara uji Organo halida yang dapat diabsorpsi (AOX) dalam air limbah secara microcoulometry*

SNI 01-2332.1-2006. *Cara uji mikrobiologi – Bagian 1 : Penentuan coliform dan Escherichia coli pada produk perikanan*

SNI 06-6989.54-2005. *Arsen (Spektrofotometri Serapan Atom tungku karbon)*

SNI 06-6989.16:2009. *Kadmium (Spektrofotometri Serapan Atom Nyala)*

SNI 6989-17:2009. *Kromium total (Spektrofotometri Serapan Atom Nyala)*

SNI 06-2472-1991. *Kobal (Spektrofotometri Serapan Atom tungku karbon)*

SNI 6989.68:2009. *Kobal (Spektrofotometri Serapan Atom Nyala)*

SNI 6989.6:2009. *Tembaga (Spektrofotometri Serapan Atom Nyala)*

SNI 6989.8:2009. *Timbal (Spektrofotometri Serapan Atom nyala)*

SNI 6989.46:2009. *Timbal (Spektrofotometri Serapan Atom tungku karbon)*

SNI 6989.78:2011. *Raksa (Spektrofotometri Serapan Atom Uap Dingin)*

SNI 6989.18:2009. *Nikel (Spektrofotometri Serapan Atom Nyala)*

SNI 06-2475-1991. *Selenium (Spektrofotometri Serapan Atom tungku karbon)*  
SNI 6989.64:2009. *Timah (Spektrofotometri Serapan Atom tungku karbon)*  
SNI 6989.7:2009. *Seng (Spektrofotometri Serapan Atom Nyala)*  
US EPA 2461. *Molibdenum analysis*  
US EPA 9023, *extractable organic halides (EOX) in solid*  
US EPA 1682: *Salmonella in Sewage Sludge (Biosolids) by Modified Semisolid Rappaport-Vassiliadis (MSRV) Medium*  
US EPA 3050B, *Acid Digestion of Sediments, Sludges, and Soils*  
US EPA 6010C 2007. *Mercury, Tin. Inductively Coupled Plasma – Atomic Emission Spectrometry*  
AOAC 945.75 *Extraneous Materials (Foreign Matter) In Products*  
AOAC 994.18-2005, *pH measurement of Organic Soil.*  
APHA. 9260D-2005. *Quantitative Salmonella Procesures.*

### 3 Istilah dan definisi

#### 3.1

##### **pembenah tanah organik**

bahan-bahan alami organik berbentuk padat atau cair yang mampu memperbaiki sifat fisik, kimia dan biologi tanah

#### 3.2

##### **dekomposisi**

perubahan komposisi bahan organik akibat penguraian oleh mikroorganisma pada suhu tertentu menjadi senyawa organik yang lebih sederhana

#### 3.3

##### **lumpur primer**

lumpur yang dihasilkan dari proses pengolahan air limbah secara fisika dan atau kimia

##### **lumpur sekunder**

#### 3.4

lumpur yang dihasilkan dari proses pengolahan air limbah secara biologi aerobik

#### 3.5

##### **kertas non deinking**

kertas yang dibuat dari bahan baku pulp ( serat primer) dan atau kertas daur ulang ( serat sekunder ) tanpa adanya proses penghilangan tinta

#### 3.6

##### **hutan tanaman industri (HTI)**

hutan yang ditanami tanaman jenis kayu tertentu dengan tipe sejenis sebagai bahan baku industri

**3.7****ukuran butiran**

besar butiran atau kehalusan

**3.8****bahan asing**

bahan ikutan dalam produk yang terbawa selama proses produksi, penyimpanan dan distribusi seperti plastik, kaca, kerikil, sampah dan bahan asing lainnya .

**3.9****kadar air**

perbandingan berat air yang mengisi rongga pori material tanah atau material lainnya terhadap berat partikel padatnya, yang dinyatakan dalam persen.

**3.10****pH**

derajat keasaman

**3.11****bahan organik karbon**

bahan organik total yang teroksidasi habis dengan kalium dikromat ( $K_2Cr_2O_7$ ).

**3.12****coliform fecal**

kelompok bakteri fakultatif aerob, gram negatif tidak berbentuk spora, berbentuk batang pendek, mampu menfermentasi laktosa dengan menghasilkan gas serta tumbuh pada suhu  $45^{\circ}C \pm 0,5^{\circ}C$  selama sekurang-kurangnya 24 jam

**3.13****salmonella Sp**

bakteri gram negatif berbentuk batang, fakultatif anaerobik, dapat bergerak terdiri dari sekitar 2 000 serovars

**3.14****logam berat**

kelompok logam non esensial yang pada tingkat tertentu menjadi logam beracun bagi makhluk hidup

**3.15****AOX (*Adsorbable Organic Halide*) atau organohalida yang dapat diadsorbsi**

jumlah total bahan-bahan organik yang terhalogenasi atau terklorinasi yang terkandung dalam contoh

**4 Simbol dan singkatan istilah**

4.1. C/N adalah perbandingan Carbon (C ) terhadap Nitrogen (N)

4.2. MPN adalah *Most Probable Number*

**5 Persyaratan mutu dan cara uji**

Persyaratan mutu dan cara uji hasil pengolahan lumpur IPAL Industri Pulp dan Kertas sebagai pembenah tanah organik untuk HTI dapat dilihat pada tabel dibawah ini.

**Tabel 1 - Persyaratan mutu dan cara uji hasil pengolahan lumpur IPAL industri pulp dan kertas sebagai pembenah tanah organik untuk HTI**

| No                     | Parameter      | Satuan | Persyaratan mutu | Cara Uji                                                                                                                                                                        |
|------------------------|----------------|--------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameter fisik</b> |                |        |                  |                                                                                                                                                                                 |
| 1.                     | Ukuran butiran | mm     | 0,55 – 25        | - SNI 3423:2008<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005     |
| 2.                     | Bahan asing    | %      | ≤ 2              | - AOAC 945.75<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005       |
| <b>Parameter kimia</b> |                |        |                  |                                                                                                                                                                                 |
| 3.                     | Kadar air      | %      | ≤ 50             | - SNI 1965:2008<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005     |
| 4.                     | pH             | -      | 6 – 8            | - AOAC 994.18.2005<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005  |
| 5.                     | Karbon organik | %      | ≥ 10             | - SNI 13-4720-1998,<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005 |

Tabel 1 - Lanjutan

| No                           | Parameter      | Satuan  | Persyaratan mutu | Cara Uji                                                                                                                                                                                           |
|------------------------------|----------------|---------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.                           | Rasio C/N      | -       | 10 - 25          | - SNI 13-4720-1998, SNI 13-4721-1998<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005   |
| 7.                           | AOX            | mg/kg   | $\leq 500$       | - SNI 7228.2.2011, dan US-EPA 9023,<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005    |
| <b>Parameter biologi</b>     |                |         |                  |                                                                                                                                                                                                    |
| 8.                           | Coliform Fecal | MPN/g   | $\leq 100$       | - SNI 01-2332.1-2006<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005                   |
| 9.                           | Salmonella Sp  | MPN/4 g | $\leq 3$         | - APHA. 9260D-2005 dan US EPA 1682<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005     |
| <b>Parameter logam berat</b> |                |         |                  |                                                                                                                                                                                                    |
| 10.                          | Arsen (As)     | mg/kg   | $\leq 10$        | - SNI 06-6989.54-2005 dan US EPA 3050B<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005 |

Tabel 1 - Lanjutan

| No  | Parameter    | Satuan | Persyaratan mutu | Cara Uji                                                                                                                                                                                                             |
|-----|--------------|--------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11. | Kadmium (Cd) | mg/kg  | $\leq 3$         | - SNI 06.6989.16.2009 dan US EPA 3050B<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005                   |
| 12. | Kromium(Cr)  | mg/kg  | $\leq 210$       | - SNI 6989.17.2009 dan US EPA 3050B<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005                      |
| 13. | Kobalt (Co)  | mg/kg  | $\leq 20$        | -SNI 06-2472-1991, SNI 6989.68.2009 dan US EPA 3050B<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005     |
| 14. | Tembaga (Cu) | mg/kg  | $\leq 100$       | - SNI 6989.6.2009. dan US EPA 3050B atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005                           |
| 15. | Timbal (Pb)  | mg/kg  | $\leq 50$        | - SNI 6989.8 : 2009, SNI 6989.46 : 2009 dan US EPA 3050B<br>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005 |

Tabel 1 - Lanjutan

| No | Parameter       | Satuan | Persyaratan mutu | Cara Uji                                                                                                                                                                                                                                                 |
|----|-----------------|--------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | Raksa (Hg)      | mg/kg  | $\leq 0,8$       | <ul style="list-style-type: none"> <li>- SNI 6989.78-2011 dan US EPA 6010C</li> <li>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005</li> </ul>  |
| 17 | Molibdenum (Mo) | mg/kg  | $\leq 10$        | <ul style="list-style-type: none"> <li>- EPA 2461 dan US EPA 3050B</li> <li>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005</li> </ul>          |
| 18 | Nikel (Ni)      | mg/kg  | $\leq 50$        | <ul style="list-style-type: none"> <li>- SNI 6989.18.2009. dan US EPA 3050B</li> <li>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005</li> </ul> |
| 19 | Selenium (Se)   | mg/kg  | $\leq 1,0$       | <ul style="list-style-type: none"> <li>- SNI 06-2475-1991 dan US EPA 3050B</li> <li>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005</li> </ul>  |
| 20 | Timah (Sn)      | mg/kg  | $\leq 20$        | <ul style="list-style-type: none"> <li>- SNI 6989.64.2009 dan US EPA 6010C</li> <li>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005</li> </ul>  |
| 21 | Seng (Zn)       | mg/kg  | $\leq 500$       | <ul style="list-style-type: none"> <li>- SNI 6989.7.2009. dan US EPA 3050B</li> <li>- atau metode pengujian lainnya yang divalidasi atau diverifikasi, yang dilakukan oleh laboratorium pengujian yang telah menerapkan ISO/IEC 17025 : 2005</li> </ul>  |

## 6 Pengambilan contoh

Pengambilan contoh uji dilakukan sesuai SNI 19-0428-1998.

## 7 Penandaan dan pelabelan

Informasi berikut wajib dicantumkan pada wadah penyimpanan dan sarana pengangkutan hasil olahan limbah sebagai pembenah tanah organik minimal terdiri dari :

- a) nama dan alamat pengolah.
- b) jenis hasil pengolahan limbah :  
“pembenah tanah organik hasil pengolahan sludge IPAL Industri Pulp dan Kertas”
- c) tanggal/ kode pengolahan
- d) pernyataan penggunaan khusus : “hanya untuk HTI”
- e) aturan penggunaan:  
[aplikasi maksimal (ton/ha/tahun) sesuai ketentuan perijinan yang diberikan]
- f) pernyataan sesuai SNI



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Peraturan Menteri Negara Lingkungan Hidup Nomor 18 Tahun 2009 Tentang Tata Cara Perizinan Pengelolaan Limbah Bahan Berbahaya Dan Beracun

Laporan Kajian Penyusunan SNI Spesifikasi Kompos sebagai Pembenah Tanah Organik dari Hasil Pengolahan Sludge IPAL Industri Pulp dan Kertas. Kerjasama Asosiasi Pulp dan Kertas Indonesia (APKI) dengan Balai Besar Pulp dan Kertas (BBPK), 2011



## **ANNEX 6-5**

Reviewed Module as Certificated Official Regulation/Standard No.004

SNI 8065:2016 on analysis method and how to control water seepage for fill type  
dams Output 3



## Metode analisis dan cara pengendalian rembesan air untuk bendungan tipe urugan

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## **Prakata**

Standar Nasional Indonesia tentang “Metode analisis dan cara pengendalian rembesan air untuk bendungan tipe urugan” disusun untuk memberikan dasar-dasar analisis dan cara pengendalian rembesan air sebagai acuan dengan mempertimbangkan semua aspek rembesan air dalam desain, baik desain bendungan tipe urugan baru maupun desain modifikasi bendungan lama tipe urugan, serta memberikan rekomendasi praktis dalam analisis rembesan air.

Standar ini dipersiapkan oleh Komite Teknis 91-01 Bahan Konstruksi Bangunan dan Rekayasa Sipil pada Subkomite Teknis 91-01-S1 Sumber Daya Air melalui Gugus Kerja Balai Bangunan Hidraulik dan Geoteknik Keairan dan telah dibahas dalam forum rapat konsensus yang diselenggarakan pada tanggal 4 Desember 2013 yang melibatkan para narasumber, pakar dan instansi terkait, serta telah melalui proses jajak pendapat tanggal 28 Agustus 2014 hingga 27 Oktober 2014.

## Pendahuluan

Desain suatu bendungan tipe urugan yang menahan air dalam volume yang besar perlu mempertimbangkan faktor keamanan terhadap pengaruh rembesan air. Dari pengalaman di beberapa negara di dunia, 38% dari bendungan tipe urugan yang mengalami keruntuhan disebabkan oleh pengaruh rembesan air.

Sampai sekarang buku petunjuk mengenai metode analisis dan cara pengendalian rembesan air untuk bendungan tipe urugan belum ada di Indonesia. Oleh karena itu, perlu disusun suatu standar yang dapat digunakan sebagai acuan bagi pendesain bendungan tipe urugan. Standar ini membahas ragam keruntuhan dan kriteria desain, sifat kelulusan air (permeabilitas) material, metode analisis rembesan air dan metode pengendalian rembesan air, serta pertimbangan desain.

## Metode analisis dan cara pengendalian rembesan air untuk bendungan tipe urugan

### 1 Ruang lingkup

Standar ini membahas ragam keruntuhan pengaruh gaya rembesan air, sifat teknik material, metode analisis rembesan air, cara pengendalian rembesan air, dan pertimbangan desain bendungan tipe urugan.

Standar ini memberikan dasar-dasar analisis rembesan air untuk :

- a) mengetahui efektivitas berbagai teknik pengendalian rembesan air;
- b) memberi data kuantitatif dan cara pengujian parameter permeabilitas tanah untuk desain sistem pengontrolan yang dipilih;
- c) memperkirakan rembesan air pada tubuh dan fondasi bendungan; dan
- d) memberi saran penempatan instrumen rembesan air seperti pisometer dan pengamat rembesan lainnya.

### 2 Acuan normatif

Dokumen referensi di bawah ini harus digunakan dan tidak dapat ditinggalkan untuk melaksanakan pedoman ini:

SNI 03-2393-1991, *Injeksi semen pada batu, Tata cara pelaksanaan*

SNI 2411:2008, *Cara uji kelulusan air bertekanan di lapangan*

SNI 2435:2008, *Cara uji kelulusan air benda uji tanah di laboratorium dengan tekanan tetap*

SNI 3423:2008, *Cara uji analisis ukuran butir*

### 3 Istilah dan definisi

Istilah dan definisi berikut berlaku untuk penggunaan standar ini:

#### 3.1

##### **aliran jenuh**

aliran yang melewati media porus di dalam zona dengan tekanan air pori positif di bawah garis freatik; aliran jenuh biasanya terjadi akibat gradien hidraulik pengaruh gravitasi air waduk di udik bendungan dan daerah keluaran air di hilir bendungan

#### 3.2

##### **aliran tak jenuh**

aliran melewati media porus di dalam zona dengan tekanan air pori negatif yang berada di atas garis freatik; biasanya terjadi karena perbedaan daya isap kapiler permukaan (*capillary surface tension*), yang menyebabkan terjadinya gradien hidraulik antara zona jenuh dan daerah keluaran air

#### 3.3

##### **anisotropi**

sifat alami material yang tidak sama dalam segala arah; dalam analisis rembesan air, anisotropi berhubungan dengan nilai koefisien permeabilitas yang tidak sama, yaitu yang searah bidang perlapisan (arah horizontal  $k_h$ ) dan yang tegak lurus perlapisan (arah vertikal  $k_v$ )

**3.4****garis freatik**

garis aliran air yang berhubungan dengan bidang imajiner dalam tubuh dan/atau fondasi bendungan, yang tekanan air porinya sama dengan tekanan atmosfer

**3.5****gaya perembesan air**

gaya yang terjadi akibat aliran air dalam zona jenuh air dengan arah yang sama dengan arah aliran

**3.6****gradien hidraulik**

perbandingan tinggi potensial hidraulik antara dua titik dibagi jaraknya dalam media aliran tanpa dimensi; tinggi potensial hidraulik biasanya dinyatakan sebagai penjumlahan tinggi tekanan air pori yang dinyatakan dalam unit tinggi dan tinggi elevasi titik yang ditinjau terhadap suatu datum tertentu

**3.7****permeabilitas**

kapasitas rata-rata dari suatu media aliran porus untuk melewatkan air di bawah suatu unit gradien tertentu, dalam kondisi aliran laminar; permeabilitas primer adalah aliran air yang melewati ruang pori dari media porus; permeabilitas sekunder adalah aliran air yang melewati bukaan terbatas dalam suatu media, seperti rekahan atau saluran kecil akibat pelarutan

**3.8****rembesan air**

semua gerakan air dari waduk melewati tubuh dan fondasi bendungan yang merupakan fungsi dari waktu, dan termasuk aliran melewati media porus, rekahan, dan saluran kecil

**3.9****retak susut**

retakan yang terjadi akibat penurunan kadar air dalam tanah (inti kedap air) hingga jauh di bawah kadar air pada waktu pelaksanaan

**3.10****susut**

pengeringan atau penurunan kadar air dalam tanah, terutama terjadi pada bendungan tipe urugan tanah dan berpotensi mengalami retak susut

**3.11****tekanan air pori**

tekanan air dalam rongga butiran tanah yang berhubungan satu dengan yang lainnya di dalam tubuh dan fondasi bendungan, baik tekanan air pori positif ( $>$  tekanan atmosfer) yang terjadi karena pengaruh gravitasi maupun tekanan air pori negatif (*suction*) karena pengaruh isapan permukaan

**4 Ragam keruntuhan**

Untuk menilai apakah suatu bendungan tipe urugan aman terhadap gaya-gaya perembesan air, maka dalam tahap desain perlu dilakukan analisis rembesan air. Hasil analisis tersebut kemudian dibandingkan dengan kriteria desain, yang biasanya dinyatakan dengan faktor keamanan. Ragam keruntuhan pengaruh gaya rembesan air pada umumnya dibagi dalam lima jenis.

#### 4.1 Gradien keluaran melampaui batas

Bila gradien keluaran ( $I_e$ ) tercatat melampaui batas, butiran tanah di dalam bagian kaki bendungan akan terapung dan terlepas dari ikatannya. Hal ini terutama terjadi akibat berkurangnya gaya gravitasi, dan tergantung pada jenis tanahnya sehingga menimbulkan hal-hal seperti di bawah ini.

##### 4.1.1 Didih pasir (*sandboil*)

Didih pasir biasanya terjadi di dalam tanah tak berkoheksi dengan persentase butiran kasar (kerikil) tinggi, dan butiran halus yang diendapkan di permukaan. Tanah yang mengalami didih pasir, struktur butiran kasarnya tetap stabil sehingga menyebabkan adanya peningkatan permeabilitas tanah.

##### 4.1.2 Likuifaksi statis

Likuifaksi statis biasanya terjadi di dalam tanah nonkoheksi dengan gradasi butiran lebih halus (pasir halus dan lanau). Massa tanah di sebelah hilir dapat mengalami likuifaksi bila air waduk meningkat karena gradien hidrolik mencapai gradien kritis ( $I_c$ ).

##### 4.1.3 Erosi buluh (*piping*)

Erosi buluh terjadi di dalam massa fondasi atau urugan yang berkoheksi. Proses erosi buluh dimulai pada satu titik diskontinuitas di sebelah hilir atau konsentrasi aliran air. Sebagai contoh seperti pemadatan yang kurang baik pada bidang kontak antara bendungan dan struktur memanjang dari udik ke hilir, lubang yang terbuka, akar tanaman dan lubang buatan binatang. Butir-butir tanah terlepas mulai di sebelah hilir sehingga terjadi pembentukan pipa kecil yang merambat secara perlahan-lahan ke udik bendungan. Biasanya lintasan lubang kecil tersebut mempunyai bentuk seperti jaring alir (*flownet*). Untuk mencegah kejadian semacam ini, harus dibuat suatu sistem pengontrol yang perlu diamati secara kontinu di lokasi-lokasi rembesan terkonsentrasi.

Faktor keamanan biasanya dinyatakan sebagai nilai banding antara gradien kritis ( $I_c$ ) dan komponen vertikal dari gradien keluaran. Gradien ini diperoleh dari perhitungan atau pembacaan langsung pada instrumen pisometer di lapangan, dan dapat dihitung dengan persamaan [1] dan [2].

$$FK = \frac{I_c}{I_e} \geq 4 \quad (1)$$

$$I_c = \frac{\gamma'}{\gamma_w} = \frac{G_s - 1}{1 + e} \quad (2)$$

Keterangan :

- FK adalah faktor keamanan (tanpa dimensi);  
 $I_c$  adalah gradien keluaran kritis (tanpa dimensi);  
 $I_e$  adalah gradien keluaran dari hasil analisis rembesan atau pembacaan instrumen pisometer (tanpa dimensi)  
 $\gamma'$  adalah berat volume efektif (terendam) ( $t/m^3$ );  
 $\gamma_w$  adalah berat volume air ( $t/m^3$ );  
 $G_s$  adalah graviti spesifik (tanpa dimensi);  
 $e$  adalah angka pori (tanpa dimensi);

Nilai rata-rata  $G_s$  biasanya digunakan untuk berbagai perhitungan gradien keluaran karena variasi nilainya tidak berbeda jauh untuk jenis tanah yang berbeda. Namun, nilai  $e$  di lapangan untuk berbagai jenis tanah bervariasi cukup besar, Oleh karena itu, penaksirannya (bila tidak ada data hasil pengujian) harus dilakukan secara hati-hati berdasarkan pengalaman dan pertimbangan teknis yang baik pula.

Bila tidak ada informasi mengenai nilai graviti spesifik  $G_s$  atau angka pori  $e$ , dapat digunakan  $I_c = 1$  yang kurang lebih identik dengan kondisi pasir kuarsa di lapangan. Nilai ini bukan nilai konservatif sehingga harus digunakan secara hati-hati. Karena nilai  $I_c$  yang lebih rendah yaitu sebesar 0,5, pernah terukur oleh beberapa peneliti untuk jenis tanah pasir halus dan lanau.

Faktor keamanan minimum untuk desain harus diambil minimal 4 untuk mencegah terjadinya keruntuhan karena pengaruh gradien keluaran yang melampaui batas. Faktor ini terutama digunakan untuk mencegah hal-hal yang tidak diperhitungkan dalam tahap desain. Misalnya pengaruh heterogenitas tanah, kemunduran kualitas tanah yang merupakan fungsi dari waktu dan penyimpangan hasil perkiraan.

## 4.2 Tekanan air pori melampaui batas

Bila tekanan air pori di dalam fondasi dan tubuh bendungan melampaui batas, maka dapat terjadi beberapa jenis keruntuhan.

### 4.2.1 Ketidakstabilan lereng timbunan dan deformasi berlebihan

Tekanan air pori dan gaya perembesan air adalah penyebab utama kekhawatiran ketidakstabilan pada bendungan tipe urugan. (Kriteria desain ini dapat diperiksa pada SNI 8064:2016, Metode analisis stabilitas lereng statik bendungan tipe urugan).

### 4.2.2 Tekanan air pori di dalam fondasi

Tekanan air pori di dalam fondasi bendungan dapat menyebabkan terjadinya tekanan angkat yang tinggi pada bangunan air.

### 4.2.3 Tekanan air pori yang tinggi di hilir bendungan

Tekanan air pori yang tinggi di hilir fondasi bendungan dapat menimbulkan tekanan angkat tinggi, sehingga terjadi pengangkatan atau peletusan (*upheaval* atau *blowup*). Kondisi ini terjadi, bila terdapat lapisan fondasi dengan koefisien permeabilitas tinggi di bawah tubuh bendungan (lapisan takterkekang = *unconfined layer*). Keruntuhan akan mulai terjadi, bila tekanan angkat di bawah lapisan takterkekang melebihi tekanan overburden di atasnya, sehingga menyebabkan bobolnya lapisan takterkekang dan terjadi peningkatan gradien keluaran. Erosi buluh atau likuifaksi statis dapat terjadi pada lapisan di bawahnya. Untuk mendeteksi secara dini kondisi semacam ini, harus dipasang pisometer di hilir bendungan.

Faktor keamanan terhadap pengaruh tekanan angkat yang tinggi dihitung dengan menggunakan persamaan (3).

$$FK = \frac{\gamma_n t}{\gamma_w h} = \frac{G_s t}{(1+e)h} > 2 \quad (3)$$

Keterangan :

$\gamma_n$  adalah berat volume material fondasi; ( $t/m^3$ )

$t$  adalah tebal overburden; (m)

$h$  adalah tinggi tekanan pisometrik. (m)

### 4.3 Gradien internal yang tinggi tidak tersaring

Bila gradien tidak tersaring bernilai tinggi, maka akan terjadi perpindahan butiran halus dari satu zona ke zona lainnya di dalam bendungan tipe urugan, atau dari urugan ke dalam rongga pori tanah fondasi, seperti berikut:

- Selimut kedap air atau inti kedap air terletak di atas fondasi aluvial berbutir kasar atau batuan yang mengandung banyak rekahan.
- Inti kedap air dibuat miring dan tipis di atas zona drainase.
- Melewati puncak dinding halang kedap air dengan penutup yang sempit.

Untuk mencegah keruntuhan tipe ini, harus dipasang saringan (filter) sesuai dengan standar yang berlaku.

### 4.4 Debit rembesan melampaui batas

Debit rembesan yang melampaui batas tanpa membawa material halus bukan merupakan keruntuhan struktural, tetapi dapat menimbulkan kehilangan air yang besar sehingga tidak dapat memenuhi kebutuhan air.

### 4.5 Retak susut

Retak susut terjadi akibat penurunan kadar air di dalam inti kedap air hingga jauh di bawah kadar air pada waktu pelaksanaan. Hal ini dapat terjadi karena:

- penguapan di permukaan urugan;
- drainase ke dalam sistem drainase bendungan; dan
- drainase ke dalam fondasi bendungan yang porus.

Retak susut biasanya terjadi antara batas plastis dan batas susut atau bila kadar air turun di bawah batas plastis sehingga kuat geser juga dapat menurun.

## 5 Sifat teknik material

### 5.1 Pemilihan parameter koefisien permeabilitas untuk analisis

Koefisien permeabilitas adalah parameter tanah terpenting bagi analisis dan pengontrolan rembesan air. Standar uji permeabilitas tanah di laboratorium untuk media porus biasanya diperoleh dengan mengalirkan air akuades melewati massa tanah yang sudah jenuh pada temperatur 20°C.

Permeabilitas primer adalah kapasitas aliran air melewati struktur butiran tanah. Permeabilitas sekunder adalah kapasitas aliran air yang melewati rekahan atau bukaan pendek pada massa tanah. Permeabilitas primer biasanya relatif kecil dibandingkan dengan permeabilitas sekunder. Pada pengujian lapangan untuk batuan dengan rekahan, kondisi aliran tidak diketahui secara pasti apakah aliran laminar atau turbulen. Biasanya interpretasi hasil uji dan perhitungan permeabilitas dilakukan dengan anggapan aliran laminar.

Dalam penentuan kuantitas dan kecepatan aliran, seperti besarnya kehilangan air, penentuan ukuran sistem drainase, desain sumur pelepas tekanan (*relief well*) dan sistem *dewatering*, dibutuhkan data permeabilitas tanah. Beberapa cara penentuan permeabilitas tanah dibahas berikut ini.

### 5.1.1 Data terpublikasi

Koefisien permeabilitas tanah fondasi dapat diprediksi dengan menggunakan data terpublikasi bila telah ada penyelidikan geoteknik tetapi tidak ada data uji permeabilitas. Sumber data ini dapat digunakan sebagai studi pendahuluan atau desain final bila masalah rembesan air tidak kritis. Bila dianggap kritis, harus dilakukan penyelidikan tambahan yang lebih terperinci. Pada Tabel A.1 sampai dengan A.7, dan Gambar A.1 sampai dengan A.3 pada Lampiran A, diperlihatkan variasi koefisien permeabilitas untuk berbagai jenis tanah dan batuan.

### 5.1.2 Data teramati pada waktu desain atau konstruksi

Data teramati pada waktu desain atau konstruksi mempunyai tingkat variasi ketelitian yang tergantung pada jumlah pengujian lapangan. Data ini merupakan sumber awal, yang dapat digunakan dalam mempelajari rembesan air di dalam bendungan lama, dan biasanya mencakup:

- uji permeabilitas lapangan dari laporan penyelidikan geoteknik;
- uji permeabilitas di laboratorium; dan
- uji gradasi material.

### 5.1.3 Data hasil uji laboratorium

Data ini diperoleh dari hasil uji laboratorium pada contoh tanah tak terganggu dari material urugan sesuai dengan standar yang berlaku. Uji permeabilitas laboratorium sangat berguna untuk menguji bahan urugan berbutir halus dan bahan selimut kedap air. Dalam uji ini, gradien hidraulik dapat divariasikan, sehingga dapat mempersingkat waktu uji dibandingkan dengan uji lapangan. Beberapa metode uji dapat diuraikan sebagai berikut:

- Metode pengujian laboratorium tentang kelulusan air bertekanan konstan untuk tanah (SNI 2435:2008).
- Metode pengujian laboratorium tentang kelulusan air bertekanan jatuh bebas.
- Metode pengujian laboratorium analisis ukuran butir tanah (SNI 3423:2008).
- Data pembagian butir dapat digunakan untuk menaksir koefisien permeabilitas tanah dengan persamaan empiris dari *Hazen*.

$$k = C \times D_{10}^2 \quad (4)$$

Keterangan :

k adalah koefisien permeabilitas [cm/s];  
 C adalah konstanta = 1, berlaku untuk pasir dan kerikil bergradasi seragam, tanpa sementasi dan bersih (lanau dan lempung < 5%);  
 D<sub>10</sub> adalah ukuran butir yang lewat saringan 10 % pada kurva gradasi material (mm).  
 Selain itu, dapat juga digunakan penaksiran nilai k menggunakan parameter lain seperti terlihat pada Gambar A.2 Lampiran A.

### 5.1.4 Data hasil uji lapangan

Data permeabilitas material fondasi yang paling akurat dapat diperoleh dari hasil uji lapangan dengan cara sebagai berikut:

- metode pengujian lapangan tentang kelulusan air bertekanan (SNI 2411:2008);
- uji pemompaan dalam lubang bor;
- uji infiltrasi dalam sumur dangkal;

- d) uji kelulusan air dengan alat permeameter cincin.

### 5.1.5 Data pengamatan fluktuasi muka air tanah

Data pengamatan fluktuasi muka air tanah diperoleh dari hasil pengujian dalam sumuran pada fondasi atau ebatmen dengan mengamati volume air yang masuk atau keluar dari sumuran.

### 5.1.6 Data hasil analisis

Data hasil analisis balik diperoleh dari hasil pengujian dan analisis numerik. Caranya adalah dengan mencoba-coba koefisien permeabilitas material sehingga menghasilkan kondisi yang sama dengan hasil pengamatan pisometer di lapangan (kalibrasi) .

## 5.2 Sifat anisotropi permeabilitas

Material tanah dan batuan biasanya bersifat anisotropik, termasuk material urugan dan fondasi bendungan. Sifat anisotropi permeabilitas, terutama terjadi karena pengaruh cara pengendapan atau cara pemadatan, bentuk partikel butiran, serta orientasi dan pola rekahan di dalam massa batuan.

### 5.2.1 Sifat anisotropi dalam urugan

- a) Urugan tanah berbutir halus
  - 1) Bendungan yang dipadatkan dengan baik mengikuti standar yang berlaku, nilai anisotropi  $k_h/k_v = 2-10$
  - 2) Bendungan yang tidak dipadatkan secara baik atau berlapis-lapis, nilai anisotropi bisa mencapai  $k_h/k_v = 50$
- b) Urugan tanah berbutir kasar biasanya digunakan sebagai bahan drainase yang dipadatkan dengan lapisan lebih tebal. Nilai anisotropinya  $k_h/k_v$  lebih kecil dibandingkan untuk tanah berbutir halus. Tabel A.4 menunjukkan variasi anisotropi untuk beberapa kondisi. Bila data tidak diperoleh, maka untuk perkiraan nilai anisotropi permeabilitas dapat digunakan Tabel A.4.

### 5.2.2 Sifat anisotropi dalam fondasi

Bila tidak ada data spesifik dari lapisan tanah dan batu untuk analisis, Tabel A.7 pada Lampiran A dapat digunakan untuk berbagai variasi nilai anisotropi.

- a) Batuan endapan yang berlapis-lapis,  $k_h/k_v = 100$  , biasanya tergantung pada pembagian butir per lapisan tanah (periksa Tabel A.4, Lampiran A).
- b) Endapan angin (*wind deposit*)  $k_h/k_v = 0.02 - 2$ .
- c) Batuan yang penuh rekakan,  $k_h/k_v = 0.1-10$  biasanya agak sulit ditentukan dan tergantung pada orientasi rekahan, berat volume, dan ukuran bukaan rekahan.
- d) Batuan porus yang keras mempunyai nilai anisotropi agak rendah, yaitu  $k_h/k_v = 1-3$ .

### 5.2.3 Porositas

Porositas adalah sifat dasar yang digunakan dalam ilmu yang berhubungan dengan aliran air melewati media porus. Parameter ini merupakan nilai banding antara volume rongga pori dan volume total tanah, dan dapat dihitung dengan menggunakan persamaan (5).

$$n = 1 - \frac{\gamma_d}{\gamma_w G_s} \quad (5)$$

Keterangan :

$n$  adalah porositas (tanpa dimensi)  
 $\gamma_d$  adalah berat volume kering ( $t/m^3$ )  
 $\gamma_w$  adalah berat volume air ( $t/m^3$ )  
 $G_s$  adalah spesifik gravitasi (tanpa dimensi)

Nilai porositas mempengaruhi nilai koefisien permeabilitas tanah, tetapi tidak langsung menentukan koefisien permeabilitas. Tanah berbutir halus pada umumnya mempunyai porositas lebih tinggi daripada tanah berbutir kasar. Namun ukuran pori yang kecil mempunyai tahanan gesek lebih tinggi terhadap aliran air dan permeabilitasnya lebih rendah.

Porositas tidak langsung digunakan dalam permasalahan aliran jenuh, tetapi secara teoretis identik dengan batas atas kadar air volumetrik untuk aliran air takjenuh dalam bendungan tipe urugan.

Porositas efektif atau “*specific yield*” merupakan sebagian volume air dengan drainase dari suatu massa tanah secara gravitasi. Parameter ini dapat digunakan sebagai koefisien simpanan untuk permasalahan aliran air bebas (*unconfined flow*). Tabel A.8 sampai dengan Tabel A.10 memperlihatkan variasi nilai porositas untuk berbagai jenis tanah dan batuan. Gambar A.3 memperlihatkan hubungan antara porositas dan “*specific yield*”.

### 5.2.4 Hubungan antara koefisien permeabilitas dan kadar air

Hubungan antara parameter koefisien permeabilitas dan kadar air merupakan suatu fungsi. Fungsi ini diperlukan untuk studi rembesan dalam bendungan tipe urugan dengan derajat kejenuhan yang berbeda-beda. Koefisien permeabilitas pada kondisi takjenuh biasanya dinyatakan dengan koefisien permeabilitas efektif ( $k_r$ ) yang merupakan sebagian dari koefisien permeabilitas jenuh air ( $k$ ). Bila tidak ada hasil uji permeabilitas, secara praktis dapat digunakan rumus empiris [6].

$$k_r = \left( \frac{\theta}{n} \right)^\varepsilon \quad (6)$$

$$\theta = \frac{(w\gamma_d)}{(100\gamma_w)} \quad (7)$$

Keterangan :

$n$  adalah porositas (tanpa dimensi);  
 $\theta$  adalah derajat kejenuhan fraksional (tanpa dimensi);  
 $\varepsilon$  adalah konstanta berkisar antara 3 –6 (tanpa dimensi);

|            |                                                        |                     |
|------------|--------------------------------------------------------|---------------------|
|            | Untuk material drainase yang dipadatkan                | $\varepsilon = 3.5$ |
|            | Untuk material urugan yang dipadatkan dan batuan porus | $\varepsilon = 4.0$ |
|            | Untuk material tanah asli mengandung butiran halus     | $\varepsilon = 4.5$ |
| W          | adalah kadar air tanah (tanpa dimensi);                |                     |
| $\gamma_d$ | adalah berat volume kering tanah ( $t/m^3$ );          |                     |
| $\gamma_w$ | adalah berat volume air ( $t/m^3$ );                   |                     |

Selain itu hubungan antara koefisien permeabilitas dan kadar air atau tekanan air pori negatif dapat ditentukan dengan cara yang diberikan oleh *Corey* atau *Fredlund* dkk (2000).

### 5.2.5 Hubungan antara daya isap tanah dengan kadar air

Tekanan air pori negatif sebagai fungsi dari kadar air merupakan sifat tanah yang perlu diperhitungkan dalam evaluasi rembesan dengan derajat kejenuhan yang bervariasi. Daya isap tanah (*soil suction*) sangat mempengaruhi kekuatan geser tanah kohesif, yang biasanya menimbulkan tekanan air pori negatif di atas garis freatik bendungan. Dalam kasus-kasus tertentu, sering dibutuhkan tekanan air pori negatif terjadi dalam tanah lempung urugan dan fondasi, agar kondisi cukup stabil. Data ini dapat diperoleh dengan cara sebagai berikut :

- Menggunakan data yang terpublikasi untuk tanah asli seperti diperlihatkan pada Gambar A.4 dan A.5 dari Lampiran A.
- Melakukan uji laboratorium khusus seperti diuraikan oleh *Fredlund* dkk [8.18].

## 6 Metode analisis rembesan air

Semua analisis yang diuraikan dalam standar ini berhubungan dengan metode perhitungan untuk memperkirakan besarnya rembesan air melewati tubuh dan fondasi bendungan.

### 6.1 Rencana analisis

Sebelum melakukan analisis rembesan air, terlebih dahulu perlu disusun suatu rencana analisis berikut ini :

- penjelasan singkat tentang maksud analisis;
- pemilihan metode analisis;
- kondisi yang akan dianalisis, yaitu:
  - kondisi pembebanan akibat perubahan muka air waduk;
  - parameter yang akan divariasi;
  - data material yang digunakan untuk analisis yaitu :
    - sumber data;
    - tambahan pengujian lapangan dan laboratorium;
  - hasil kuantitatif yang akan diperoleh;
  - perkiraan harga dan waktu.
- Standar teknis, dalam Tabel 1 memperlihatkan ikhtisar tipe analisis dan metode analisis untuk beberapa situasi yang dapat digunakan. Standar ini hanya memberi suatu petunjuk umum untuk analisis rembesan air, dan tidak mencakup semua situasi secara detail yang mungkin terjadi. Oleh karena itu, standar ini harus digunakan dengan hati-hati dan disesuaikan dengan pengalaman masing-masing. Dan bila diperlukan, dianjurkan untuk meminta advis teknis kepada tenaga spesialis dalam bidang ini, sesuai dengan tingkat kesulitan masalah yang dihadapi.

**Tabel 1 - Metode analisis rembesan air**

| <b>No.</b> | <b>Situasi</b>                                                                                                                       | <b>Penyelidikan tipikal</b>                                                                                                                                                        | <b>Metode yang dianjurkan</b>                                                                                                          |
|------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 1          | Urugan homogen dengan fondasi kedap air, aliran langgeng 2D                                                                          | Garis freatik, tekanan air pori, gaya perembesan air (stabilitas)                                                                                                                  | Grafis atau garis freatik menggunakan Gambar C.1 sampai dengan C.3                                                                     |
| 2          | Urugan zonal dengan fondasi kedap air, aliran langgeng 2D                                                                            | Garis freatik, tekanan air pori, gaya perembesan air (stabilitas)                                                                                                                  | Jaring alir periksa Gambar C.4 atau model numerik (SEEP2D, PLAXIS, PC-SEEP, SEEP/W).                                                   |
| 3          | Urugan homogen dengan fondasi porus yang seragam, aliran langgeng 2D                                                                 | Garis freatik, tekanan air pori, gaya perembesan air (stabilitas)<br><br>Gradien keluaran dan debit rembesan.<br><br>Alternatif sistem pengendalian dan variasi parameter material | Jaring alir Gambar C.4 sampai dengan C.7<br><br>Model numerik (SEEP2D, PLAXIS, PC-SEEP, SEEP/W)<br><br>Model numerik (SEEP2D, PC SEEP) |
| 4          | Urugan zonal dengan fondasi porus, aliran langgeng 2D                                                                                | Garis freatik, tekanan air pori, gaya perembesan air (stabilitas)<br><br>Gradien keluaran dan debit rembesan.<br><br>Alternatif sistem pengendalian dan variasi parameter material | Model numerik (SEEP2D, PC SEEP, SEEP/W)                                                                                                |
| 5          | Aliran transien 2D, kondisi batas tetap                                                                                              | Proses penjenjutan dan waktu sampai terjadi aliran tetap                                                                                                                           | Model numerik (PC-SEEP, SEEP/W)                                                                                                        |
| 6          | Situasi termasuk aliran 2D tidak langgeng, jenuh – tidak jenuh, urugan zonal dan homogen, fondasi heterogin, kondisi batas transien. | Pengisian pertama, operasi waduk, perubahan kadar air dan tekanan air pori, pengaruh presipitasi dan evaporasi                                                                     | Model numerik (PC-SEEP, SEEP/W)                                                                                                        |

## 6.2 Metode analisis

### a) Metode numerik

Metode numerik dengan komputer sangat dianjurkan untuk digunakan dalam analisis rembesan air karena beberapa keuntungan yaitu sebagai berikut.

- 1) Sistem yang kompleks dapat dianalisis dengan mudah.
- 2) Tidak perlu ada transformasi dimensi akibat pengaruh sifat material.

- 3) Hasil yang dikeluarkan berupa nilai digital pada setiap titik nodal, yang kemudian dapat digambarkan garis ekipotensial dan tekanan air pori.
- 4) Parameter tanah dapat divariasikan dengan mudah.

Program-program komputer yang banyak digunakan dapat dibedakan atas dua jenis, yaitu sebagai berikut :

- 1) Elemen hingga (*finite element*)
    - (a) Program SEEP2D dikembangkan DUNCAN, J.M dan WONG, K.S dari Virginia Polytechnic Institute, hanya dapat digunakan untuk aliran langgeng.
    - (b) Program PLAXIS dari Belanda, hanya dapat digunakan untuk aliran langgeng.
    - (c) Program PC-SEEP/SEEP-W dari Geo-Slope Programming Ltd (1987), Calgary Alberta, Canada dapat digunakan untuk aliran langgeng dan aliran transien (*transien flow*).
  - 2) Elemen batas (*bundary element*)  
Program BIE2DCP dikembangkan di US Bureau of Reclamation dan hanya digunakan untuk aliran langgeng.
- b) Metode persamaan dan grafis
- Berdasarkan teori rembesan jenuh air dan kondisi yang disederhanakan, metode ini dapat digunakan sebagai analisis pendahuluan dalam desain dan perkiraan biaya. Bila penyederhanaan ini dapat diterima melalui penyelidikan yang terperinci, cara ini dapat digunakan untuk desain final. Semua metode analisis didasarkan pada persamaan Darcy yaitu:

$$q = k.i.A \quad (8)$$

Keterangan :

- q adalah debit rembesan (m<sup>3</sup>/s);  
i adalah gradien hidraulik (tanpa dimensi);  
A adalah luas potongan yang ditinjau (m<sup>2</sup>);  
k adalah koefisien permeabilitas (m/s).

Selain itu, gaya rembesan ( $F_s$ ) untuk analisis stabilitas dan deformasi dapat dihitung untuk kondisi jenuh dengan persamaan:

$$F_s = \gamma_w i V \quad (9)$$

Keterangan :

- $F_s$  adalah gaya rembesan (ton)  
 $\gamma_w$  adalah berat volume air (ton/m<sup>3</sup>)  
V adalah volume (m<sup>3</sup>)

Persamaan-persamaan, grafik-grafik dan gambar-gambar pada Lampiran B dapat digunakan untuk analisis pendahuluan dan final dalam desain sistem pengendalian rembesan air. Misalnya sumur pelepas tekanan, parit drainase, selimut kedap air, berm hilir, dan dinding halang. Namun dalam penggunaannya, hal itu harus dilakukan secara hati-hati. Sebagai contoh, metode tersebut tidak berlaku bila digunakan kombinasi beberapa sistem pengendalian rembesan air yang merupakan satu kesatuan.

- c) Metode grafis
  - 1) Garis freatik untuk kondisi aliran langgeng dapat diperkirakan secara semi grafis menggunakan prosedur yang diberikan pada Gambar C.1, C.2 dan C.3 dari Lampiran C. Hasilnya dapat digunakan untuk memperkirakan tekanan air pori dalam analisis stabilitas lereng bendungan, sebagai acuan untuk penempatan pisometer, atau pembandingan dengan data yang terbaca dari instrumen.

- 2) Cara jaring alir merupakan cara grafis untuk menggambarkan tinggi potensial hidraulik dan arah aliran dalam 2 dimensi, khususnya aliran langgeng yang jenuh air. Cara ini berguna untuk memperkirakan tekanan air pori, gradien hidraulik, dan debit rembesan. Namun, jaring alir hanya dapat digunakan untuk permasalahan yang sederhana, seperti sistem satu atau dua zona bahan dengan parameter yang tidak bisa divariasikan. Dasar-dasar pembuatan jaring alir dapat diperiksa pada Lampiran C.4 dari Lampiran C. Contoh-contoh hasil pembuatan jaring alir dapat diperiksa pada Gambar C.5 sampai C.8.
- d) Metode tahanan listrik  
Metode ini dapat digunakan karena ada kesamaan antara hukum Ohm dan hukum Darcy. Media tanah dapat disesuaikan dengan tahanan-tahanan listrik yang dialiri arus listrik. Voltase yang terukur pada tiap titik simpul dapat diidentikkan sebagai tinggi tekanan air. Metode ini dapat digunakan untuk aliran langgeng. Namun, karena membutuhkan banyak resistor untuk membuat model media aliran, pelaksanaannya menjadi kurang praktis.

### 6.3 Kondisi muka air waduk sebagai pembebanan

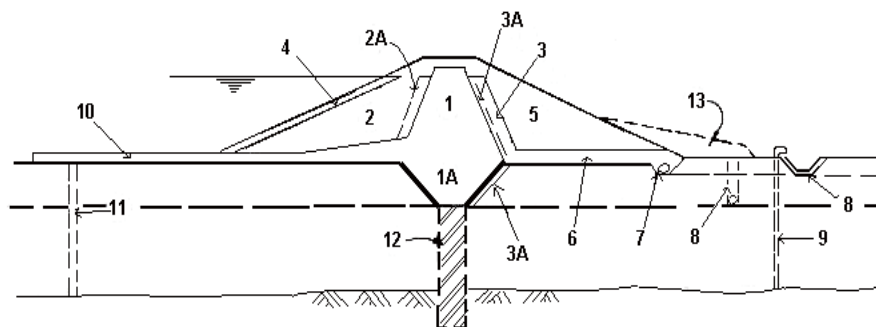
Kondisi muka air waduk sebagai pembebanan dalam analisis, harus memperhitungkan hal berikut ini.

- a) Elevasi muka air maksimum harus digunakan untuk menentukan pengaruh gradien keluaran dan tekanan angkat pada fondasi porus. Bila fondasi sudah jenuh, perubahan tekanan air dapat terjadi dalam waktu singkat. Kapasitas maksimum pada kondisi muka air waduk maksimum juga harus digunakan untuk desain sistem drainase yang terpengaruh oleh fondasi porus.
- b) Elevasi muka air normal harus digunakan untuk memperkirakan debit rembesan, dan untuk menentukan garis freatik pada kondisi aliran langgeng. Pada umumnya elevasi ini merupakan elevasi maksimum yang digunakan untuk menentukan kapasitas maksimum untuk kebutuhan air (konservasi air).
- c) Elevasi muka air waduk minimum atau disebut juga sebagai elevasi muka air konservasi inaktif harus digunakan untuk studi retak susut di dalam tubuh bendungan, bila terjadi dalam jangka panjang. Kriteria ini dapat digunakan, kecuali jika ada kriteria lain yang harus diperhitungkan.
- d) Elevasi muka air hilir rata-rata harus digunakan untuk studi aliran langgeng.
- e) Hidrograf untuk di waduk dan di hilir bendungan, dapat dikembangkan dari kriteria operasi waduk untuk studi pengaruh aliran transien, yaitu :
  - 1) pengisian pertama waduk;
  - 2) perubahan muka air tahunan waduk; dan
  - 3) siklik banjir.

## 7 Pengendalian rembesan air dan pertimbangan desain

Filosofi dasar pengendalian rembesan yang digunakan oleh berbagai instansi di luar negeri secara bertahap adalah untuk memperoleh keamanan dan kemampuan penyimpanan air dalam waduk. Pengendalian rembesan air secara bertahap sangat dibutuhkan karena banyak faktor yang belum diketahui pada tahap desain sampai masa guna bendungan, antara lain:

- a) anomali geologi dan keterbatasan data penyelidikan;
- b) asumsi yang tidak sesuai dengan kejadian gempa dan cuaca;
- c) penurunan fungsi dari satu atau beberapa sistem pengendalian rembesan dengan waktu;
- d) perubahan cara pengoperasian waduk;
- e) peningkatan populasi di sekitar lokasi.



Keterangan gambar:

- |    |                                               |    |                                                     |
|----|-----------------------------------------------|----|-----------------------------------------------------|
| 1  | Zona penahan air (inti)                       | 6  | Selimut drainase                                    |
| 1A | Parit halang                                  | 7  | Drainase kaki ( <i>toe drain</i> )                  |
| 2  | Zona drainase udik untuk pelindung stabilitas | 8  | Parit drainase (terbuka atau tertutup)              |
| 2A | Zona transisi                                 | 9  | Sumur pelepas tekanan ( <i>relief wells</i> )       |
| 3  | Zona drainase hilir ( <i>chimney drain</i> )  | 10 | Selimut kedap air                                   |
| 3A | Subzona saringan ( <i>filter</i> )            | 11 | Dinding halang slurry ( <i>Slurry wall cutoff</i> ) |
| 4  | Zona armor                                    | 12 | <i>Grouting</i> tirai                               |
| 5  | Zona pelindung stabilitas hilir               | 13 | Berm rembes air                                     |

**Gambar 1 - Pengontrolan rembesan air pada bendungan tipe urugan**

Sistem pengendalian rembesan air dibagi dalam dua kategori, yaitu cara dinding penahan air dan cara pengontrolan drainase. Desain bendungan biasanya menggunakan kombinasi dari kedua cara tersebut. Walaupun prinsip kerja kedua cara tersebut berbeda, dalam analisis rembesan air, kedua cara itu harus digabung sebagai satu kesatuan.

Pada Gambar 1, diperlihatkan sketsa beberapa sistem pengontrolan rembesan air dalam satu gambar dan diuraikan secara terperinci seperti berikut ini.

## 7.1 Sistem pengendalian rembesan pada urugan

### 7.1.1 Zona urugan

Zona urugan biasanya terdiri atas zona penahan air (inti kedap air) yang dilindungi oleh drainase saring (*filter*) dan zona pelindung untuk stabilitas. Untuk mengendalikan rembesan air, dapat dipilih salah satu alternatif atau kombinasi dari beberapa alternatif berikut ini.

- Parit halang (*cutoff trench*) biasanya merupakan bagian dari inti kedap air yang dibuat pada lapisan fondasi yang porus, dan bila memungkinkan secara ekonomis, mencapai kedalaman fondasi yang kedap air. Desain bidang kontak antara inti dan fondasi dianjurkan cukup panjang, untuk mengurangi gradien hidraulik di sepanjang bidang kontak. Sebagai contoh, pada potongan bendungan dekat ebatmen, lereng inti kedap air harus dibuat lebih landai. Masuknya aliran air karena perubahan geometri pada permukaan hilir inti kedap air harus dicegah untuk mengurangi rembesan.
- Zona drainase hilir (*chimney drain*) harus dilengkapi dengan subzona saring (*filter*) terhadap material inti kedap air dan subzona campuran pasir dan kerikil yang porus, yang memenuhi persyaratan. Zona drainase hilir (*chimney drain*) harus mempunyai kapasitas yang cukup dan ditempatkan cukup tinggi untuk mengatasi kondisi aliran darurat yang mungkin terjadi, sebagai contoh bila ada retakan pada inti kedap air pada waktu muka air waduk maksimum.
- Zona drainase udik dan zona pelindung stabilitas biasanya menggunakan material yang nonkohesif dan mempunyai sifat disipasi air yang tinggi waktu surut cepat.

### 7.1.2 Selimut drainase

Selimut drainase (*drainage blanket*), biasanya merupakan perpanjangan dari drainase hilir dalam arah horizontal, yang dihubungkan dengan drainase kaki (*toe drain*). Material yang digunakan harus memenuhi syarat filter. Bila material bagian atas dan bawah mempunyai kemungkinan terjadinya perpindahan partikel halus kedalam material drainase maka selimut drainase harus didesain agar dapat menampung debit air dari zona drainase hilir, fondasi dan rembesan air hujan.

Koefisien permeabilitas material selimut drainase dapat ditentukan dengan menggunakan persamaan (4).

## 7.2 Sistem pengendalian rembesan pada fondasi

### 7.2.1 Parit drainase hilir

Parit drainase hilir yang dibuat sejajar dengan kaki bendungan dapat digunakan sebagai drainase untuk rembesan fondasi yang dibutuhkan pada lokasi yang rendah. Parit tersebut harus didesain dengan memberi lining dari material bergradasi sesuai dengan syarat filter, dan ditutup dengan material riprap sebagai bahan pelindung terhadap erosi.

### 7.2.2 Sumur pelepas tekanan

Sumur pelepas tekanan (*relief well*) berfungsi untuk mengurangi tekanan artesis dalam akuifer terkekang dengan aman, karena pengaruh tekanan angkat dan atau gradien keluaran melewati lapisan terkekang di hilir bendungan. Bila sumur ini berfungsi sebagai drainase dari formasi berbutir kasar, material yang digunakan di sekeliling saringan harus memenuhi syarat filter.

### 7.2.3 Selimut kedap air

Bila fondasi berupa material sangat porus, harus digunakan selimut kedap air di udik sebagai kelanjutan horizontal dari dinding halang bendungan (inti). Selimut ini berfungsi untuk menurunkan gradien rembesan atau jumlah rembesan akibat adanya beda tinggi muka air waduk dan muka air hilir (*head*). Gradien yang tinggi sering terjadi pada potongan tebal selimut, yang mengakibatkan terjadinya erosi buluh dari material selimut ke dalam material fondasi. Untuk mencegah hal ini, perlu dipasang lapisan filter yang memenuhi syarat filter di bawah selimut. Lapisan selimut harus dibuat lebih tebal di daerah sambungan dengan inti bendungan, agar tahan terhadap bahaya erosi buluh dan bobolnya bendungan, yang garis alirannya terpendek. Pada Lampiran Gambar B.5, diperlihatkan cara memperkirakan efektivitas selimut kedap air di udik .

### 7.2.4 Dinding halang slari (*slurry*)

Dinding halang slari adalah dinding halang yang sangat efektif untuk mencegah rembesan air masuk melewati fondasi bendungan. Hal ini digunakan bila dinding halang yang berupa parit tidak ekonomis untuk mencapai lapisan fondasi kedap air. Desain bendungan harus memperhitungkan pengaruh gradien hidraulik pada bidang kontak antara inti bendungan dan dinding halang slari, agar penempatan dinding cukup baik. Penempatan dinding halang di udik bendungan, seperti terlihat pada Gambar B.4 pada Lampiran B dapat digunakan untuk memperkirakan efektivitas kedalaman dinding halang.

### 7.2.5 Dinding diafragma

Dinding diafragma sebagai dinding halang biasanya terbuat dari beton, tetapi kadang-kadang menggunakan proses bahan dan alat yang dipatenkan. Cara ini sangat efektif sebagai dinding halang air melewati tubuh dan fondasi bendungan.

### 7.2.6 Injeksi (*grouting*) tirai

Injeksi berupa tirai dapat digunakan untuk mengurangi rembesan, tetapi sebagai dinding halang air tingkat efektivitasnya tergantung pada kondisi geologi. Pada umumnya injeksi tirai hanya berfungsi untuk mengurangi aliran rembesan total melewati fondasi. Namun, injeksi tirai tidak berfungsi untuk memperpanjang garis aliran karena suatu bukaan kecil pada tirai akan menimbulkan garis aliran memendek. Tipe campuran injeksi yang sering digunakan adalah injeksi semen, yang hanya efektif digunakan pada lapisan berbutir kasar atau formasi batuan yang mengandung banyak rekahan. Injeksi bahan kimia juga sering digunakan pada lapisan fondasi berbutir halus. Gambar B.5 dari Lampiran B, dapat digunakan untuk memperkirakan efektivitas kedalaman dinding halang.

### 7.2.7 Perbaikan bidang kontak

Perbaikan bidang kontak antara urugan dan fondasi bendungan tipe urugan yang dibangun di atas fondasi batuan harus dilakukan sesuai dengan standar yang berlaku.

### 7.2.8 *Berm* rembes air di hilir

*Berm* rembes air di hilir adalah konstruksi yang efektif untuk melawan gradien keluaran yang tinggi atau tekanan angkat yang tinggi pada kaki hilir bendungan. Bila gradien keluaran merupakan masalah utama, maka material *berm* harus dibuat dari bahan yang lebih porus dibandingkan material dibawahnya. Material *berm* ini berfungsi sebagai filter, sistem drainase dan beban penggimbang (*counterweight*).

### 7.2.9 Galeri (terowong drainase)

Galeri merupakan serangkaian lubang drainase yang dibor, yang kadang-kadang diperlukan untuk mengurangi tekanan air pori dalam batuan di *ebatmen*, dan memindahkan aliran rembesan dari bidang kontak antara tubuh dan fondasi bendungan.

### 7.2.10 Pengeboran drainase semihorizontal

Pengeboran drainase semihorizontal dapat dibuat ke dalam *ebatmen* bendungan untuk mengurangi tekanan air pori berlebih atau menahan rembesan sebelum mencapai bendungan.

## Lampiran A (informatif) Sifat teknis material tanah dan batu

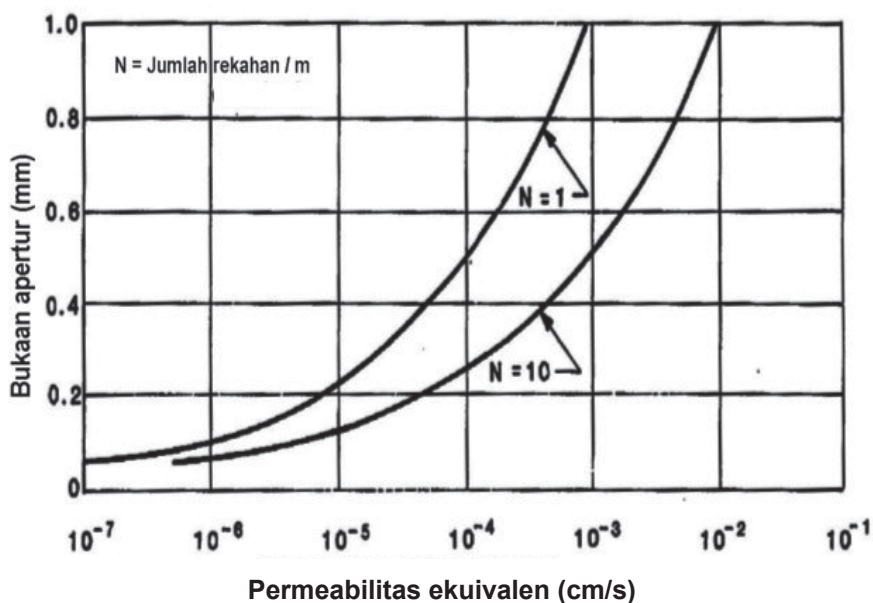
(Bahan diambil dari *United States Bureau of Reclamation, Design Standards, Embankment Dams No. 13, Chapter 8, Seepage Analysis and Control*)

### Gambar

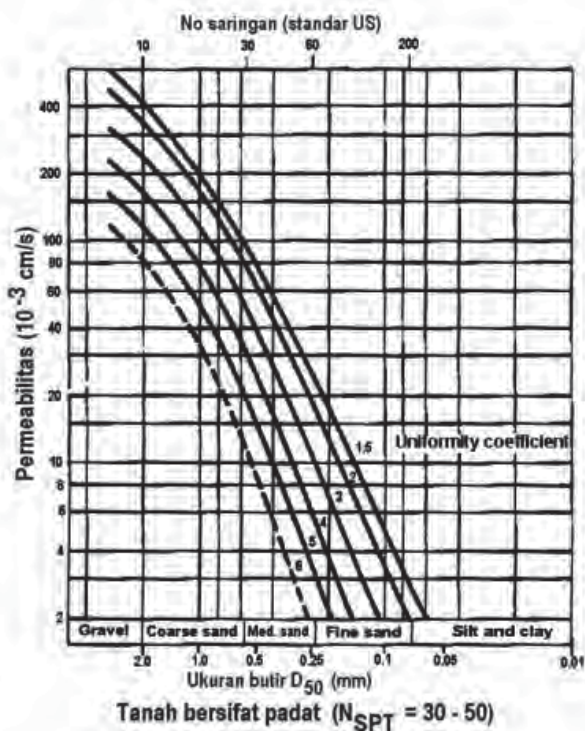
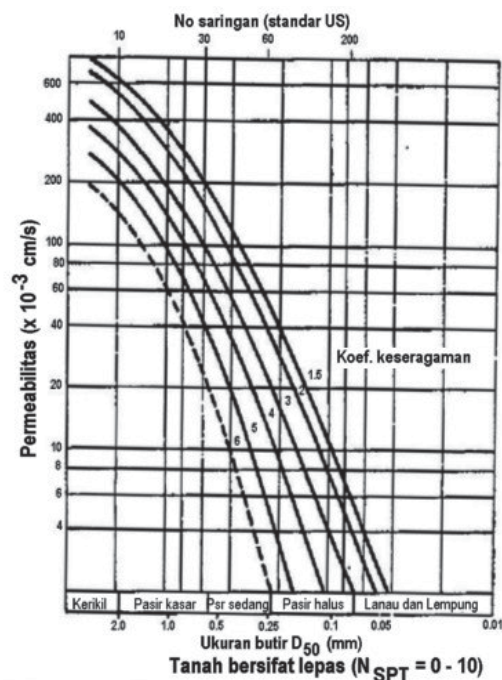
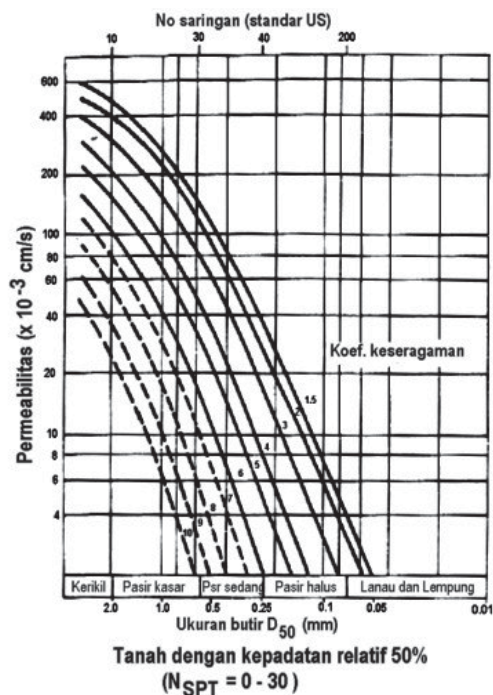
- A.1 Koefisien permeabilitas ekuivalen dari susunan rekahan paralel yang sederhana
- A.2 Koefisien permeabilitas dari tanah nonkohesif berdasarkan ukuran butir, keseragaman dan kepadatan (*density*)
- A.3 Koefisien permeabilitas untuk berbagai kelas material geologi
- A.4 Hubungan antara porositas dan *specific yield*
- A.5 Daya isap (*suction*) tanah nonkohesif dan kohesif
- A.6 Hubungan antara koefisien permeabilitas relatif dan kadar air

### Tabel

- A.1 Permeabilitas material inti bendungan
- A.2 Permeabilitas material pelindung stabilitas bendungan tipe urugan
- A.3 Permeabilitas material drainase bendungan tipe urugan
- A.4 Anisotropi material bendungan tipe urugan
- A.5 Permeabilitas tanah alami takterkonsolidasi
- A.6 Permeabilitas batuan tanpa rekahan
- A.7 Anisotropi tanah alami dan batuan asli
- A.8 Porositas tanah urugan
- A.9 Porositas tanah alami takterkonsolidasi
- A.10 Porositas batuan



**Gambar A.1 - Koefisien permeabilitas ekuivalen dari susunan rekahan paralel yang sederhana**

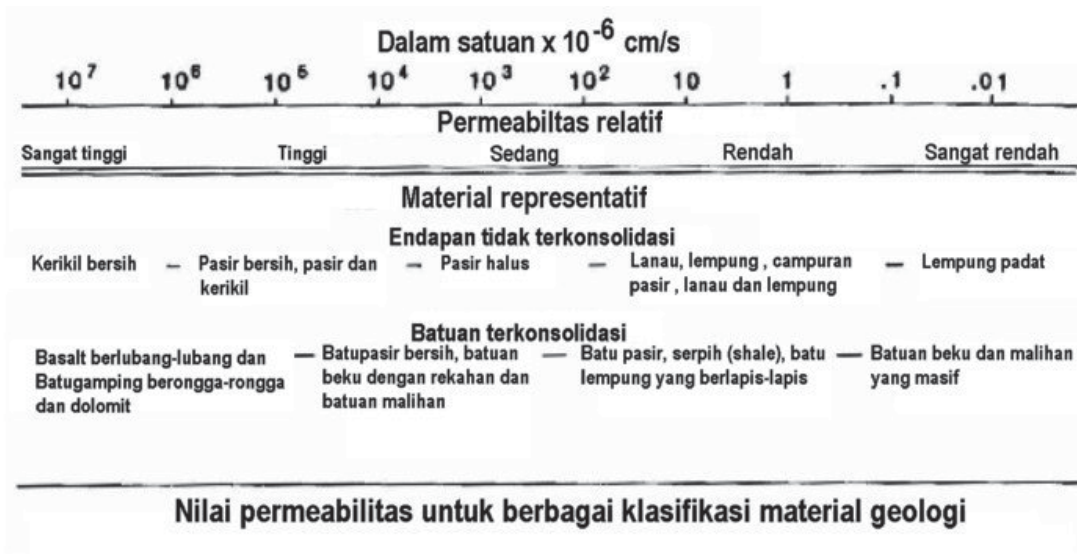


Catatan :  
 $N_{SPT}$  adalah nilai pukulan hasil uji penetrasi standar yang terkoreksi

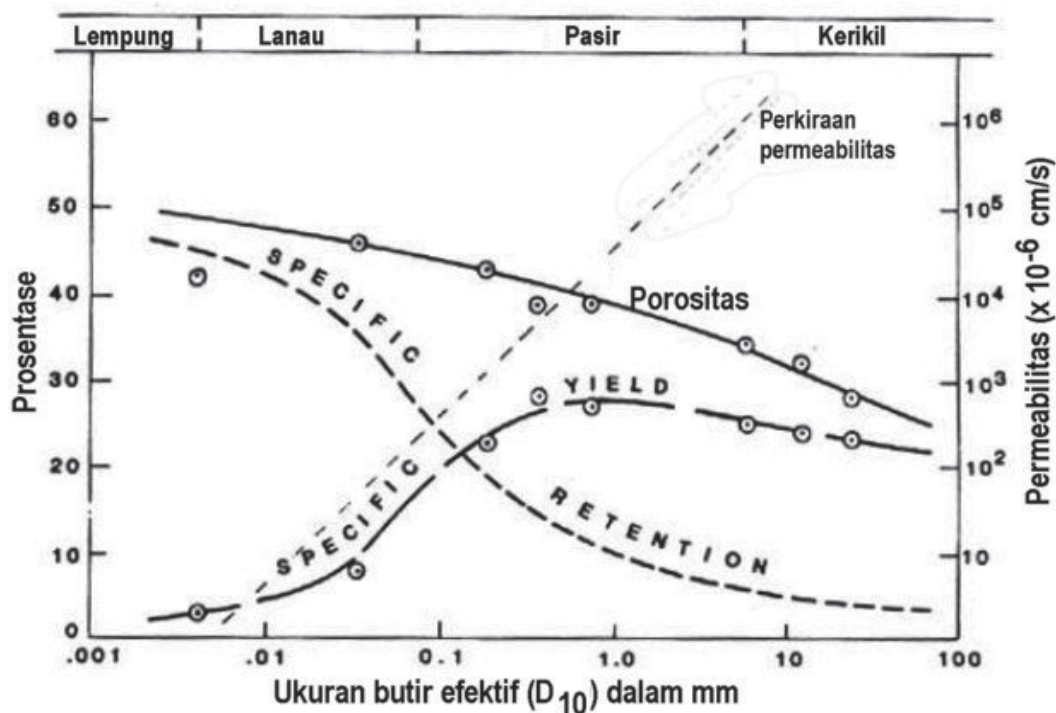
Koefisien keseragaman

$$C_u = \frac{D_{60}}{D_{10}}$$

Gambar A.2 - Koefisien permeabilitas tanah non kohesif berdasarkan ukuran butir, keseragaman, dan kepadatan

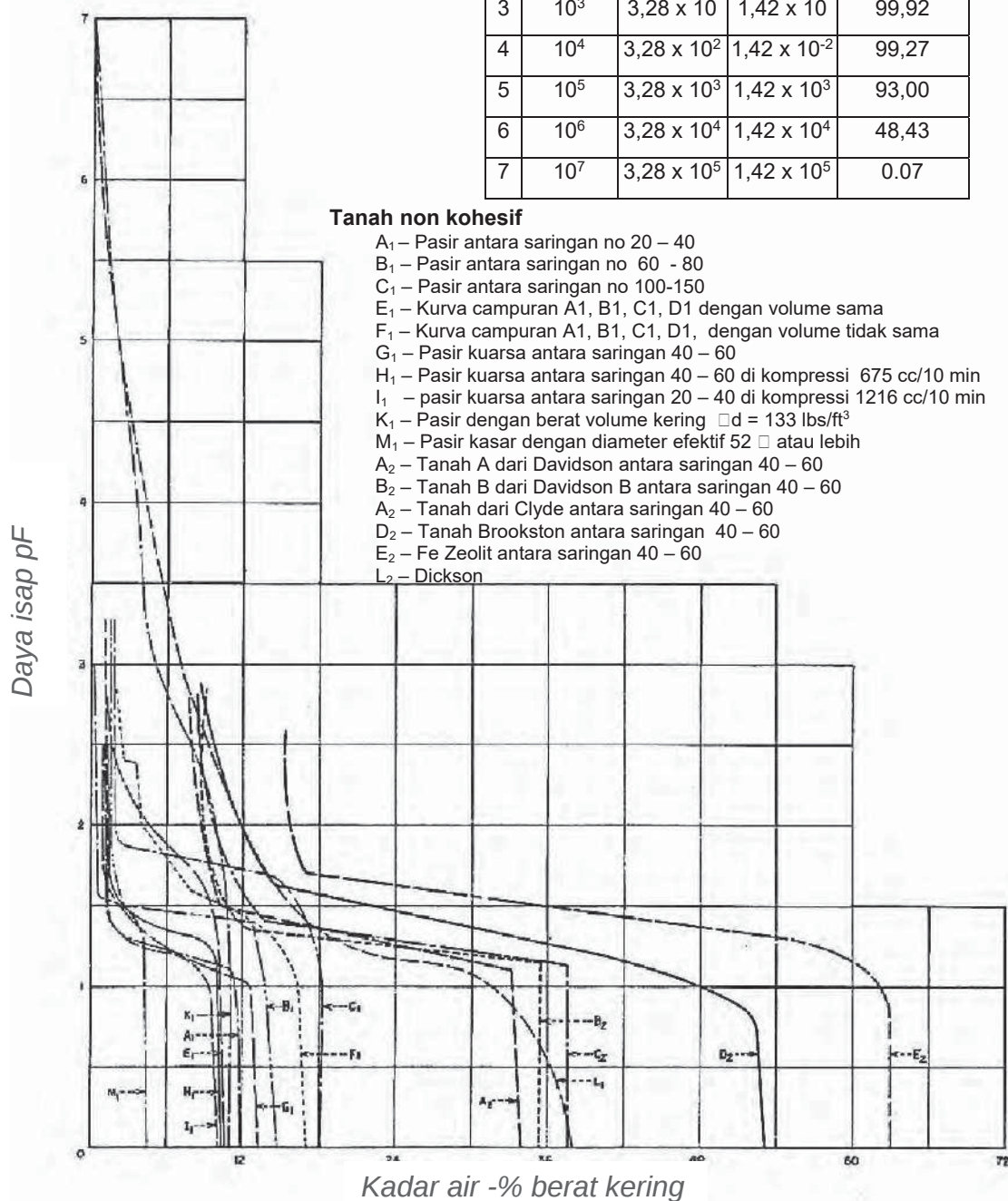


Gambar A.3 - Koefisien permeabilitas untuk berbagai kelas material geologi


 Gambar A.4 - Hubungan antara porositas dan *specific yield*

Tabel konversi satuan

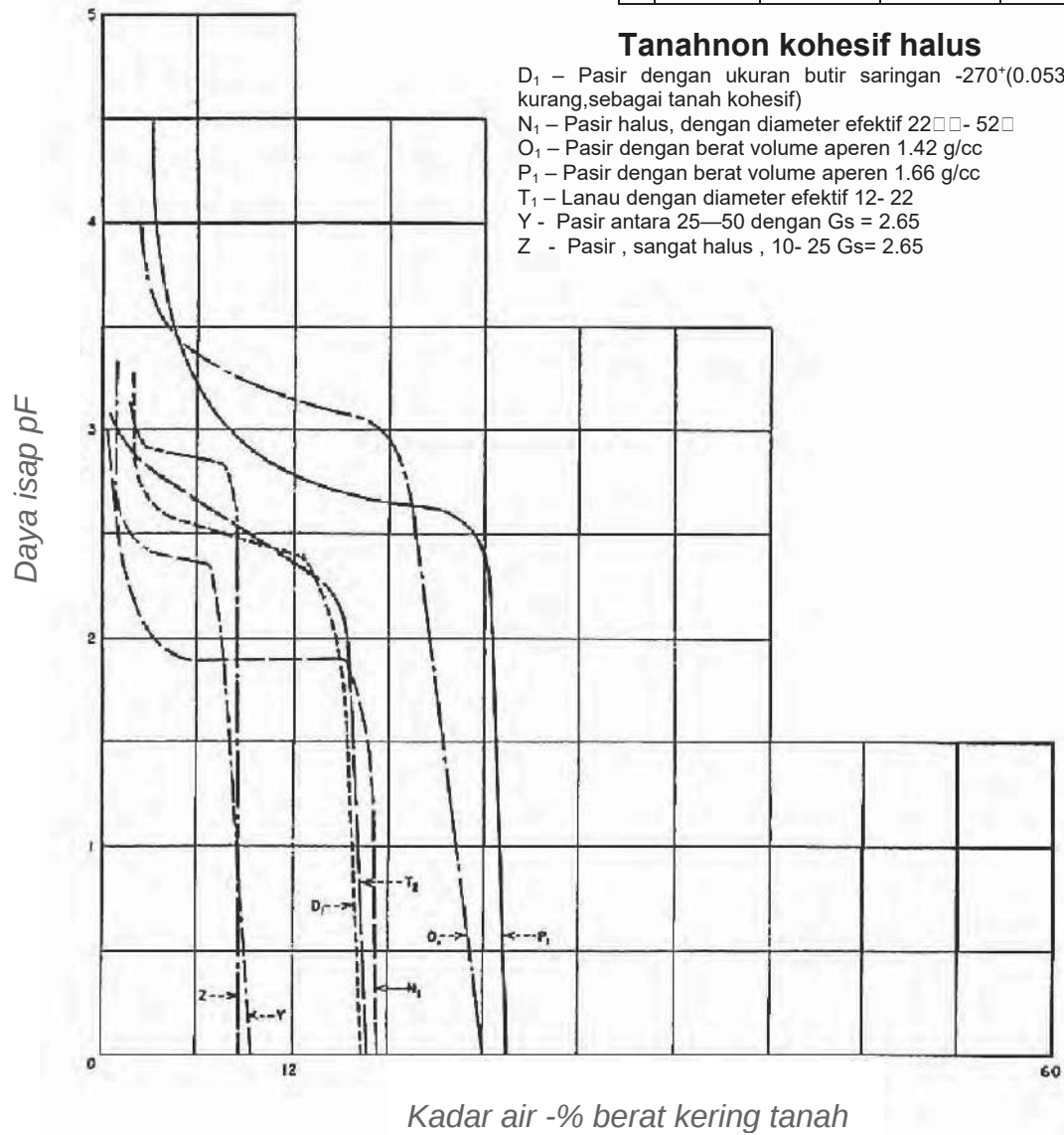
| pF | Tekanan negatif ekuivalen |                       | Daya isap<br>(lbs/sq in) | Kelembaban relatif<br>(Persen) |
|----|---------------------------|-----------------------|--------------------------|--------------------------------|
|    | cm - H <sub>2</sub> O     | Ft - H <sub>2</sub> O |                          |                                |
| 0  | 1                         | $3,28 \times 10^{-2}$ | $1,42 \times 10^{-2}$    |                                |
| 1  | 10                        | $3,28 \times 10^{-2}$ | $1,42 \times 10^{-1}$    |                                |
| 2  | $10^2$                    | 3.28                  | 1.42                     | 99,99                          |
| 3  | $10^3$                    | $3,28 \times 10$      | $1,42 \times 10$         | 99,92                          |
| 4  | $10^4$                    | $3,28 \times 10^2$    | $1,42 \times 10^2$       | 99,27                          |
| 5  | $10^5$                    | $3,28 \times 10^3$    | $1,42 \times 10^3$       | 93,00                          |
| 6  | $10^6$                    | $3,28 \times 10^4$    | $1,42 \times 10^4$       | 48,43                          |
| 7  | $10^7$                    | $3,28 \times 10^5$    | $1,42 \times 10^5$       | 0,07                           |



A.5a - Daya isap (suction) tanah untuk tanah nonkohesif

Tabel konversi satuan

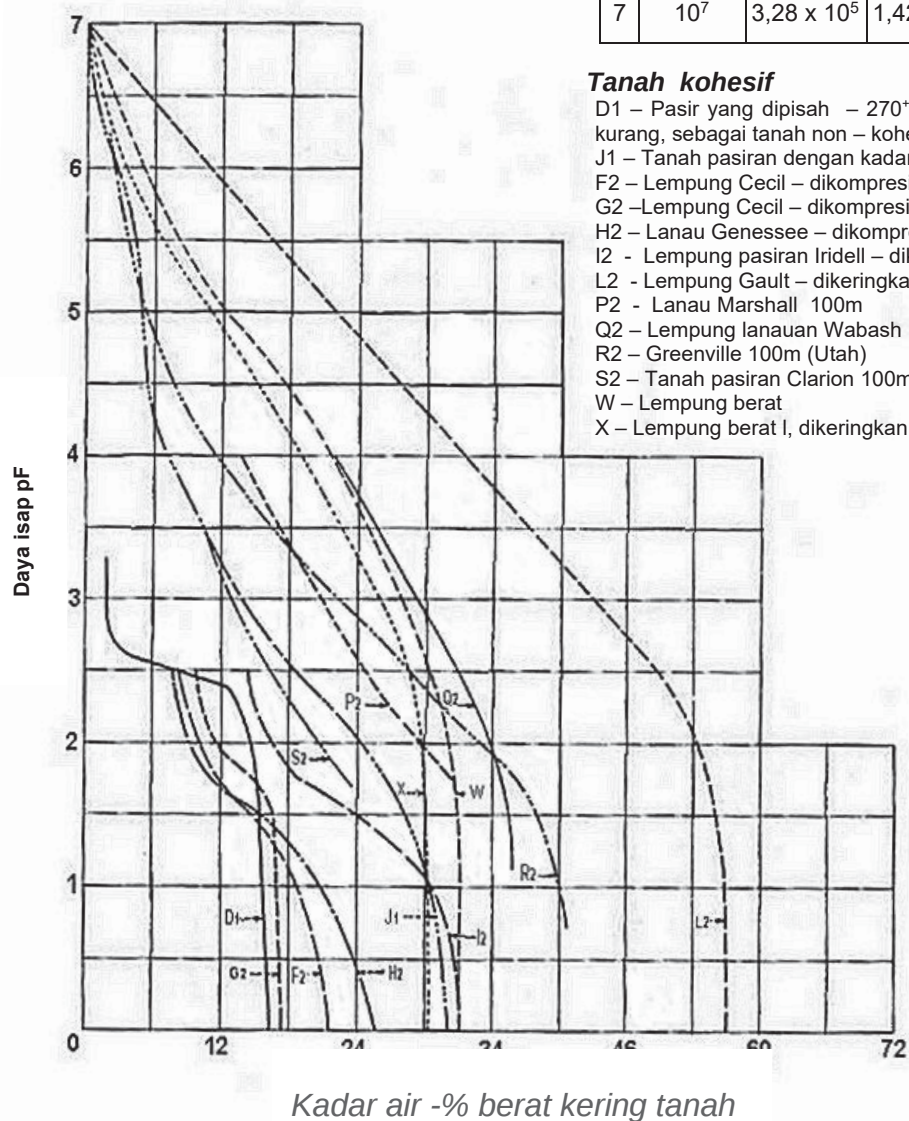
| pF | Tekanan negatif ekuivalen |                       | Daya isap (lbs/sq in) | Kelembaban relatif (Persen) |
|----|---------------------------|-----------------------|-----------------------|-----------------------------|
|    | cm - H <sub>2</sub> O     | ft - H <sub>2</sub> O |                       |                             |
| 0  | 1                         | $3,28 \times 10^{-2}$ | $1,42 \times 10^{-2}$ |                             |
| 1  | 10                        | $3,28 \times 10^{-2}$ | $1,42 \times 10^{-1}$ |                             |
| 2  | $10^2$                    | 3.28                  | 1.42                  | 99,99                       |
| 3  | $10^3$                    | $3,28 \times 10$      | $1,42 \times 10$      | 99,92                       |
| 4  | $10^4$                    | $3,28 \times 10^2$    | $1,42 \times 10^{-2}$ | 99,27                       |
| 5  | $10^5$                    | $3,28 \times 10^3$    | $1,42 \times 10^3$    | 93,00                       |
| 6  | $10^6$                    | $3,28 \times 10^4$    | $1,42 \times 10^4$    | 48,43                       |
| 7  | $10^7$                    | $3,28 \times 10^5$    | $1,42 \times 10^5$    | 0,07                        |



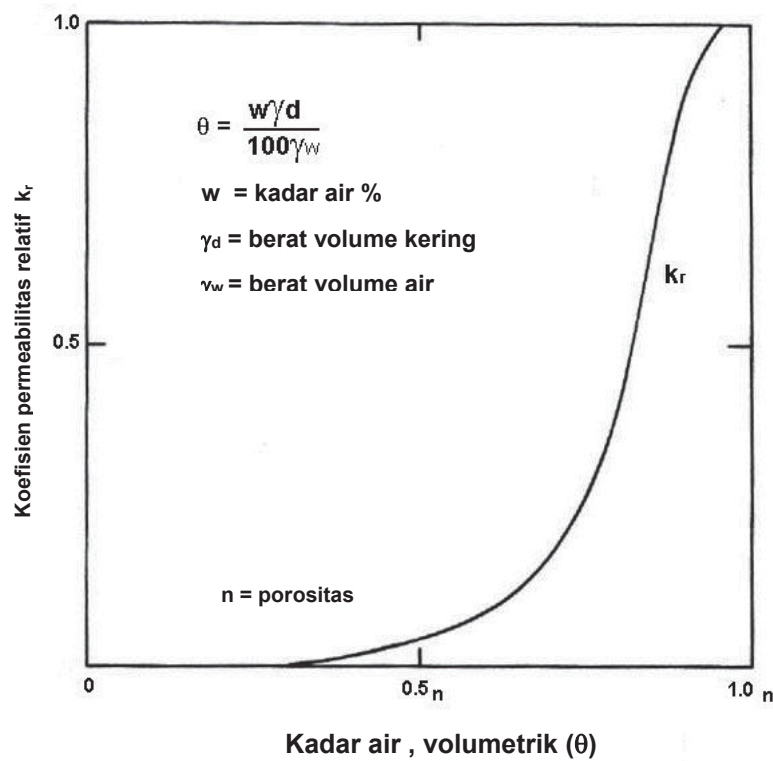
Gambar A.5b - Daya isap tanah nonkohesif halus

Tabel konversi satuan

| pF | Tekanan negatif ekuivalen |                       | Daya isap (lbs/sq in) | Kelembaban relatif (Persen) |
|----|---------------------------|-----------------------|-----------------------|-----------------------------|
|    | cm - H <sub>2</sub> O     | ft - H <sub>2</sub> O |                       |                             |
| 0  | 1                         | $3,28 \times 10^{-2}$ | $1,42 \times 10^{-2}$ |                             |
| 1  | 10                        | $3,28 \times 10^{-2}$ | $1,42 \times 10^{-1}$ |                             |
| 2  | $10^2$                    | 3.28                  | 1.42                  | 99,99                       |
| 3  | $10^3$                    | $3,28 \times 10$      | $1,42 \times 10$      | 99,92                       |
| 4  | $10^4$                    | $3,28 \times 10^2$    | $1,42 \times 10^{-2}$ | 99,27                       |
| 5  | $10^5$                    | $3,28 \times 10^3$    | $1,42 \times 10^3$    | 93,00                       |
| 6  | $10^6$                    | $3,28 \times 10^4$    | $1,42 \times 10^4$    | 48,43                       |
| 7  | $10^7$                    | $3,28 \times 10^5$    | $1,42 \times 10^5$    | 0,07                        |



Gambar A-5c - Daya isap tanah kohesif



Gambar A.6 - Hubungan antara koefisien permeabilitas relatif dan kadar air, volumetrik

**Tabel A.1 Permeabilitas ( $k_v$ ) material inti bendungan ( $k_v$  disesuaikan dengan % butiran halus)**

| USCS                | ** $k_v$ batasan ( $\times 10^{-6}$ cm/s) |
|---------------------|-------------------------------------------|
| GM – SM             | 0,0 s.d. 10,0                             |
| GM or GC            | 0,0 s.d. 10,0                             |
| SP – SM             | 0,0 s.d. 10,0                             |
| SM                  | 0,0 s.d. 10,0                             |
| SM – SC             | 0,0 s.d. 3,0                              |
| SM – ML             | 0,0 s.d. 10,0                             |
| SC                  | 0,0 s.d. 3,0                              |
| ML                  | 0,0 s.d. 10,0                             |
| ML – CL             | 0,0 s.d. 1,0                              |
| CL                  | 0,0 s.d. 1,0                              |
| MH                  | 0,0 s.d. 0,1                              |
| CH                  | 0,0 s.d. 0,1                              |
| Bibliografi : [8.9] |                                           |

**Tabel A.2 Permeabilitas ( $k_v$ ) material pelindung stabilitas bagian luar (*shell*) bendungan ( $k_v$  disesuaikan dengan % butiran halus)**

| USCS                | $k_v$ batasan ( $\times 10^{-6}$ cm/s) |
|---------------------|----------------------------------------|
| GP                  | 2,000 s.d. 1,000,000                   |
| GW                  | 1,000 s.d. 100,000                     |
| GP - SP             | 1,000 s.d. 50,000                      |
| GW - SW             | 500 s.d. 5,000                         |
| GM                  | 10 s.d. 500                            |
| SP (m. s.d. c.)     | 10,000 s.d. 20,000                     |
| SP (f. s.d. m.)     | 5,000 s.d. 10,000                      |
| SP (v.f. s.d. f.)   | 500 s.d. 5,000                         |
| SW                  | 300 s.d. 5,000                         |
| SP – SM             | 10 s.d. 1,000                          |
| SM                  | 10 s.d. 500                            |
| Bibliografi : [8.9] |                                        |

**Tabel A.3 Permeabilitas ( $k_v$ ) material drainase bendungan ( $k_v$  meningkat sesuai dengan peningkatan ukuran butir)**

| Material                | $k_v$ batasan ( $\times 10^{-6}$ cm/s) |
|-------------------------|----------------------------------------|
| Pasir kasar dan kerikil | 150,000 s.d. 500,000                   |
| Pasir kasar dan medium  | 50,000 s.d. 150,000                    |
| Pasir halus dan medium  | 10,000 s.d. 50,000                     |
| Bibliografi : [8.9]     |                                        |

**Tabel A.4 Anisotropi ( $k_h/k_v$ ) material bendungan ( $k_h/k_v$  meningkat dengan peningkatan kadar air pemadatan)**

| Material                                                   | Batasan $k_h/k_v$ |
|------------------------------------------------------------|-------------------|
| Inti bendungan<br>Standar pemadatan USBR                   | 4 s.d. 9          |
| Tanpa standar pemadatan                                    | 9 s.d. 36         |
| Isian hidrolik ( <i>Hydraulic Fill</i> )                   | 64 s.d. 225       |
| Zona pelindung stabilitas bendungan urugan<br>Standar USBR | 4 s.d. 9          |
| Zona drainase bendungan urugan standar USBR                | 1 s.d. 4          |
| Bibliografi : [8.9]                                        |                   |

\*\* Tabel A.1 berdasarkan pada data uji laboratorium

**Tabel A.5 Permeabilitas ( $k_h$ ) tanah alami tak terkonsolidasi ( $k_h$  disesuaikan dengan % butiran halus)**

| Tanah                      | $k_h$ batasan<br>( $\times 10^{-6}$ cm/s) |
|----------------------------|-------------------------------------------|
| Kerikil, pekerjaan terbuka | $> 2,000,000$                             |
| Kerikil pasiran (GP)       | 200,000 s.d. 2,000,000                    |
| Kerikil (GW)               | 10,000 s.d. 1,000,000                     |
| Pasir, kasar (SP)          | 10,000 s.d. 500,000                       |
| Pasir, sedang (SP)         | 1,000 s.d. 100,000                        |
| Pasir, halus (SP)          | 500 s.d. 50,000                           |
| Pasir (SW)                 | 100 s.d. 50,000                           |
| Pasir, Lanauan (SM)        | 100 s.d. 10,000                           |
| Pasir, lempungan (SC)      | 100 s.d. 1,000                            |
| Lanau Silt (ML)            | 10 s.d. 1,000                             |
| Lempung Clay (CL)          | 0 s.d. 3                                  |
| Bibliografi : [8.9]        |                                           |

**Tabel A.6 Permeabilitas ( $k_h$ ) batuan tanpa rekahan ( $k_h$  disesuaikan dengan % ukuran butir)**

| Batuan              | Batasan $k_h$<br>( $\times 10^{-6}$ cm/s) |
|---------------------|-------------------------------------------|
| Batu pasir, sedang  | 100 s.d. 200,000                          |
| Batu pasir, lanauan | 0 s.d. 5,000                              |
| Batu kapur          | 0 s.d. 15,000                             |
| Gambut              | 0 s.d. 15,000                             |
| Granit lapuk        | 200 s.d. 10,000                           |
| Schist              | 0 s.d. 2,000                              |
| Tuff                | 0 s.d. 1,000                              |
| Gabbro, lapuk       | 50 s.d. 500                               |
| Basalt              | 0 s.d. 50                                 |
| Dolomit             | 0 s.d. 5                                  |
| Gneiss              | 0 s.d. 2                                  |
| Bibliografi : [8.9] |                                           |

**Tabel A.7 Anisotropi tanah alami dan batuan asli**

| Formasi                     | $k_h/k_v$     | Catatan                                             |
|-----------------------------|---------------|-----------------------------------------------------|
| Endapan berlapis            | 10 s.d. 1,000 | $k_h/k_v$ tergantung ukuran butiran dari peralapsan |
| Tanah dan batuan masif      | 1 s.d. 3      | $k_h/k_v$ tergantung bentuk dan orientasi butir     |
| Batuan dengan rekahan       | 0,1 s.d. 10   | $k_h/k_v$ tergantung besar bukaan                   |
| Tanah Eolian (loess & dune) | 0,02 s.d. 2   | $k_h/k_v$ tergantung konsolidasi                    |
| Bibliografi : [8.9]         |               |                                                     |

**Tabel A.8 Porositas (n) tanah urugan  
(n meningkat dengan keseragaman)**

| USCS                | Batas porositas, n |
|---------------------|--------------------|
| GP                  | 0,25 s.d. 0,35     |
| GW                  | 0,20 s.d. 0,30     |
| GM                  | 0,20 s.d. 0,35     |
| GM – SM             | 0,20 s.d. 0,25     |
| GC                  | 0,25 s.d. 0,35     |
| GC – SC             | 0,20 s.d. 0,30     |
| SP                  | 0,25 s.d. 0,35     |
| SW                  | 0,20 s.d. 0,30     |
| SM                  | 0,25 s.d. 0,35     |
| SM - ML             | 0,25 s.d. 0,35     |
| SM - SC             | 0,25 s.d. 0,35     |
| SC                  | 0,20 s.d. 0,30     |
| ML                  | 0,30 s.d. 0,40     |
| ML - CL             | 0,25 s.d. 0,40     |
| CL                  | 0,25 s.d. 0,40     |
| CH                  | 0,35 s.d. 0,50     |
| Bibliografi : [8.9] |                    |

**Tabel A.9 Porositas (n) tanah alami tak  
terkonsolidasi (n disesuaikan dengan  
kepadatan)**

| Tanah               | Batas porositas, n |
|---------------------|--------------------|
| Kerikil kasar       | 0,25 s.d. 0,40     |
| Kerikil sedang      | 0,25 s.d. 0,45     |
| Kerikil halus       | 0,25 s.d. 0,45     |
| Pasir kasar         | 0,25 s.d. 0,45     |
| Pasir sedang        | 0,25 s.d. 0,50     |
| Pasir halus         | 0,25 s.d. 0,50     |
| Pasir halus         | 0,25 s.d. 0,50     |
| Pasir till          | 0,20 s.d. 0,35     |
| Pasir dune          | 0,40 s.d. 0,50     |
| Lanau               | 0,30 s.d. 0,60     |
| Lanau , till        | 0,30 s.d. 0,40     |
| Loess               | 0,45 s.d. 0,60     |
| Lempung             | 0,35 s.d. 0,80     |
| Bibliografi : [8.9] |                    |

**Tabel A.10 Porositas (n) batuan  
(Batasan disesuaikan dengan ukuran butir, sementasi, pelapukan)**

| Batuan              | Porositas , n  |  | Batuan            | Porositas , n  |
|---------------------|----------------|--|-------------------|----------------|
| <i>Shale</i>        | 0,01 s.d. 0,10 |  | Basalt            | 0,03 s.d. 0,35 |
| Batu lempung        | 0,40 s.d. 0,45 |  | Batu pasir halus  | 0,01 s.d. 0,50 |
| Batu lanau          | 0,20 s.d. 0,40 |  | Batu pasir sedang | 0,30 s.d. 0,45 |
| Tuff                | 0,07 s.d. 0,55 |  | Gabbro (lapuk)    | 0,35 s.d. 0,45 |
| <i>Schist</i>       | 0,04 s.d. 0,50 |  | Granit, lapuk     | 0,35 s.d. 0,55 |
| Dolomit             | 0,20 s.d. 0,35 |  | <i>Most other</i> | < 0.01         |
| Batu kapur          | 0,07 s.d. 0,55 |  |                   |                |
| Bibliografi : [8.9] |                |  |                   |                |

## Lampiran B (informatif)

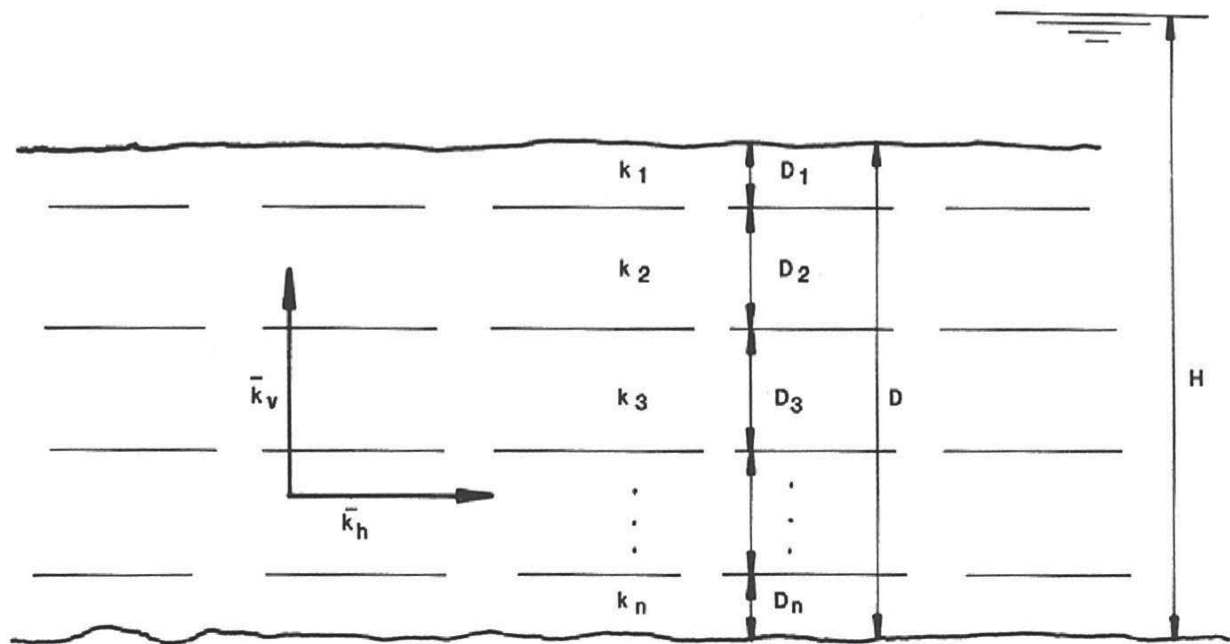
### Persamaan dan grafik untuk analisis dan desain rembesan air

#### Catatan :

1. Metode yang digunakan dalam lampiran ini harus digunakan secara hati-hati, karena semuanya didasarkan atas perkiraan dengan asumsi fondasi yang sangat disederhanakan.
2. Beberapa metode yang diuraikan diperlukan penyederhanaan potongan dengan melakukan transformasi menjadi potongan isotropik ekuivalen seperti pada Gambar B.1 dan B.2.

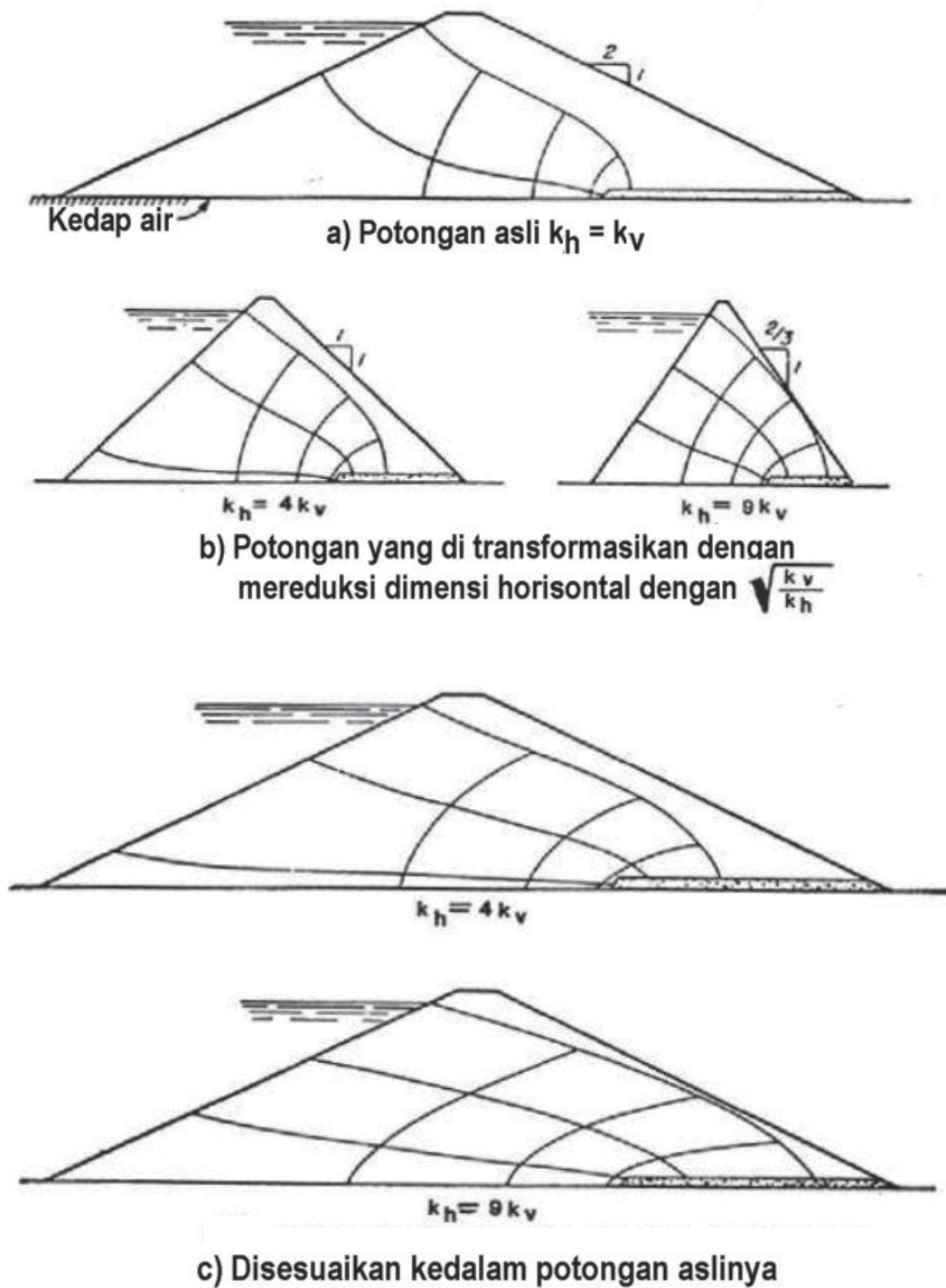
#### Gambar

- Gambar B.1 Persamaan permeabilitas untuk tanah berlapis
- Gambar B.2 Metode transformasi untuk analisis bendungan anisotropi <sup>[8.9]</sup>
- Gambar B.3 Pengaruh penetrasi sebagian dari parit halang <sup>[8.9]</sup>
- Gambar B.4 Pengaruh penetrasi sebagian dinding halang (*cut off wall*) <sup>[8.9]</sup>
- Gambar B.5 Efisiensi selimut kedap air dan dinding halang <sup>[8.9]</sup>
- Gambar B.6 Analisis sistem pelepas tekanan <sup>[8.9]</sup>
- Gambar B.7 Desain berm rembesan di hilir <sup>[8.9]</sup>,  $k_f > k_z$
- Gambar B.8 Persamaan untuk perhitungan selimut kedap air <sup>[8.9]</sup>
- Gambar B-9 Persamaan untuk perhitungan selimut semikedap air <sup>[8.9]</sup>

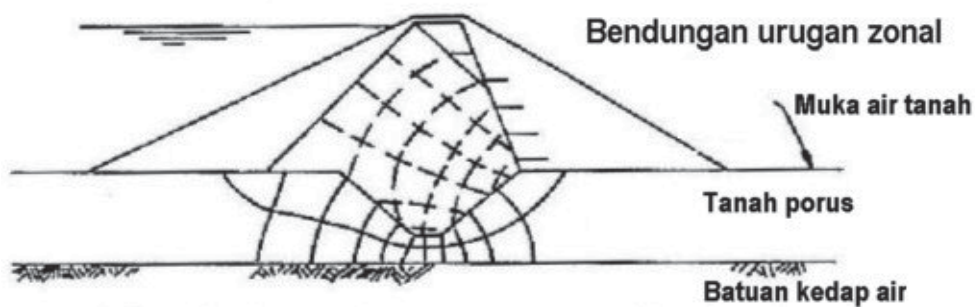


| Vertikal                                                                                                                                                                                                                                                                                        | Horizontal                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Asumsi :</p> <p>1. Kecepatan Vertikal</p> $V = \bar{k}_v \frac{H}{D} = V_1 = V_2 = \dots V_n$<br>$k_1 i_1 = k_2 i_2 = \dots k_n i_n$ <p>2. Perbedaan head</p> $H = H_1 + H_2 + \dots H_n$ $= D_1 i_1 + D_2 i_2 + \dots D_n i_n$<br>$\therefore \bar{k}_v = \frac{D}{\sum_n \frac{D_n}{k_n}}$ | <p>Asumsi :</p> <p>1. Aliran Horizontal</p> $Q_h = \bar{k}_h i_h D = k_1 i_h D_1 + k_2 i_h D_2 + \dots k_n i_h D_n$<br>$\therefore \bar{k}_h = \frac{1}{D} \sum_n k_n D_n$ |

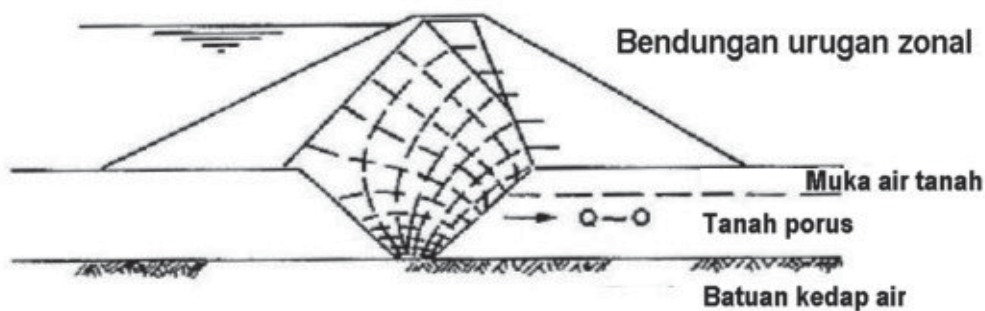
Gambar B.1 - Persamaan permeabilitas untuk tanah berlapis



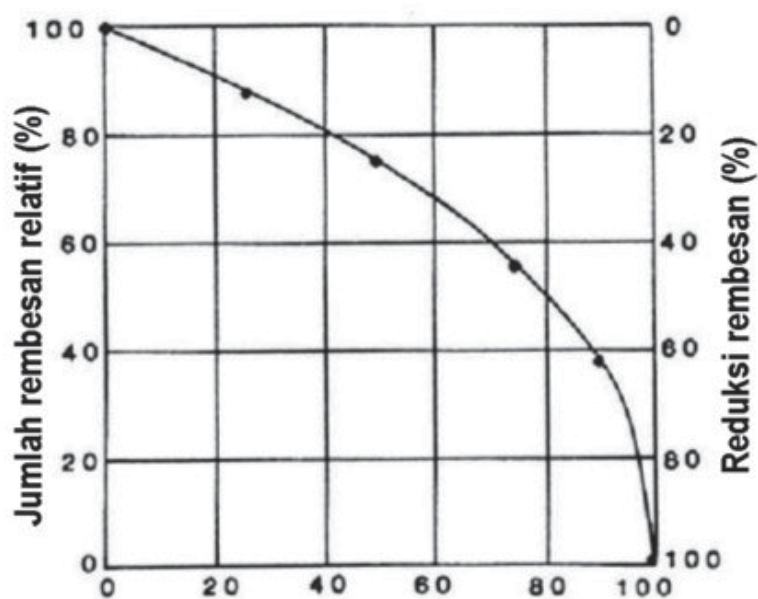
Gambar B.2 - Metode transformasi untuk analisis bendungan anisotropi [8.9]



a) Parithalang dengan penetrasi sebagian

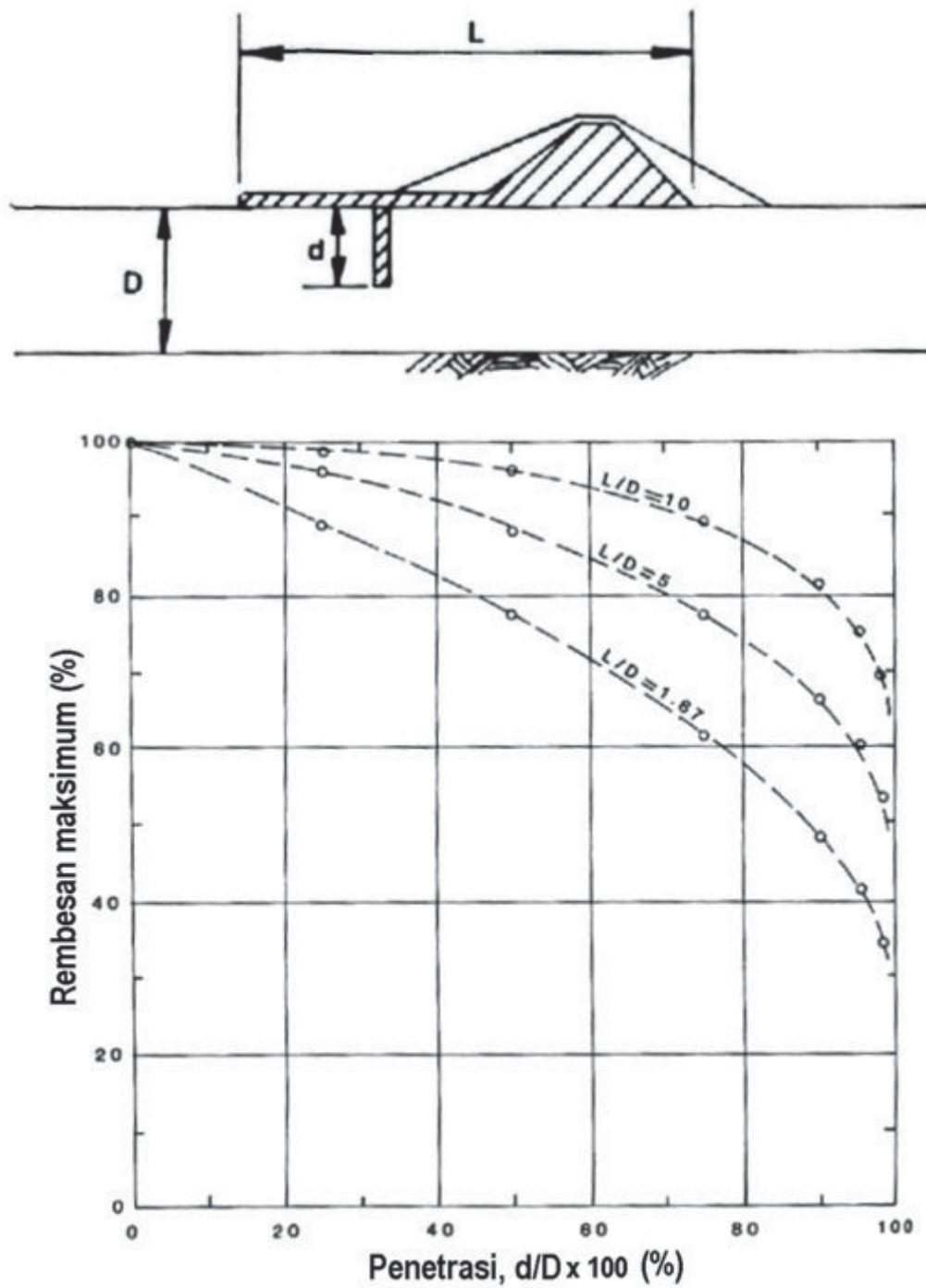


b) Parithalang dengan penetrasi penuh

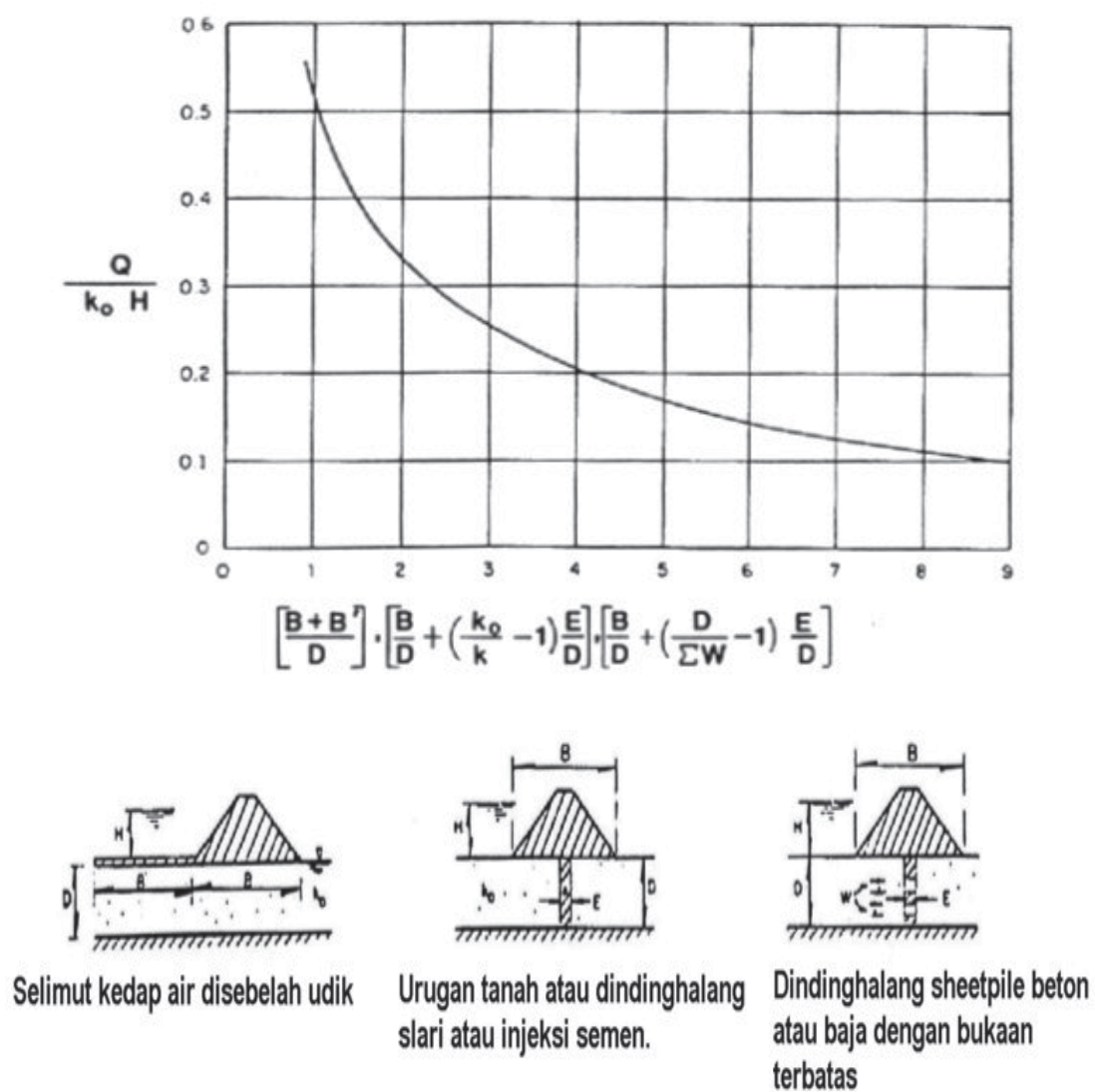


c) Hubungan antara jumlah rembesan dengan kedalaman penetrasi parithalang (menurut Cedergen)

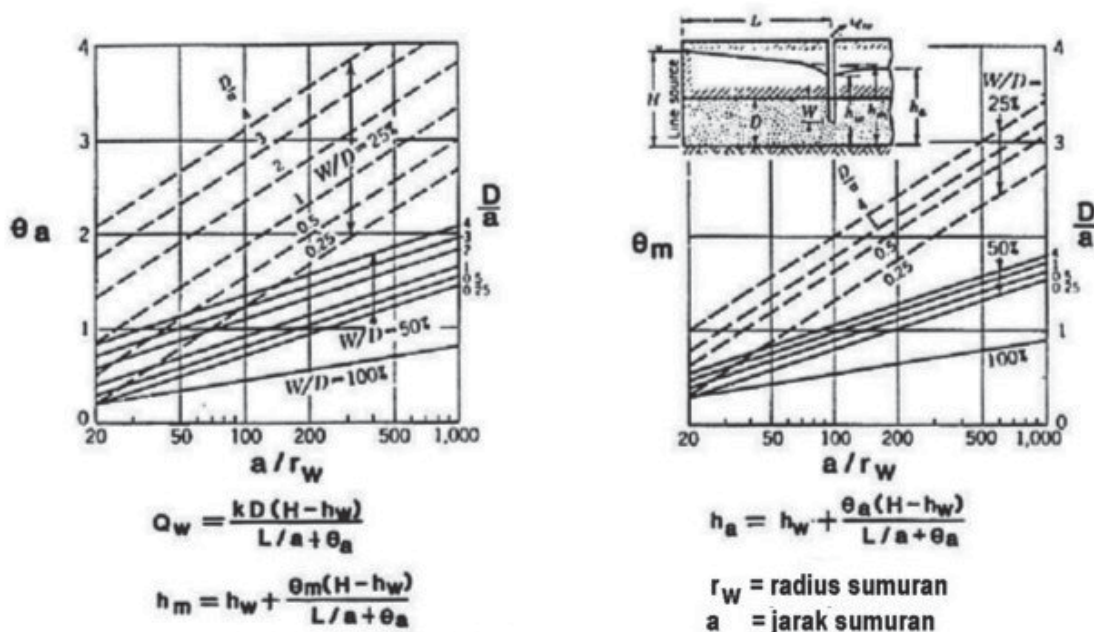
Gambar B.3 - Pengaruh penetrasi sebagian dari parithalang <sup>[8.9]</sup>



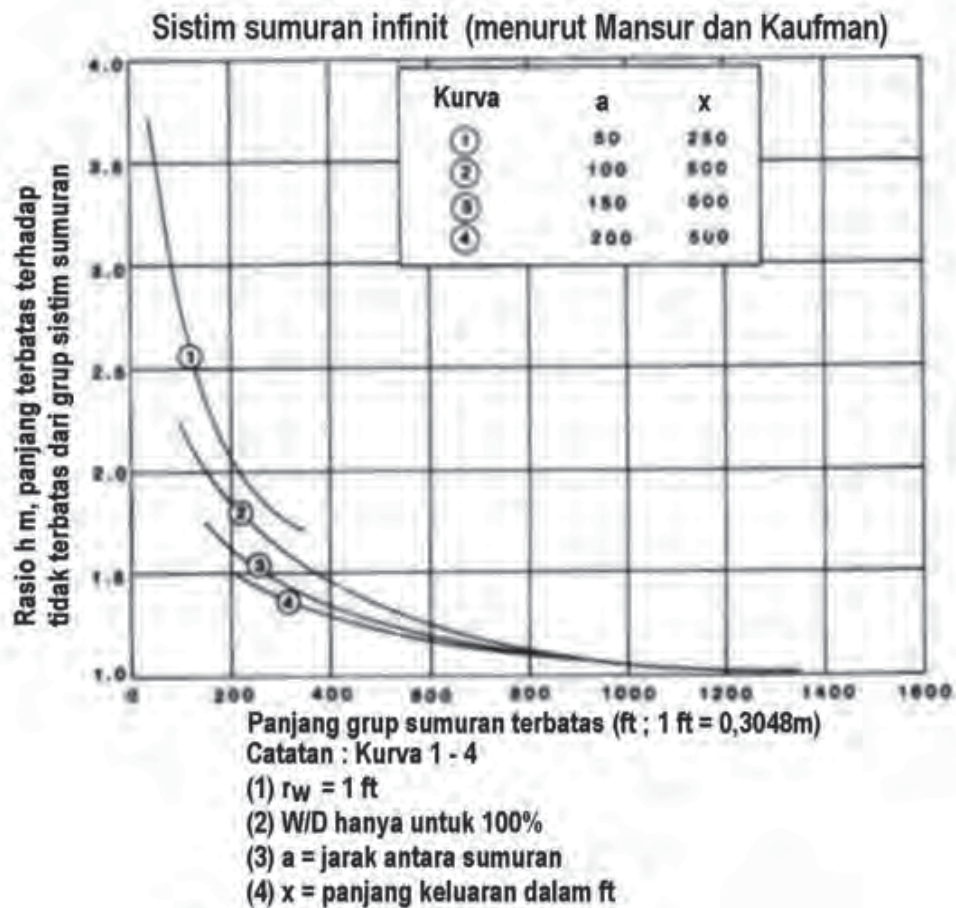
Gambar B.4 - Pengaruh penetrasi sebagian dinding halang (*Cutoff Wall*) <sup>[8.9]</sup>



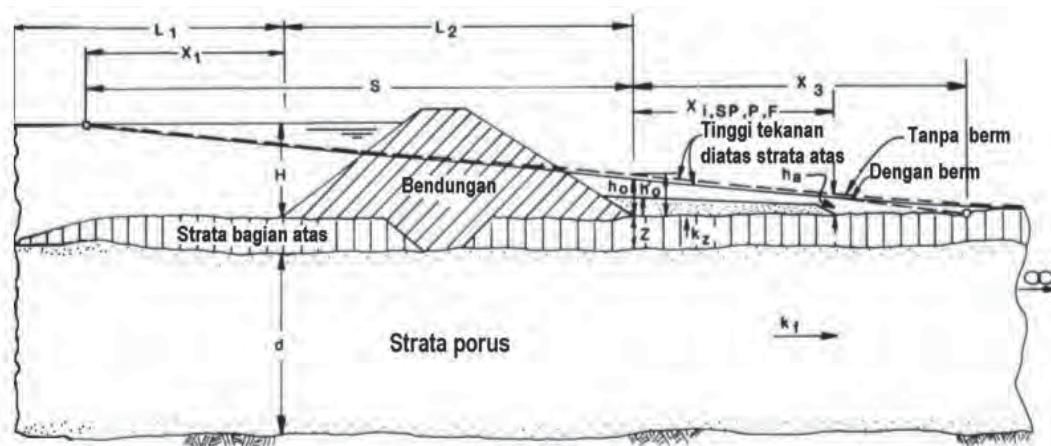
Gambar B.5 - Efisiensi selimut kedap air dan dinding halang <sup>[8.9]</sup>



a) Sistem sumuran infinit (menurut Mansur dan Kaufman)



Gambar B.6 - Analisis sistem sumur pelepas tekanan [8.9]



$$c = \sqrt{\frac{k_z}{k_f Z d}}$$

$\gamma_z$  = berat volume efektif pada strata ( $t/m^3$ )

$\gamma_t$  = berat volume efektif pada berm ( $t/m^3$ )

$\gamma_w$  = berat volume air ( $t/m^3$ )

$X_3$  = panjang efektif lapisan di bagian hilir (m)

$$= \frac{I}{C}$$

$X_1$  = panjang efektif lapisan di bagian hulu (m)

$$= \frac{\tanh cL_1}{C}$$

$h_0$  = tinggi air pada kaki bendungan di bagian hilir tanpa berm (m)

$$\frac{HX_3}{S + X_3}$$

$h_1$  = tinggi air pada kaki bendungan dengan berm (m)

$i_0$  = gradien ke atas pada kaki bendungan di bagian hilir (gunakan  $i_0 = 0.2$ )

$i_a$  = gradien yang diijinkan pada kaki berm (gunakan  $i_a = 0.3$ )

$h_a$  = tinggi air yang diijinkan pada kaki berm (m)

$$= i_a Z$$

$X_{1,SP,P,F}$  = lebar berm yang diperlukan (m)

$t$  = ketebalan berm yang diperlukan pada kaki bendungan (m)

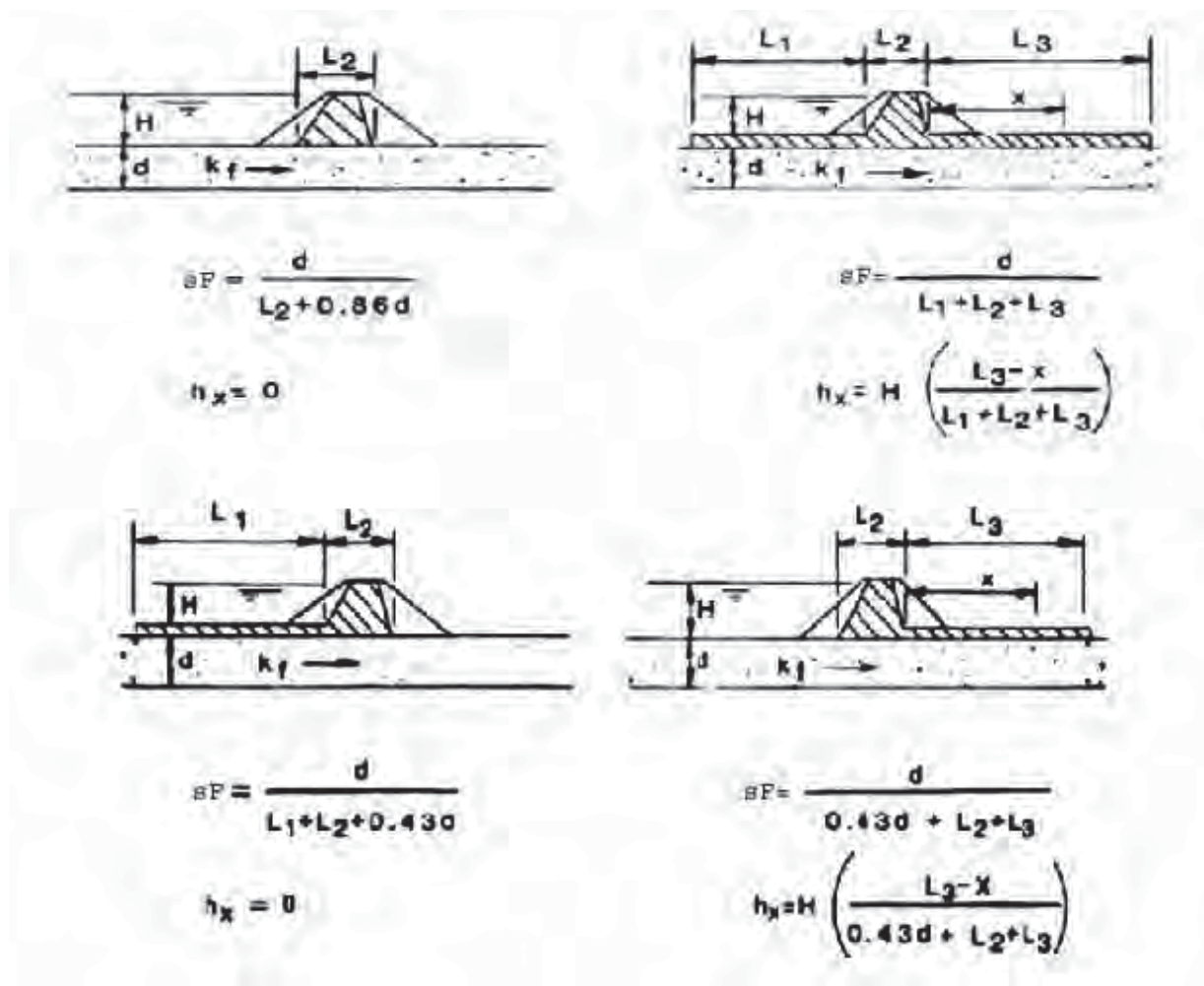
$k_t$  = koefisien permeabilitas pada berm (m/det)

$F$  = faktor keamanan untuk gaya ke atas pada kaki bendungan (gunakan  $F = 2.0$ )

$Q_B$  = debit bocoran pada berm per satuan panjang bendungan ( $m^3/det$ )

| Berm kedap air ( $k_f = 0$ )                                                                    | Berm semi kedap air ( $k_f = k_z$ )                                                | Berm porous ( $k_f > k_z$ )                                                                     | Berm drainase bebas                                                                             |
|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| $X_1 = X_3 \left( \frac{H}{h_a} - 1 \right) - S$                                                | $X_{SP} = \frac{-A + \sqrt{A^2 - 24(2+r)(1+SC) - \frac{H}{h_a}}}{2c(2+r)}$         | $X_p = \frac{1}{3} (X_p + 2X_{SP})$                                                             | $X_F = X_3 \log_e \left( \frac{h'_0}{h_a} \right)$                                              |
| $h'_0 = H \left( \frac{X_3 + X_1}{S + X_3 + X_1} \right)$                                       | Dimana :<br>$A = 6 + 3 SC (r + 1)$<br>$r = \frac{i_0}{i_a}$                        | $h'_0 = h_a \left[ 1 + CX_p + \left( \frac{2+r}{6} \right) (CX_p)^2 \right]$                    | $h'_0 = h_0 = \frac{HX_3}{S + X_3}$                                                             |
| $t = \frac{h'_0 - Z \left( \frac{\gamma_z}{F\gamma_w} \right)}{1 + \frac{\gamma_t}{F\gamma_w}}$ | $h'_0 = h_a \left[ 1 + CX_{SP} + \left( \frac{2+r}{6} \right) (CX_{SP})^2 \right]$ | $t = \frac{h'_0 - Z \left( \frac{\gamma_z}{F\gamma_w} \right)}{1 + \frac{\gamma_t}{F\gamma_w}}$ | $t = \frac{h'_0 - Z \left( \frac{\gamma_z}{F\gamma_w} \right)}{1 + \frac{\gamma_t}{F\gamma_w}}$ |
|                                                                                                 | $t = \frac{h'_0 - i_0 Z}{1 + i_0}$                                                 |                                                                                                 | $Q_B = \frac{k_f dH}{S + X_3} \left( 1 - e^{-\frac{X_F}{X_1}} \right)$                          |

Gambar B.7 - Desain berm rembesan di hilir <sup>[8.9]</sup>,  $k_f > k_z$

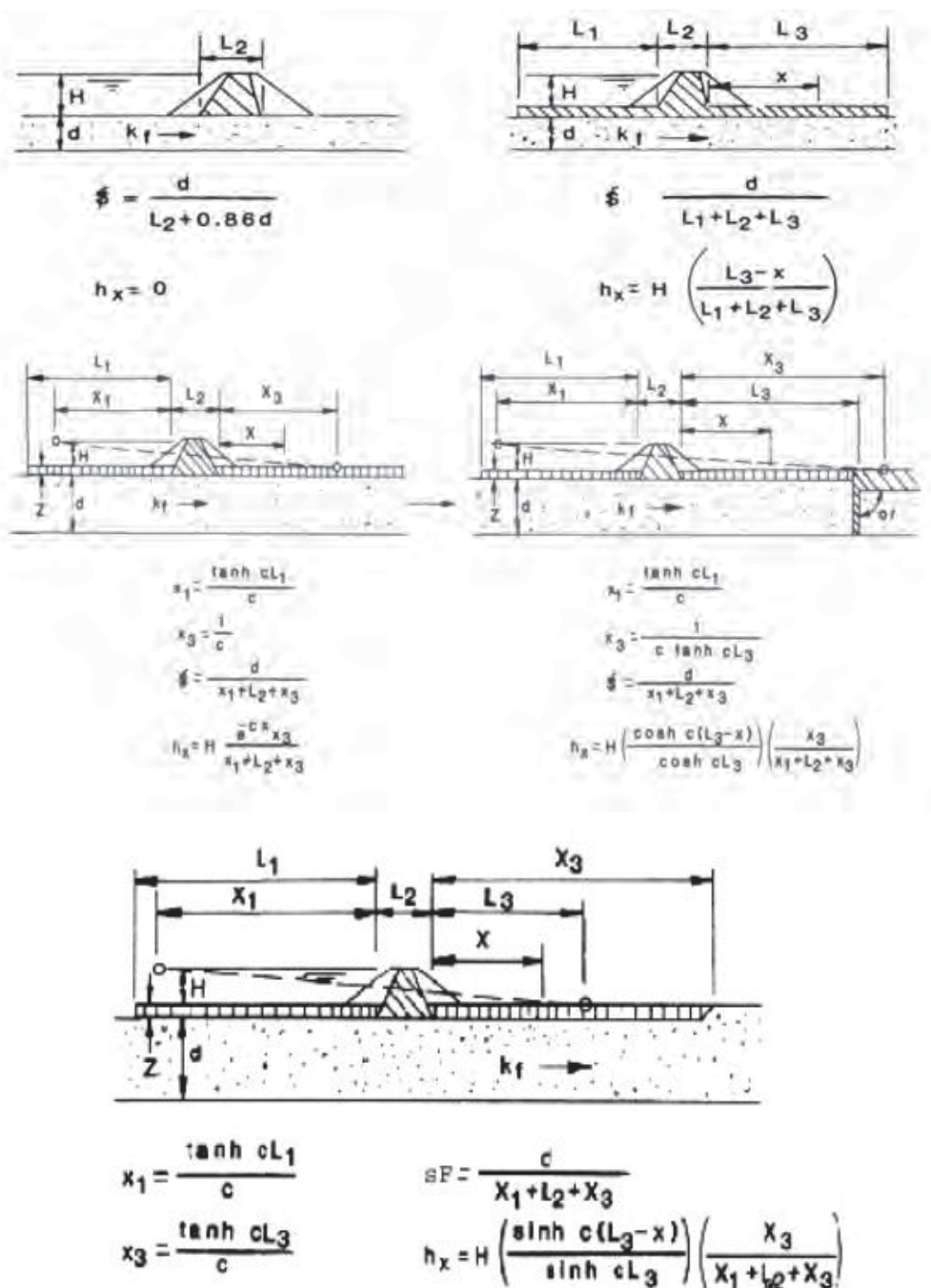


Head di bawah selimut kedap air pada jarak x dari kaki bagian hilir ..... $h_x$

Faktor bentuk yang digunakan dalam persamaan rembesan..... $sF$

Rembesan pada bendungan per satuan panjang..... $Q = sF k_f H$

**Gambar B.8 - Persamaan untuk perhitungan selimut kedap air <sup>[8.9]</sup>**



Head di bawah selimut kedap air sejauh  $x$  dari kaki bendungan hilir..... $h_x$

Koefisien permeabilitas pada lapisan fondasi..... $k_f$

Faktor.....  $c = \sqrt{\frac{k_b}{k_f Z d}}$

Faktor bentuk yang digunakan dalam persamaan rembesan..... $sF$

Rembesan pada bendungan per satuan panjang..... $Q = sF k_f H$

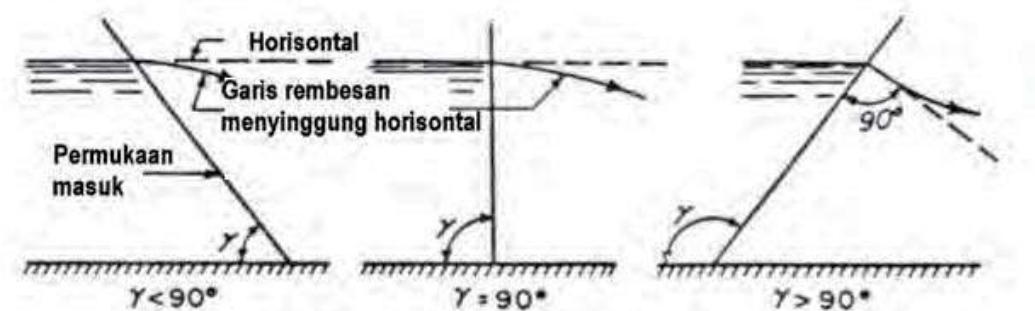
**Gambar B.9 - Persamaan untuk perhitungan selimut semikedap air [8.9]**

**Lampiran C**  
(informatif)  
**Metode grafis rembesan air**

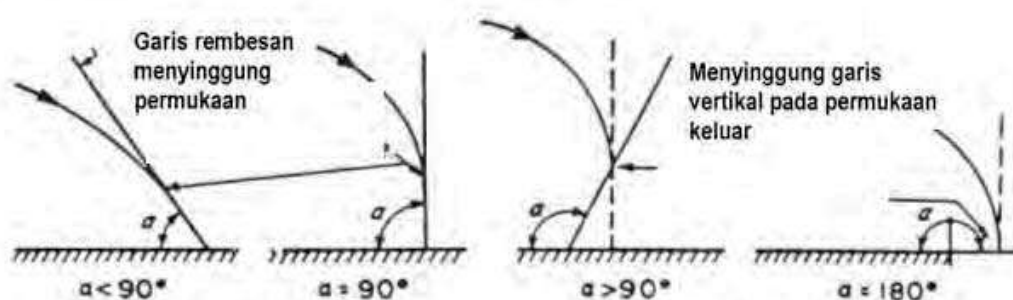
(Bahan diambil dari *United States Bureau of Reclamation , Design Standards Embankment Dams No. 13, Chapter 8, Seepage Analysis and Control*)

**Catatan :**

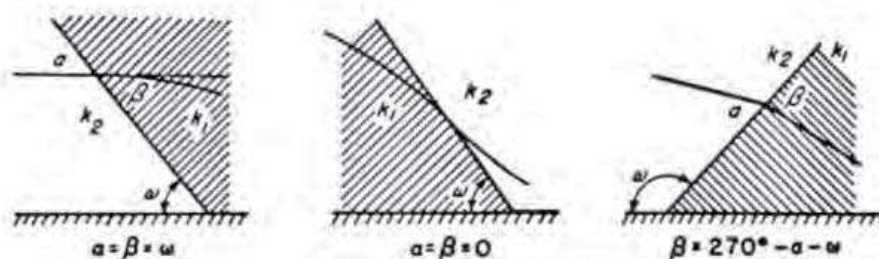
- 1) Potongan yang akan dianalisis harus ditransformasikan ke dalam potongan isotropik ekuivalen seperti diuraikan dalam Gambar B.1 dan B.2 pada Lampiran B, sebelum menggunakan metode pada Lampiran C.
- 2) Setelah menggunakan metode ini, semua dimensi, termasuk garis freatik dan/atau jaring alir, harus ditransformasikan ke potongan aslinya sebelum melakukan perhitungan gradien hidraulik dan gaya rembesan air
- 3) Perhitungan debit aliran dapat dilakukan dengan mentransformasikan potongan menggunakan koefisien permeabilitas transformasi  $k = k_h \times k_v$



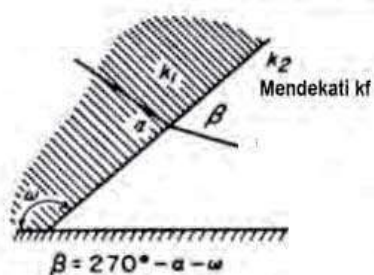
**a. Kondisi pada titik masuk garis rembesan**



**b. Kondisi pada titik keluar garis rembesan air**

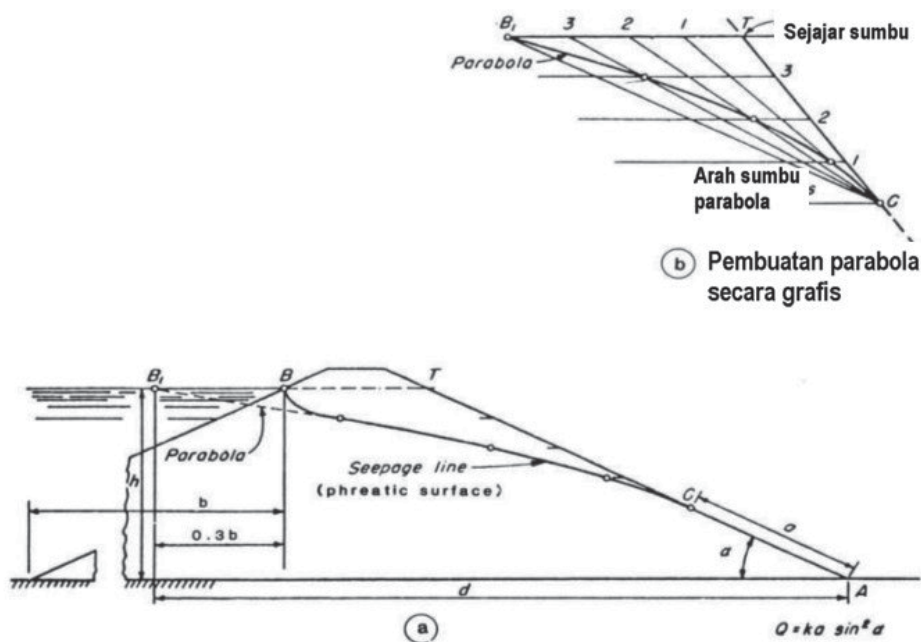


Bagian terarsir adalah tanah dengan koef. permeabilitas kr lebih kecil



**c. Pembelokan garis rembesan antara dua batas tanah dengan permeabilitas berlainan**

Gambar C.1 - Garis aliran pada kondisi masuk (*entrance*), keluar (*discharge*), dan pembelokan (*deflection*)



Prosedur penggambaran garis freatik :

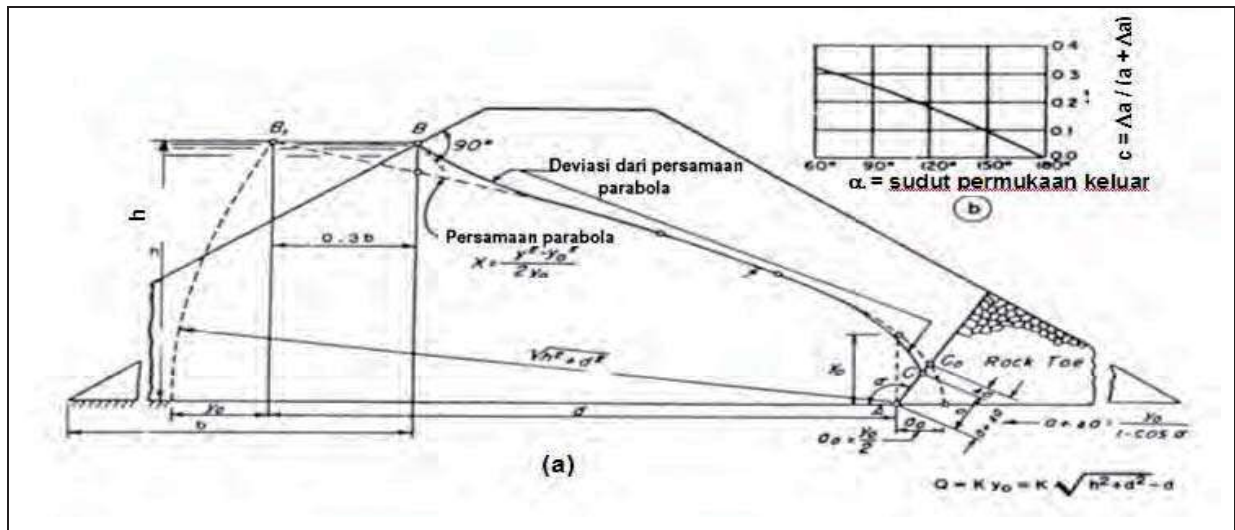
1. Gambar potongan ini seperti pada gambar (a), jika diperlukan
2. Tentukan titik  $B_1$ ,  $BB_1 = 0.3 b$
3. Tentukan titik  $r$  C dari persamaan

$$a = S_0 - \sqrt{S_0^2 - \frac{h^2}{\sin^2 \alpha}}, \text{ dengan } S_0 \text{ adalah panjang garis rembesan } B_1CA$$

$$S_0 = \sqrt{h^2 + d^2}$$

4. Plot parabola dengan metode grafik yang ditunjukkan pada gambar (b)
5. Lengkapi garis rembesan sketsa kurva dengan menghubungkan titik "B" dengan parabola- parabola
6. Buatlah sesuai dengan gambar (a).

**Gambar C.2 - Penentuan garis freatik untuk potongan yang homogen pada fondasi kedap air (untuk  $\alpha < 60^\circ$ )**



Prosedur penggambaran garis freatik :

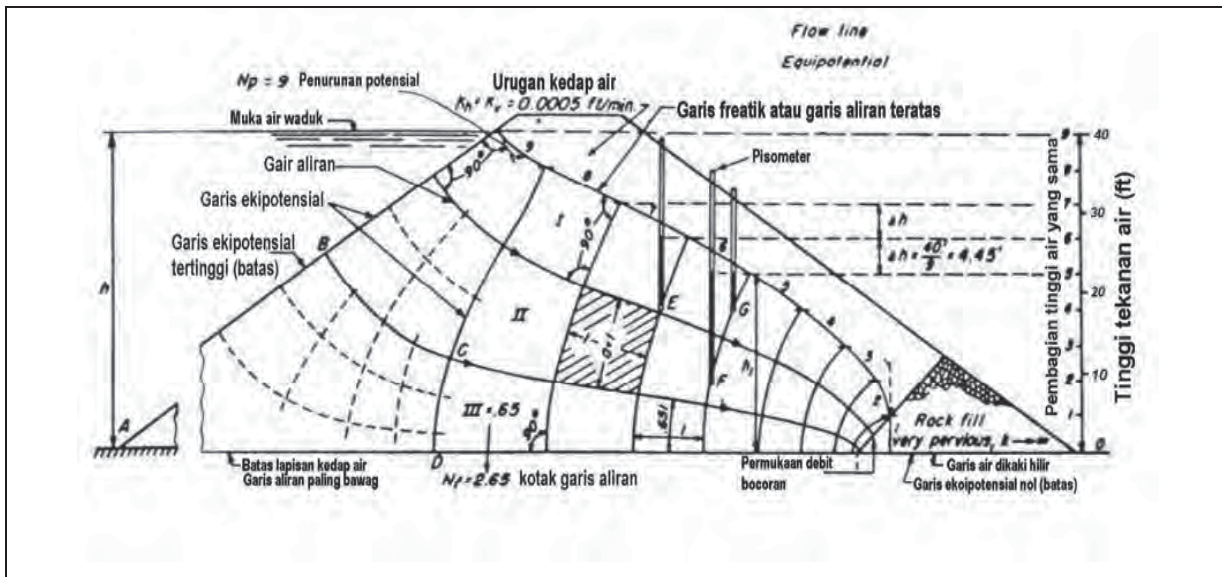
1. Gambar potongan seperti gambar (b) , jika diperlukan
2. Tentukan titik B<sub>1</sub>,  $BB_1 = 0.3 b$
3. Tentukan  $y_0$  secara grafis ditunjukkan atau dengan persamaan

$$y_0 = \sqrt{h^2 + d^2} - d$$

Plot parabola awal dari persamaan  $X = \frac{y^2 - y_0^2}{2y_0}$  atau tentukan secara grafis seperti gambar a

4. Tentukan panjang  $a + \Delta a$  dan hitung  $\Delta a$  dari grafik b
5. Tentukan titik C dan sketsa kurva dari titik C sampai parabola awal
6. Lengkapi garis rembesan sketsa perpindahan kurva dengan menghubungkan titik "B" berbentuk parabola

**Gambar C.3 - Penggambaran garis freatik untuk potongan homogen dengan fondasi kedap air ( $\alpha < 60^\circ$ )**



Perhitungan :

1. Hitung per unit lebar potongan :

$$Q = kh \frac{N_f}{N_p} = 0,005 \times 40 \times \frac{2,65}{9} = 0,059 \text{ ft}^3 / \text{min}$$

per ft dari bendungan

2. Tekanan hidrostatik pada beberapa titik :

$$h_1 = \frac{n_p}{N_p} h, \text{ dengan } n_p = \text{angka potensial}$$

terletak antara titik dan tekanan nol

$$\text{Pada titik E, } h_1 = \frac{6}{9} \times 40' = 26.7 \text{ ft.}$$

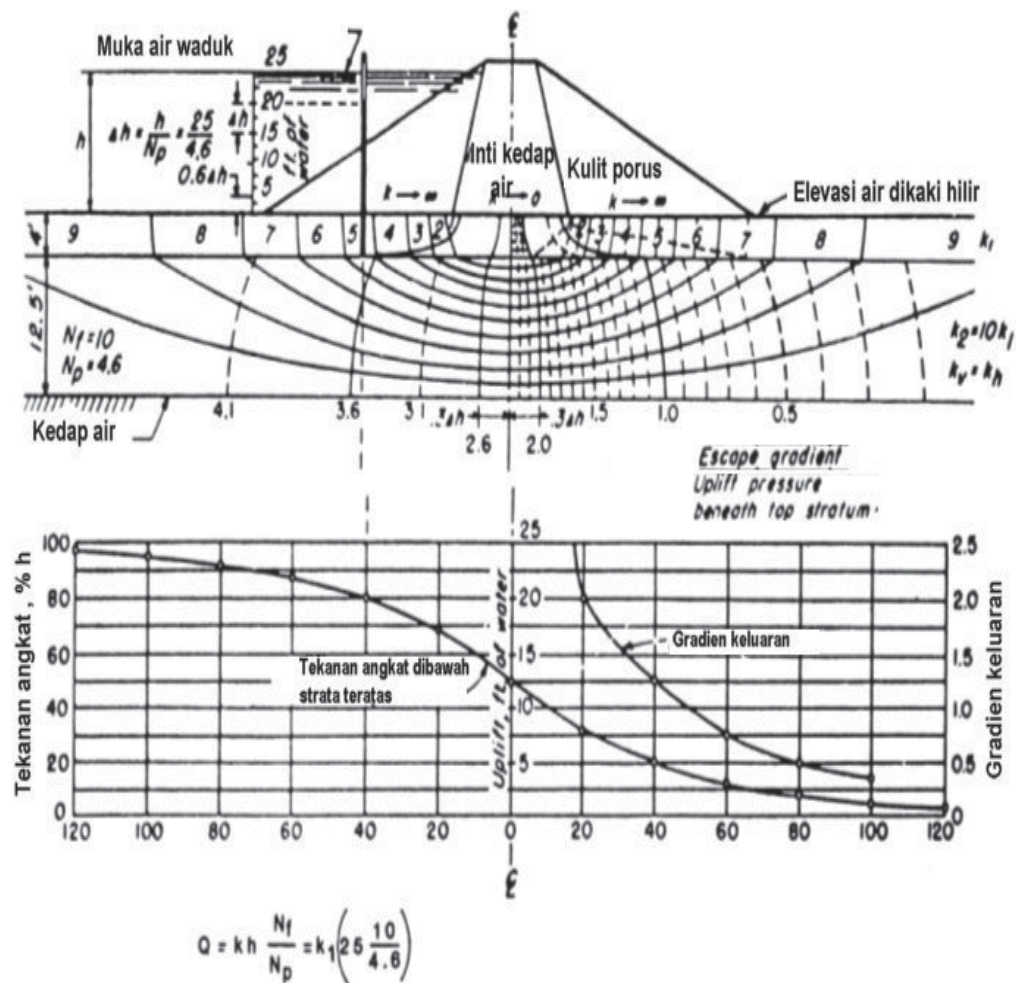
$$\text{Pada titik F dan G, } h_1 = \frac{5}{9} \times 40' = 22.2 \text{ ft.}$$

$h_1$  juga dapat ditentukan secara grafis

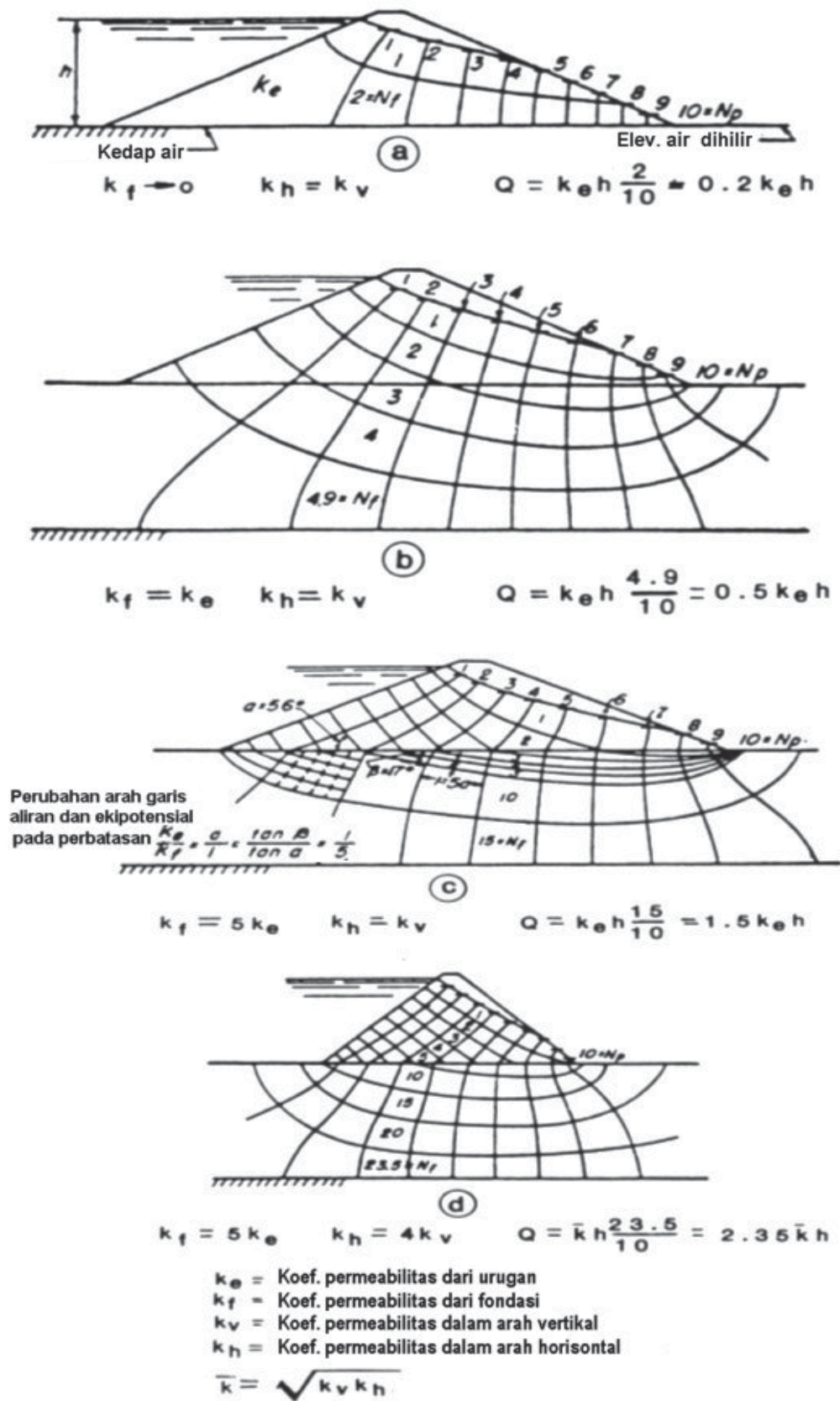
3. Gradien hidraulik rata – rata berbentuk elemen “bujur sangkar” :

$$i = \frac{\Delta h}{l}, \text{ untuk luas terarsir, } i = \frac{4.45'}{11.2'} = 0.40$$

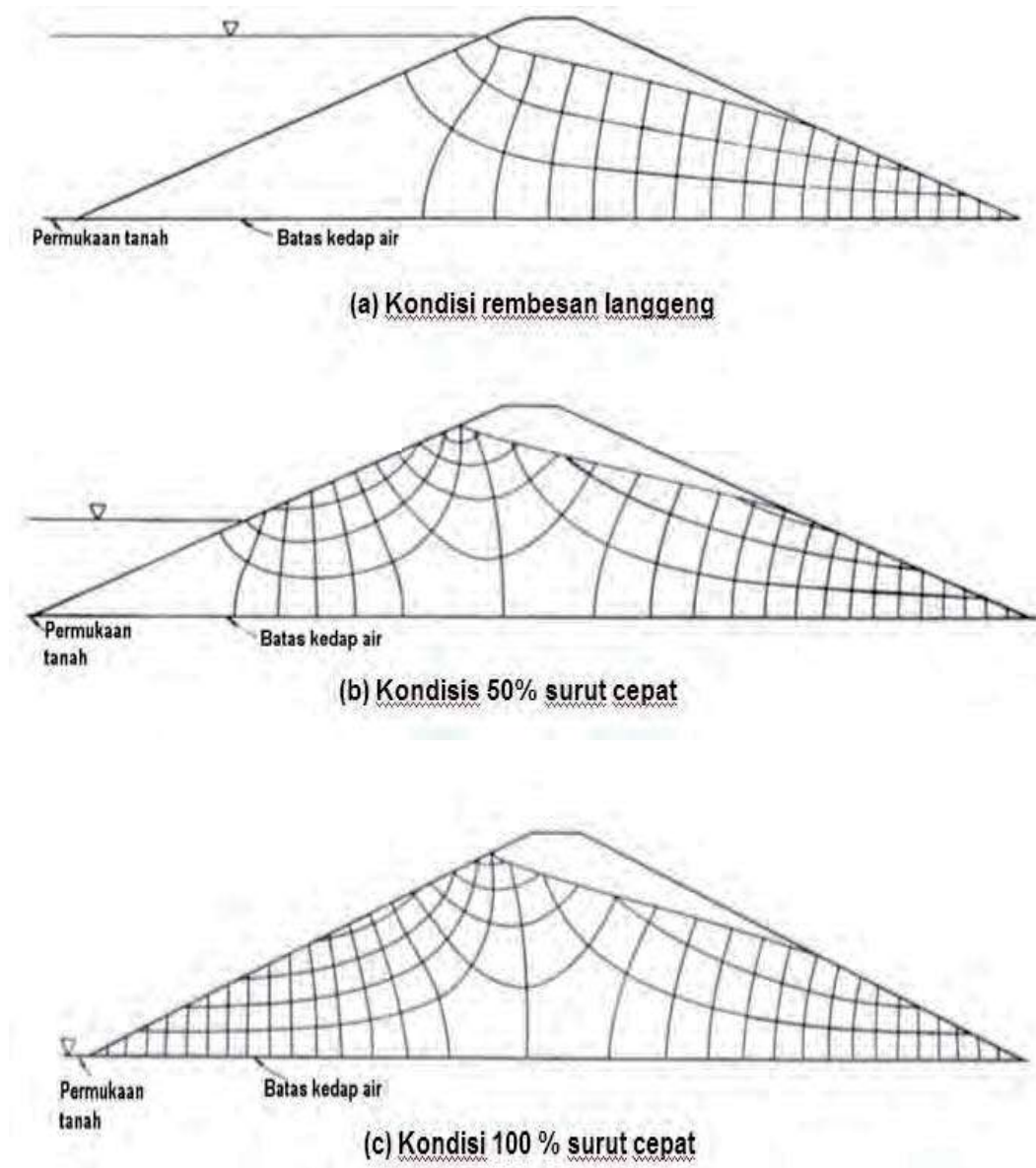
**Gambar C.4 - Perhitungan dan kebutuhan dasar untuk menentukan jaring-jaring aliran rembesan**



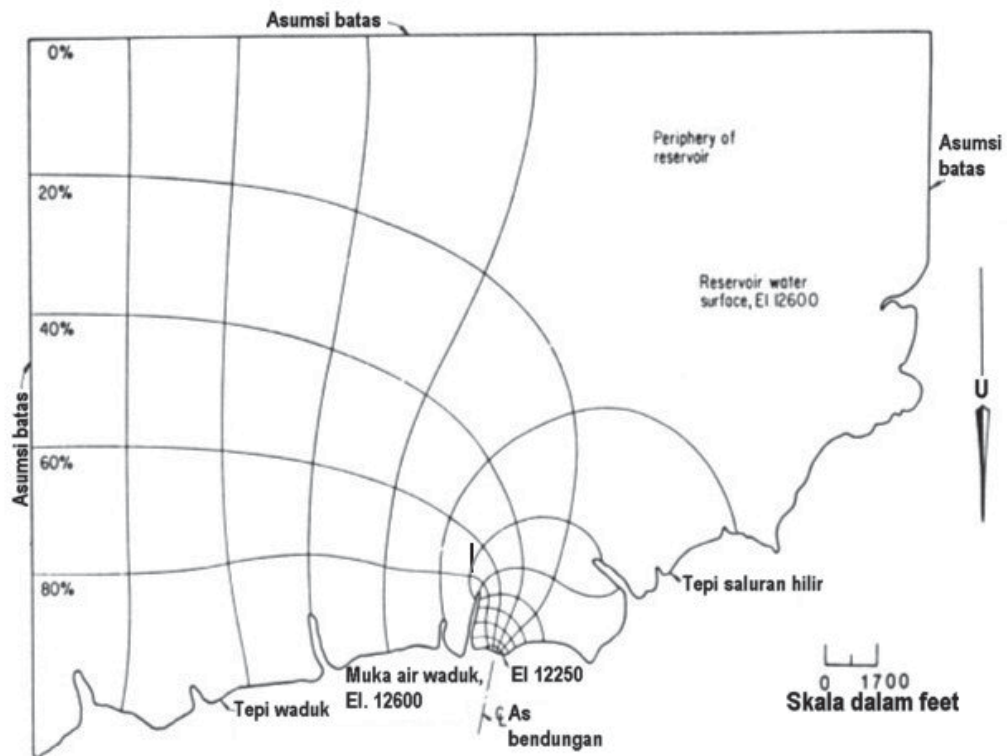
**Gambar C.5 - Perhitungan rembesan melalui fondasi**



Gambar C.6 - Rembesan melalui tubuh bendungan dan fondasi



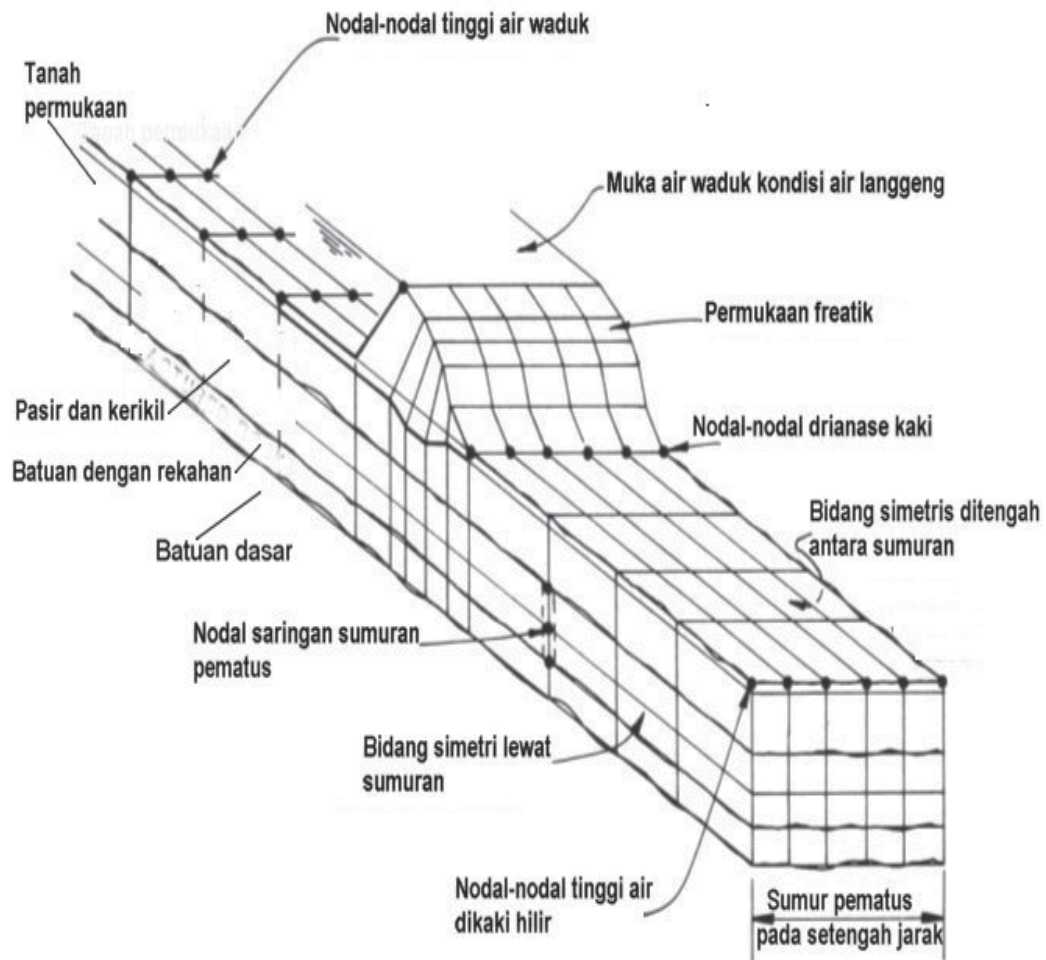
Gambar C.7 - Contoh tipe penggambaran jaring alir rembesan



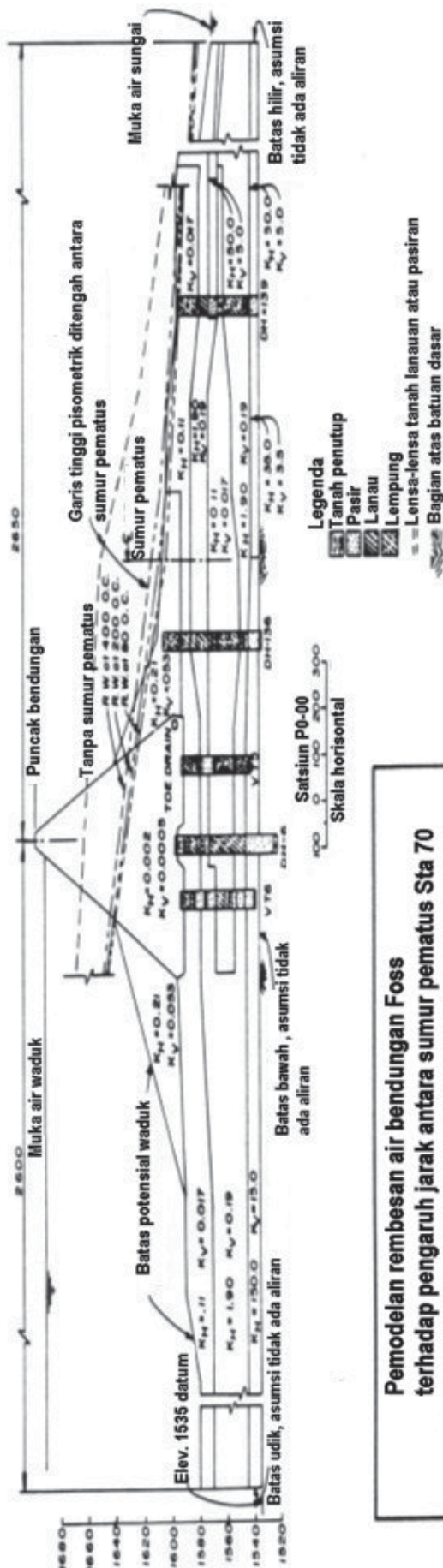
Catatan : Batuan dasar dianggap horisontal dan berfungsi sebagai lapisan drainase pada batas sebelah barat dam selatan. Elevasi dari keseluruhan permukaan drainase = 1225.0 . Batas timur dianggap kedap air. Tebal zona porus (d) = 5 ft.  
 $N_f = 13$  ,  $N_d = 5$  ,  $k = 5 \text{ ft/d}$  ,  $h = 1260 - 1225 = 35 \text{ ft}$  .  
 $Q = kh \frac{N_f}{N_d} d = (5 \times 35) \left( \frac{13}{5} \right) (5) = 2.280 \text{ ft}^3/\text{d}$

Gambar C.8 - Contoh jaring alir rembesan tiga dimensi

**Lampiran D**  
(Informatif)  
**Contoh analisis rembesan air dengan cara elemen hingga**



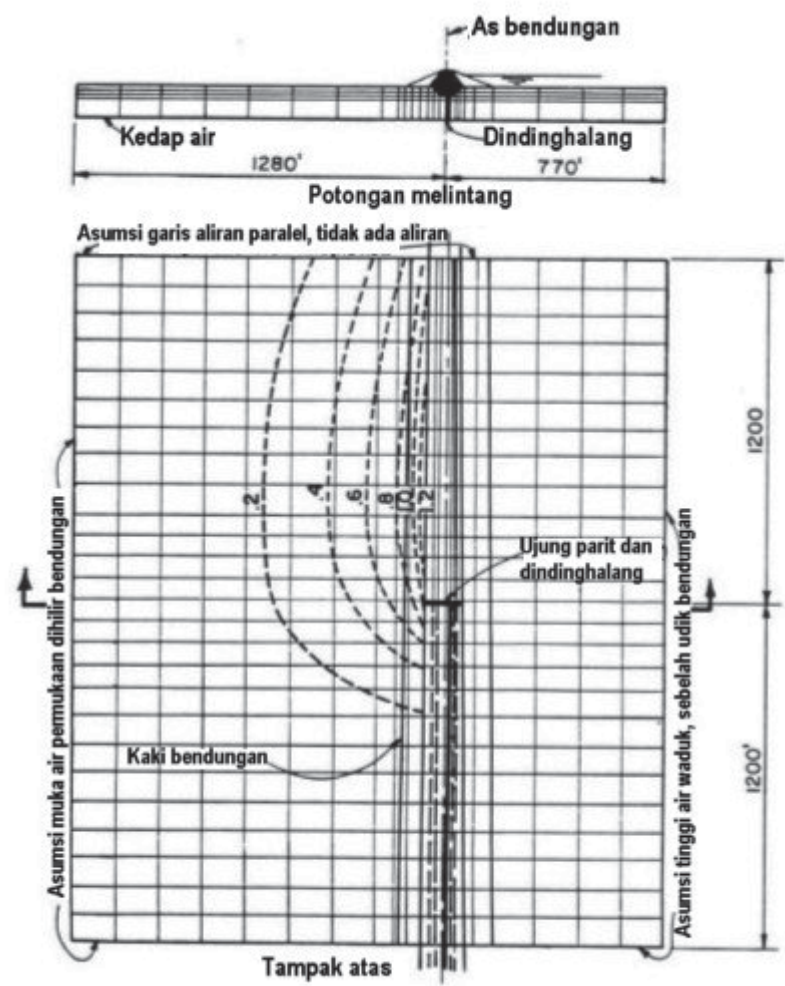
**Gambar D.1 - Quasi – Model sumur pematics dengan elemen hingga tiga dimensi**



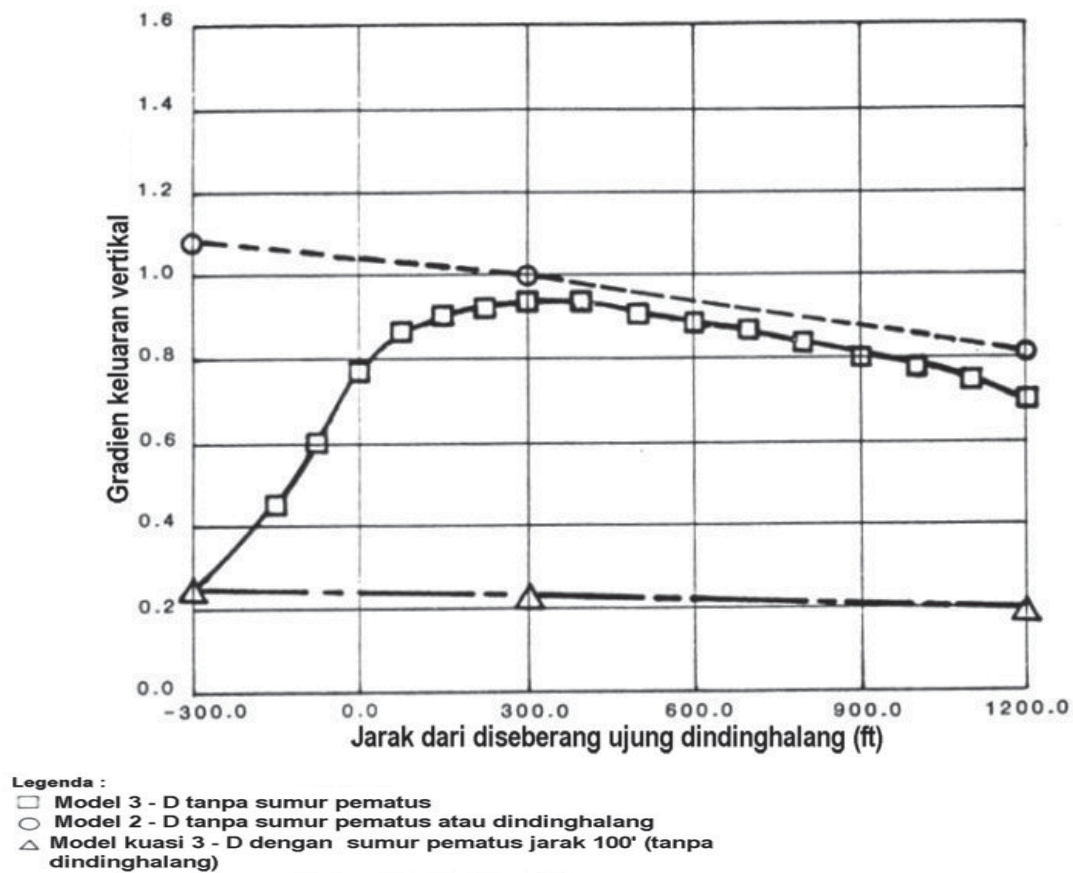
| Pemodelan rembesan air bendungan Foss terhadap pengaruh jarak antara sumur pematus Sta 70 |               |             |            |            |
|-------------------------------------------------------------------------------------------|---------------|-------------|------------|------------|
|                                                                                           | Tanpa sumuran | Jarak 400'  | Jarak 800' | Jarak 80'  |
| Tinggi tek. air dikaki                                                                    | 4.7'          | 1.4'        | 9"         | 7"         |
| Gradien keluaran                                                                          | 0.7           | 0.1         | 0.1        | 0.1        |
| Aliran per sumur                                                                          |               | 107 gal/min | 60 gal/min | 26 gal/min |
| Rembesan permukaan per 100'                                                               | 14 gal/min    | 4 gal/min   | 3 gal/min  | 3 gal/min  |

Catatan :  
Garis tinggi pisometrik sama dengan lapisan tanah diatas bagian atas batuan dasar.  
Tanah terdiri dari lebih dari satu material di beri simbol sesuai materialnya.  
 $K_h$  = permeabilitas horizontal ft/hari  
 $K_v$  = permeabilitas vertikal ft/hari

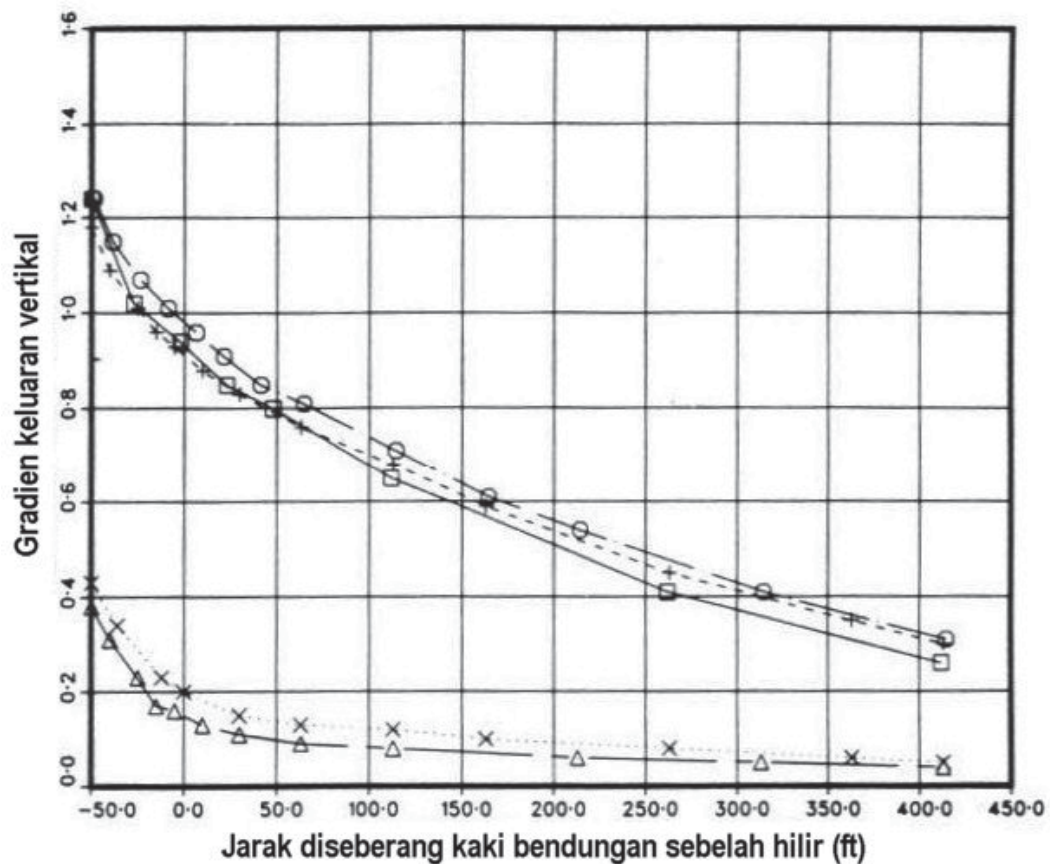
Gambar D.2 Studi sumur pematus elemen hingga kuasi tiga dimensi



Gambar D.3 - Kontur gradien keluaran studi model elemen hingga tiga dimensi



Gambar D.4 - Gradien keluaran vertikal studi model elemen hingga



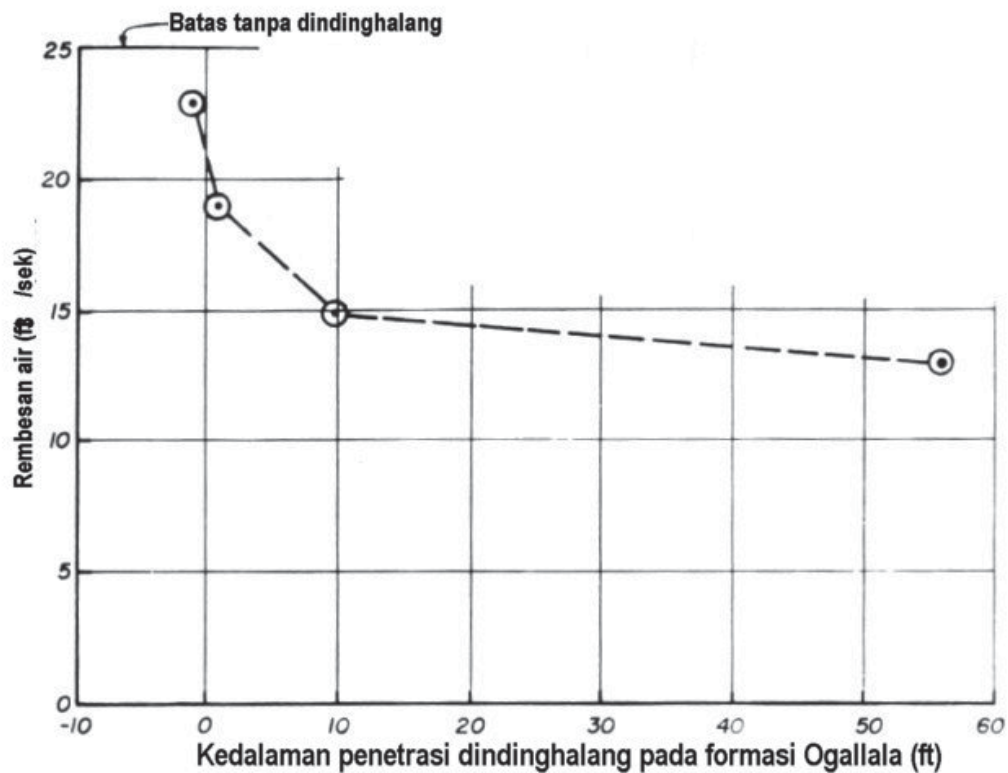
- = Run no 3A Model 3 - D tanpa sumur pematius
- = Run no 4A Model 2 - D tanpa sumur pematius
- △ = Run no 4A-3 - dengan sumur pematius 5x5 asumsi drainase bebas
- + = Run no 4A-6 - dengan sumur pematius 5x5 dengan diisi kerikil
- × = Run no 4A-7 - dengan sumur pematius 2x2 asumsi drainase bebas

Run 4A-3, 4A-6 dan 4A-7 dilakukan dengan model kuasi 3-D. Sumur pematius ditempatkan pada interval jarak 100 feet. Semua run diasumsikan sebagai aliran bebas lewat zona 2 di hilir.

**Analisis rembesan untuk evaluasi stabilitas bendungan Narrows**

**Perbandingan gradien keluaran pada potongan 300 ft diseberang ujung parit slari**

**Gambar D.5 - Analisis rembesan studi model elemen hingga**



**Gambar D.6 - Studi rembesan model elemen hingga tiga dimensi bendungan Callamus yang mempengaruhi kedalaman penetrasi dinding halang terhadap bocoran**

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## **ANNEX 6-5**

Reviewed Module as Certificated Official Regulation/Standard No.005

SNI 8283:2016 on Depth measurement method uses echo sounding to produce a bathymetry map Output 3



## Metode pengukuran kedalaman menggunakan alat perum gema untuk menghasilkan peta batimetri

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Diterbitkan di Jakarta

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## **Kata pengantar**

Standar Nasional Indonesia (SNI) 8283:2016 dengan judul “Metode pengukuran kedalaman menggunakan alat perum gema untuk menghasilkan peta batimetri” memberikan ketentuan pengukuran batimetri menggunakan alat perum gema yang meliputi ketentuan dan cara pengukuran dasar perairan hingga kedalaman 120 m. Ketentuan tersebut dimaksudkan untuk menjadi acuan dan pegangan bagi perencana dalam melaksanakan pengukuran dasar perairan sehingga diperoleh data kedalaman dan informasi tentang konfigurasi dasar perairan.

Standar ini dipersiapkan oleh Komite Teknis 91-01 Bahan Konstruksi Bangunan dan Rekayasa Sipil pada Sub Komite Teknis 91-01-S1 Sumber Daya Air melalui Gugus Kerja Bidang Hidrologi dan Geoteknik Keairan.

Standar ini telah dibahas dalam forum rapat konsensus yang diselenggarakan oleh Sub Komite Teknis 91-01-S1 Sumber Daya Air pada tanggal 22 Maret 2016 yang melibatkan para narasumber, pakar dan lembaga terkait serta telah melalui jajak pendapat pada tanggal 29 April 2016 sampai dengan 28 Juni 2016.

Untuk menghindari kesalahan dalam penggunaan dokumen dimaksud, disarankan bagi pengguna standar untuk menggunakan dokumen SNI yang dicetak dengan tinta berwarna.

Perlu diperhatikan bahwa kemungkinan beberapa unsur dari dokumen standar ini dapat berupa hak paten. Badan Standardisasi Nasional tidak bertanggung jawab untuk pengidentifikasian salah satu atau seluruh hak paten yang ada.

## Pendahuluan

Standar ini merupakan kumpulan dari pengalaman para ahli pengukuran khususnya yang menangani masalah pengukuran kedalaman dengan menggunakan alat perum gema. Salah satu hal penting dalam pelaksanaan pengukuran kedalaman adalah tahapan pelaksanaan pengukuran untuk mendapatkan hasil yang sesuai dengan yang direncanakan.

Standar ini membahas tentang istilah, definisi, ketentuan serta cara pengukuran, sehingga tahapan dalam proses pelaksanaan pengukuran kedalaman dapat diikuti secara sistematis dan praktis.

Diharapkan standar ini dapat dipergunakan sebagai acuan dalam melaksanakan pengukuran kedalaman dengan alat perum gema di Indonesia.



## Metode pengukuran kedalaman menggunakan alat perum gema untuk menghasilkan peta batimetri

### 1 Ruang lingkup

Standar ini menetapkan ketentuan dan persyaratan, cara pengukuran kedalaman perairan serta posisinya untuk membuat peta batimetri.

Alat perum gema GPS dan perum gema DGPS yang digunakan berdasarkan sinyal yang dipancarkan menggunakan pancaran tunggal.

### 2 Istilah dan definisi

Istilah dan definisi yang digunakan pada standar ini adalah sebagai berikut:

#### 2.1

##### **alat perum gema**

suatu alat untuk melakukan pekerjaan pemeruman, dengan menghitung interval waktu yang dibutuhkan oleh gelombang suara untuk merambat dari sebuah titik yang diketahui ke suatu bidang pantul dan kembali ke titik tersebut

#### 2.2

##### **aki (*storage battery*)**

sebuah sel listrik dimana di dalamnya berlangsung proses elektrokimia yang reversibel (dapat berbalikan) dengan efisiensinya yang tinggi

#### 2.3

##### **batimetri**

elevasi/ukuran kedalaman dasar laut

#### 2.4

##### **besi coba**

plat besi berlubang diameter 5 mm, untuk mengkalibrasi kedalaman

#### 2.5

##### **buku perum**

buku yang memuat catatan mengenai pemeruman

#### 2.6

##### **DGPS (*differential global positioning system*)**

Sistem untuk meningkatkan akurasi penentuan posisi atau letak di permukaan bumi dengan bantuan penyalarsan sinyal satelit.

#### 2.7

##### **GPS (*global positioning system*)**

Sistem untuk menentukan posisi atau letak di permukaan bumi dengan bantuan penyalarsan sinyal satelit

#### 2.8

##### **jarak aman**

jarak jagaan antara lunas kapal dan dasar laut

**2.9**

**kompensator kecepatan suara**

rangkaian elektronik yang digunakan untuk mengatur ketidaksesuaian kecepatan rambat suara terhadap kecepatan standar

**2.10**

**koreksi indeks**

koreksi alat terhadap data kedalaman yang besarnya ditetapkan oleh pabrik pembuat alat perum gema

**2.11**

**lajur perum**

lintasan titik-titik posisi perum

**2.12**

**nomor fix**

penomoran pada buku perum dan kertas rekaman pada saat penentuan posisi perum

**2.13**

**pantulan ganda**

berkas sinyal yang tidak tertangkap oleh *transduser*, memantul ke permukaan air, memantul ke dasar dan diterima lagi oleh transduser penerima

**2.14**

**papan duga (peilskal)**

papan berskala untuk mengamati fluktuasi muka air

**2.15**

**pemeruman**

proses pengukuran kedalaman suatu perairan dengan menggunakan alat perum gema

**2.16**

**pena kontak**

kawat tungsten yang dipasang pada sabuk pemutar, yang memberikan sumber catu daya ke pena stilus

**2.17**

**pena stilus**

kawat tungsten yang dipasang pada sabuk pemutar, bila dialiri arus listrik, pada kertas akan terbentuk goresan hitam

**2.18**

**peta batimetri (kedalaman)**

peta kontur kedalaman laut yang diikatkan pada bidang persamaan

**2.19**

**peta kerja**

peta yang memuat lajur-lajur pemeruman yang digunakan untuk mengarahkan posisi perahu supaya sesuai dengan lajur perum

**2.20**

**pola pancaran**

bentuk pancaran pulsa yang dipancarkan oleh *transduser* dan tergantung dari frekuensi dan panjang pulsa

**2.21****sabuk pemutar**

sabuk yang digunakan untuk memutar pena kontak dan pena stilus

**2.22****sinyal akustik**

sinyal yang berasal dari penimbulkan suara

**2.23****sinyal elektronik**

sinyal yang berasal dari penimbulkan gejala listrik

**2.24****spasi perum**

jarak antar dua lajur perum yang berdekatan

**2.25****transduser**

suatu alat yang mempunyai fungsi mengubah suatu besaran fisis ke suatu besaran fisis yang lainnya

**2.26****transduser penerima**

suatu alat yang menerima gema suara setelah terpantul, mengubah sinyal akustik tersebut ke dalam sinyal elektronik

**2.27****transduser pengirim**

suatu alat yang mengubah sinyal elektronik yang dibangkitkan oleh alat perum gema menjadi sinyal akustik yang diarahkan ke dasar

**3 Ketentuan dan persyaratan****3.1 Umum**

Untuk pengukuran perum gema dengan ketelitian  $\leq 10\text{cm}$ , kedalaman efektif pengukuran sampai dengan 60m. Sedangkan untuk ketelitian  $\leq 20\text{cm}$  kedalaman efektif pengukuran sampai dengan 120m. Untuk penggunaan perum gema DGPS, koordinat yang terekam memiliki ketelitian  $\leq 5\text{cm}$ . Sedangkan untuk perum gema dengan GPS koordinat yang terekam memiliki ketelitian  $\leq 200\text{cm}$ .

**3.2 Peralatan**

Peralatan dan perlengkapan harus dalam kondisi laik pakai dan lengkap.

**3.2.1 Peralatan utama**

a). Peralatan yang digunakan untuk perum gema dengan GPS, sebagai berikut:

- 1) alat perum gema;
- 2) alat penentu posisi (GPS);
- 3) alat ukur waktu dengan ketelitian detik.
- 4) *waterpass*
- 5) *peilskal* (papan duga muka air)

b). Peralatan yang digunakan untuk perum gema dengan DGPS, sebagai berikut:

- 1) alat perum gema;
- 2) *receiver base*

- 3) *receiver rover*
- 4) antena penguat sinyal untuk *rover* dan *base*
- 5) Laptop dengan sudah dilengkapi *software Hypack/Hydropo*
- 6) peilskal

### **3.2.2 Perlengkapan penunjang**

Perlengkapan penunjang yang digunakan:

- 1) perahu motor, kapasitas disesuaikan dengan kebutuhan;
- 2) peta kerja;
- 3) kompas;
- 4) alat komunikasi;
- 5) alat tulis;
- 6) map lapangan yang kedap air;
- 7) jas hujan;
- 8) jaket pelampung pengaman dengan warna menyolok.
- 9) tripod
- 10) Kamera (untuk dokumentasi)

### **3.3 Petugas dan penanggungjawab**

Nama, tanda tangan petugas dan penanggung jawab hasil pengukuran serta tanggal pengukuran harus ditulis dengan jelas dalam formulir pengukuran.

### **3.4 Cuaca**

Cuaca pada saat pengukuran dalam keadaan baik.

### **3.5 Bahan**

Bahan yang diperlukan dalam pengukuran kedalaman:

- 1) catu daya arus searah (*accu*) sesuai dengan kebutuhan, dengan memperhatikan polaritas kutub-kutubnya;
- 2) kertas rekaman;
- 3) pena stilus.

### **3.6 Pemeriksaan alat dan kalibrasi**

Pemeriksaan alat dan kalibrasi meliputi:

- 1) di kantor: rangkaian elektronik dan komponen yang mudah rusak;
- 2) di kantor dan di lapangan: pemeriksaan kalibrasi.

### **3.7 Pemasangan transduser**

Pemasangan transduser harus memenuhi ketentuan:

- 1) pemasangan tetap pada lunas kapal, pada jarak sepertiga sampai dengan setengah panjang kapal terhadap ujung haluan (lihat Gambar 4);
- 2) pemasangan tidak tetap di samping atau di buritan (lihat Gambar 5):
  - a. aman terhadap gangguan yang timbul;
  - b. terletak di dalam air;
  - c. bebas terhadap gelembung udara atau gangguan akustik lainnya yang ditimbulkan oleh baling-baling dan poros baling-baling kapal saat melakukan manuver;
  - d. jarak kabel transduser terhadap kabel penyalaan busi minimum 50 cm;
  - e. kelebihan panjang kabel transduser tidak boleh dipotong;
  - f. harus tegak agar didapat penerimaan sinyal akustik yang baik (lihat Gambar 6).

### **3.8 Interpretasi hasil rekaman**

Hal yang harus diperhatikan dalam menginterpretasi hasil rekaman kedalaman adalah:

- 1) dasar yang keras dan dasar yang lebih dekat ke transduser akan memantulkan gema lebih kuat dan lebih teliti;

- 2) ketebalan rekaman yang dihasilkan dari perum gema, data yang diambil berada pada bagian tengahnya;
- 3) pengambilan data rekaman perum gema pasti akan terdapat gangguan yang disebabkan oleh kayu, sampah, binatang harus dilakukan interpolasi dan pengecekan ulang data rekaman yang ada di sekitarnya;
- 4) pengaturan *range* kedalaman;
- 5) perhatikan posisi nol pada kertas hasil rekaman kedalaman;
- 6) perhatikan tanda tanggal dan jam mulai perekaman data kedalaman pada kertas hasil rekaman data
- 7) kekuatan pantul berkurang menurut urutan karang, pasir, logam, kayu, ikan dan plankton;
- 8) akan menghasilkan pantulan ganda di air dangkal, disebabkan oleh pantulan bolak-balik antara dasar dan permukaan air, kedalaman sebenarnya dari rekaman ganda adalah rekaman yang terdangkal (lihat Gambar 7).
- 9) hasil perekaman data kedalaman dengan kondisi normal (lihat Gambar 8)

Hal yang harus diperhatikan dalam menginterpretasi hasil rekaman posisi koordinat adalah:

- 1) menyamakan nomor data perekaman hasil GPS dan hasil pemeruman (dengan GPS);
- 2) perhatikan penggunaan sistem koordinat yang digunakan;
- 3) melakukan pengecekan data koordinat apakah sudah sesuai dengan volume pengukuran yang dibutuhkan;

### 3.9 Koreksi data

Hasil pengukuran harus dikoreksi terhadap:

- 1) penyimpangan alat;
- 2) kedudukan transduser terhadap permukaan air;
- 3) kedalaman karena perubahan kecepatan gelombang suara dalam air;
- 4) perputaran motor penggerak stilus;
- 5) fluktuasi muka air.

### 3.10 Pengikatan terhadap bidang persamaan

Pekerjaan pengukuran kedalaman harus diikatkan pada titik tetap (*benchmark*) yang tersedia atau dibuat baru.

## 4 Cara pengukuran

Lakukan persiapan, pengujian dan pengukuran sebagai berikut:

- 1) persiapan di kantor:
  - a. pilih alat perum gema sesuai dengan kebutuhan;
  - b. pilih peralatan posisi yang diperlukan;
- 2) pengujian alat di kantor:
  - a. periksa bentuk pulsa, tegangan dan frekuensi rangkaian-elektronik sesuaikan dengan spesifikasi teknis;
  - b. periksa fungsi dari sabuk pemutar stilus, pena stilus, pena kontak, lengan stilus, geser penggerak rol kertas, sekering dan lain-lain;
  - c. periksa pengaturan titik nol dan kalibrasi
  - d. periksa fungsi GPS atau DGPS;
- 3) persiapan di lapangan
  - a) siapkan perahu motor yang memadai;
  - b) pasang alat perum gema pada kapal;

- c) pemasangan *receiver base* di titik yang akan dijadikan referensi atau BM beserta antena dan penguat sinyal (perum gema DGPS);
  - d) menyamakan besaran frekuensi di *receiver base* dan *receiver rover* (perum gema DGPS);
  - e) Sambungkan alat perum gema dan DGPS pada laptop (perum gema DGPS);
  - f) pasang alat DGPS pada kapal, sebaiknya posisi pemasang DGPS tidak terhalang (perum gema DGPS);
  - g) pasang transduser sesuai dengan ketentuan;
  - h) siapkan peralatan yang diperlukan dalam pengujian lapangan;
- 4) pengujian alat di lapangan:
- a) hubungkan kabel transduser dan kabel catu daya pada alat perum gema;
  - b) gantikan sisa rol kertas rekaman dengan rol yang baru;
  - c) hidupkan alat perum gema dengan mengatur saklar ON-OFF pada kedudukan STANDBY selama 10 menit sebagai pemanasan alat, kemudian geser saklar pada kedudukan ON;
  - d) pengaturan titik nol transduser terhadap muka air;
  - e) pengaturan kelompok kedalaman;
  - f) operasikan alat perum gema sampai nampak hasil rekaman;
  - g) mulai pengujian dengan jarak besi coba (cek bar) 1 meter terhadap transduser;
  - h) turunkan besi coba (cek bar) dengan interval 1 meter sampai kedalaman maksimum yang dapat dicapai, pada setiap interval penurunan besi coba (cek bar) harus ditunggu sampai nampak hasil rekaman;
  - i) setelah kedalaman maksimum tercapai, naikan besi coba (cek bar) ke atas dengan prosedur yang sama seperti saat penurunan;
  - j) perhatikan hasil rekaman, evaluasi dengan skala yang digunakan;
  - k) minimalkan simpangan antara pembacaan pada alat perekam dan kedalaman sebetulnya dari besi coba (cek bar) dengan kompensator kecepatan suara;
  - l) lakukan pengujian saat kapal membuang sauh dan arus tenang;
- 5) lakukan pengulangan kalibrasi bila:
- a. kertas rekaman diganti dengan yang baru;
  - b. terjadi penurunan catu daya, yang dapat diketahui dari kedudukan dan bentuk ZERO-LINE;
  - c. terjadi perubahan kedudukan tombol CAL ZERO, SPEED OF SOUND, dan TIDE & DRAFT;
  - d. terjadi perubahan kedudukan vertikal atau horisontal dari transduser;
  - e. diadakan perbaikan pada alat perum gema;
  - f. tempatkan perahu survei pada titik awal lajur pertama;
  - g. siapkan peralatan penentuan posisi dan hidupkan alat perum gema;
- 6) Pelaksanaan pemeruman
- a. pembuatan peta kerja yaitu ray lintasan perahu tegak lurus dan sejajar pantai dengan jarak 25 m sampai dengan 50 m;
  - b. pengukuran pasang surut selama pelaksanaan pemeruman;
  - c. lakukan pekerjaan pemeruman segera setelah semua anggota tim di atas perahu survei;
  - d. jalankan perahu survei dengan kecepatan konstan;
  - e. catat pada buku perum keterangan-keterangan yang diperlukan antara lain: lokasi pengukuran, waktu mulai dan akhir pengukuran nomor fix, mulai dan akhir pengukuran, dan lain-lain (hanya untuk perum gema GPS);
  - f. beri tanda awal pengukuran pada kertas rekaman dan harus cocok dengan nomor fix (hanya untuk perum gema GPS);
  - g. kendalikan arah perahu survei dengan berpedoman pada peta kerja dan pengarah di darat atau kompas (hanya untuk perum gema GPS);

- h. berikan aba-aba "SIAAAP FIX" untuk pengambilan fix No.1 dan seterusnya (hanya untuk perum gema GPS);
- i. ambil posisi fix dengan interval waktu yang tetap (hanya untuk perum gema GPS);
- j. beri tanda akhir pengukuran pada kartas rekaman, setiap akhir satu lajur;
- k. pada setiap akhir lajur:
  - (1) periksa kebenaran dan kesamaan dari setiap nomor posisi fix dan waktunya dari lajur yang baru diselesaikan, antara buku perum, kertas rekaman, dan peta kerja;
  - (2) lengkapi catatan di buku perum mengenai keadaan atau kejadian selama pemeruman di lajur tersebut;
  - (3) rencanakan untuk pemeruman lajur berikutnya dengan memperhatikan haluan perahu survei; pengaruh arus sepanjang lajur yang baru diselesaikan, dan cara pendekatan kapal pada titik awal dari lajur baru;
- l. pada akhir pemeruman harian:
  - (1) periksa seluruh isi buku perum, cocokkan nomor urut posisi fix dengan nomor urut di peta kerja dan kertas rekaman;
  - (2) periksa semua keterangan yang harus dicantumkan pada akhir dan awal setiap kertas rekaman, buku perum, dan peta kerja;
  - (3) periksa apabila ada perbedaan antara besi coba awal dan besi coba akhir;
  - (4) pindahkan angka kedalaman pada posisi fix bernomor dari kertas rekaman ke dalam buku perum;
  - (5) periksa kelengkapan pengisian data posisi dan data kedalaman di dalam buku perum;
  - (6) periksa semua peralatan survei dan simpan dalam keadaan kering;
  - (7) masukkan data hasil pengukuran pada map-map yang telah disediakan dan simpan ditempat yang aman.

## 5 Laporan

Hasil pengukuran kedalaman laut dengan alat perum gema dilaporkan dalam bentuk gambar, tabel maupun keterangan yang memuat:

- 1) peta batimetri, dilengkapi dengan :
  - a. nama kegiatan;
  - b. nama lokasi pengukuran;
  - c. nama pantai;
  - d. waktu pengukuran;
  - e. elevasi patok-patok pengukuran;
- 2) sketsa lokasi pengukuran, penjelasan jenis alat dan perlengkapan, hasil interpretasi, pembahasan dan rekomendasi;
- 3) personil, memuat:
  - a. daftar nama-nama pengukur, pengawas dan penanggung jawab pekerjaan disertai tanda tangannya;
  - b. pembagian tugas dan tanggung jawab antar personil;
  - c. daftar petugas lokal;
- 4) lain-lain, mencakup:
  - a. hambatan-hambatan yang terjadi baik pada alat maupun personil dan cara penanggulangannya;
  - b. cuaca;
  - c. dokumentasi kegiatan

**Lampiran A**  
(informatif)  
**Contoh perhitungan dan gambar**

Dari hasil pengukuran sifat datar (lihat gambar 1) didapat nol papan duga = - 0.622, terhadap patok P.1 = + 1.196.

Untuk itu perhitungan elevasi titik-titik perum (z):

$z = \text{Nol peilskal} + \text{tinggi muka air} - \text{kedalaman (d)} - \text{koreksi alat}.$

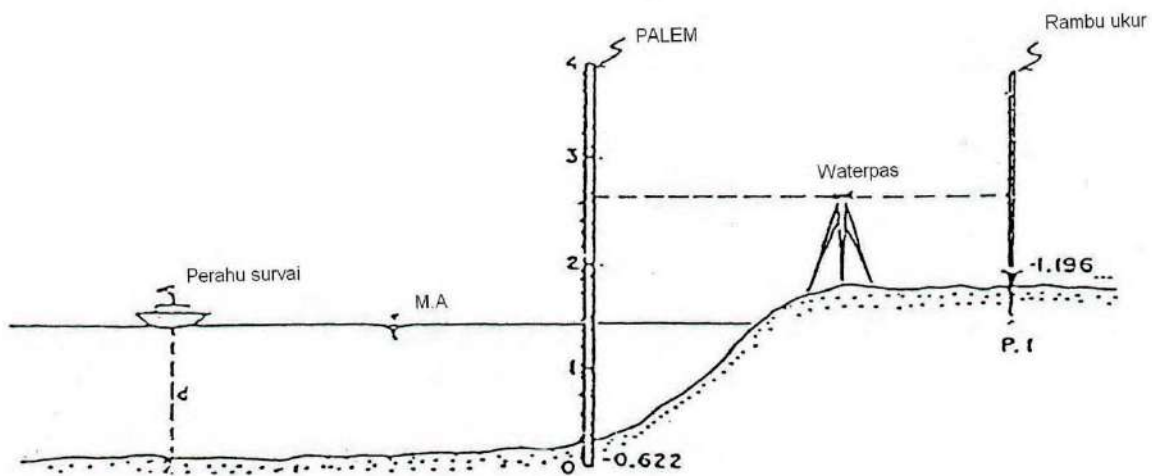
Contoh: (fix no. 20)

Diketahui:

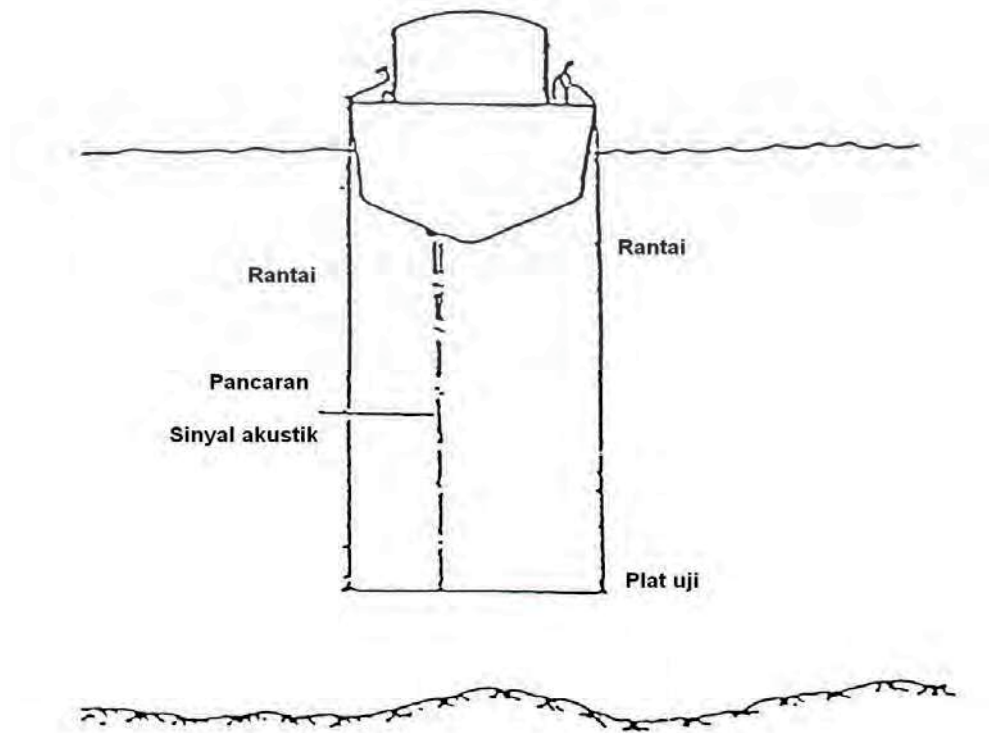
|                 |   |         |
|-----------------|---|---------|
| Nol Peilskal    | = | - 0.622 |
| Tinggi muka air | = | 0.72    |
| Kedalaman (d)   | = | 3.30    |
| Koreksi alat    | = | 0       |

$$z = - 0.622 + 0.72 - 3.3 - 0 = - 3.20 \text{ m}$$

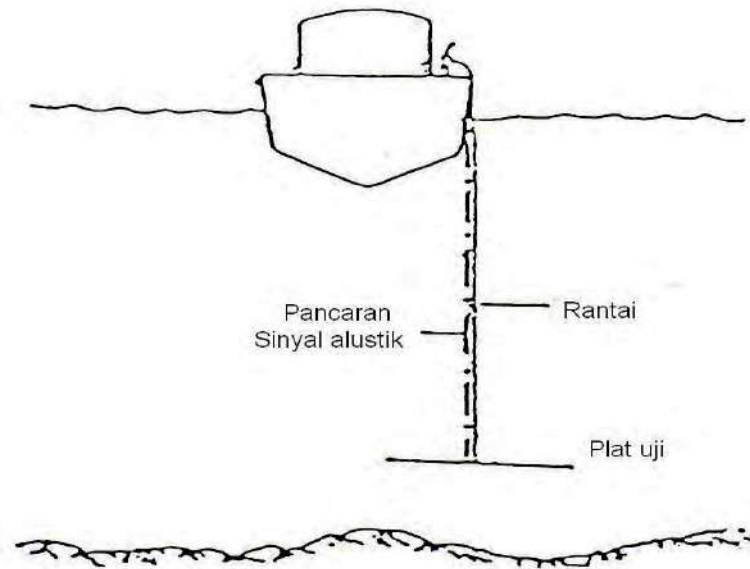
$$\text{Elevasi dasar (z)} = - 3.20 \text{ m}$$



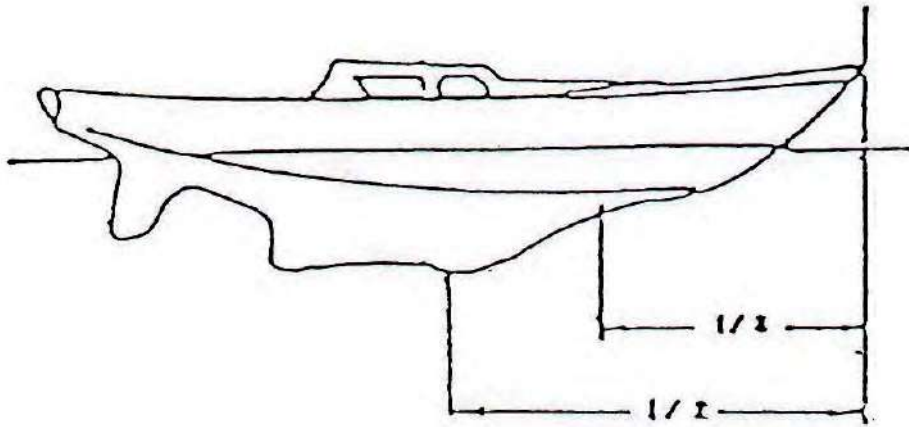
**Gambar A.1 - Pengikatan titik nol peilskal**



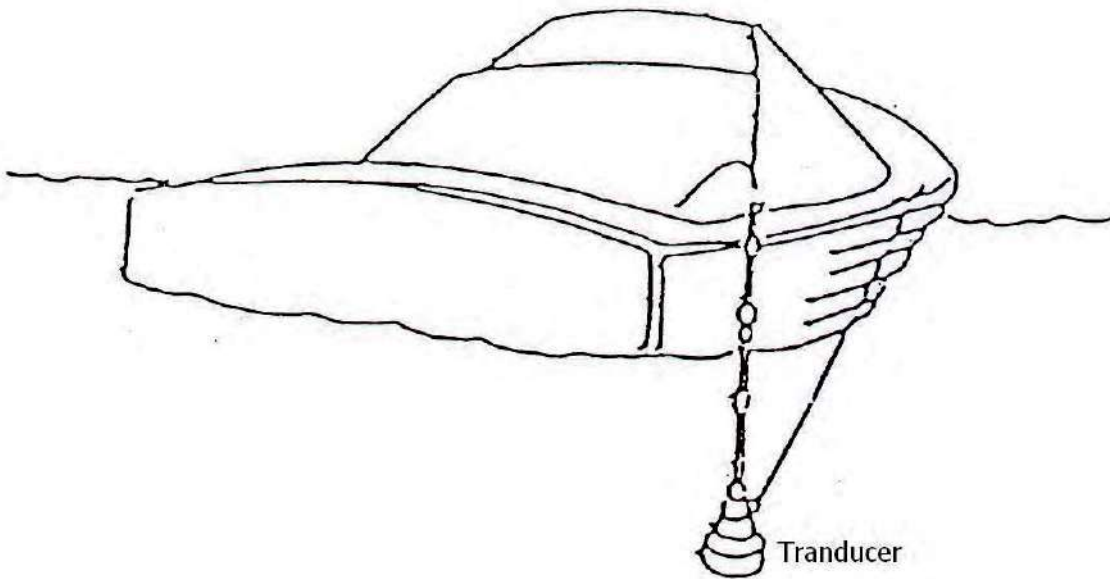
**Gambar A.2 - Uji coba transduser pada lunas kapal**



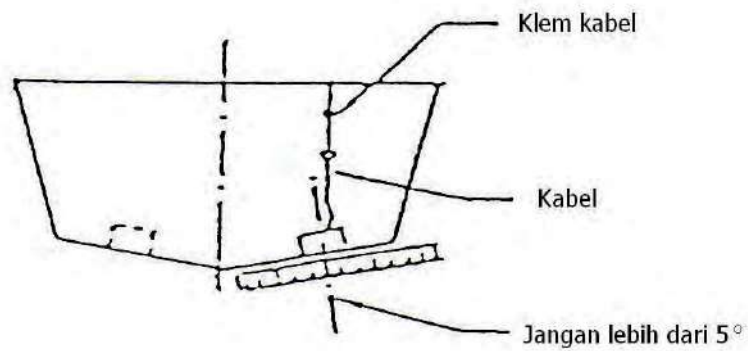
**Gambar A.3 - Uji coba pada sisi kapal**



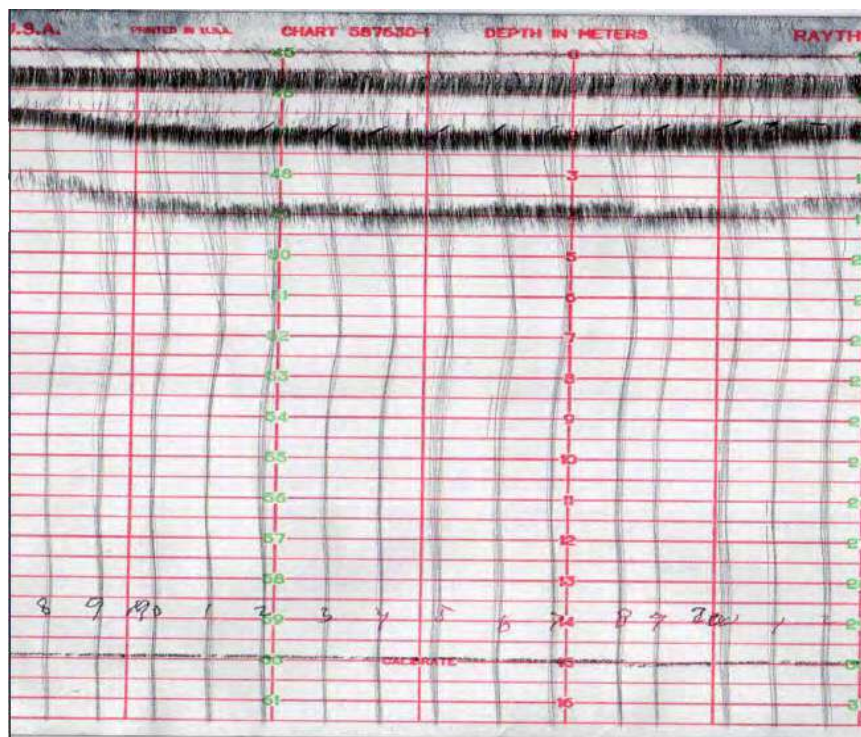
Gambar A.4 - Lokasi pemasangan Transduser



Gambar A.5 - Pemasangan Transduser tidak tetap



Gambar A.6 - Kemiringan maksimum pemasangan *tranducer*



Gambar A.7 - Contoh hasil rekaman pantulan ganda pada kondisi laut dangkal





## **Bibliografi**

SK SNI M-38-1993-03, Metode pengukuran batimetri menggunakan alat perum gema.

## Informasi pendukung terkait perumus standar

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#### CATATAN:

Susunan keanggotaan Sub Komtek 91-01-S1 diatas adalah pada saat Standar ini ditetapkan. Anggota Komtek yang juga turut menyusun sebelum perubahan keanggotaan, adalah:

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