

BPPT, PJT II

Summary Report

Republic of Indonesia

Verification Survey with the Private Sector  
for Disseminating Japanese Technologies

for

Efficient Management of the Multi-purpose  
Dam and Data Collection

for the Climate Change

with Real-Time Telemetry System (SESAME  
SYSTEM)

September 2017

Japan International Cooperation Agency

Midori Engineering Laboratory Co. Ltd.

## 1. BACKGROUND

In Indonesia, climate change triggers serious natural disasters. Because of changes in rainfall patterns, the southern region of the country, including Java, has been suffering from droughts in dry seasons and massive floods in rainy seasons. Precipitation in rainy seasons has recently increased by 10%, while that in dry seasons has decreased by 75%. It is predicted that the rice yield will decrease drastically, resulting in a 9% to 25% reduction in farmers' income<sup>39</sup>. Climate change has brought serious damage to both the social and natural environments.

At the G20 Pittsburg Summit in 2009, the Government of Indonesia declared climate change as one of its prioritized development issues. Various public organizations are assuming responsibility for (i) adaptation measures and/or (ii) mitigation measures against climate change.

To take practical and effective measures against climate change, collection, monitoring, and analysis of field data is crucial; however, it is still a challenge for Indonesia to obtain reliable data from the field because technical and economic resources are limited. Therefore, there is strong demand for economical yet effective equipment. To offer a solution to this demand, the SESAME System<sup>40</sup> was developed by Midori Engineering Laboratory Co. Ltd. (MEL). The SESAME System is a telemetry system that can collect field data in real time even in remote and/or uninhabited areas. Equipped with water and rain gauge sensors, the System can also incorporate a variety of other sensors to meet customer requirements, such as a weather robot sensor or a water quality sensor. The SESAME System automatically transmits field data to a server over existing mobile data networks at low cost; this data is then processed and output to users on the Web. Moreover, The SESAME System is economical and easy to maintain because it is assembled with ready-made parts and sensors.

In 2013 MEL conducted a feasibility study funded by the Ministry of Foreign Affairs of Japan. Through the study, MEL introduced the SESAME System and received several proposals from public organizations in Indonesia for them to take effective measures against climate change. Based on these proposals, the Verification Survey with the Private Sector for Disseminating Japanese Technologies for Efficient Management of the Multi-purpose Dam and Data Collection for Climate Change with Real-Time Telemetry System ("the Survey") was formulated and implemented with JICA's finance. The counterpart organizations of the Survey in Indonesia are Jasa Tirta II Public Corporation (PJT II) and the Agency for the Assessment and Application of Technology<sup>41</sup> (BPPT). PJT II is responsible for management of the Citarum River Basin, including the Jatiluhur (JH) Dam, and BPPT is tasked with evaluating and recommending effective technologies for climate-change measures to public and private organizations of the country.

### Background of PJT II and Jatiluhur Dam

The JH Dam is a multi-purpose dam located on the Citarum River with a capacity of 3 billion cubic meters, largest volume of any dam in Indonesia. Regarding measures to adapt to climate change, challenges faced by PJT II are as follows:

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<sup>39</sup> Climate Change in Indonesia, Implications for Humans and Nature (WWF, 2007)

<sup>40</sup> "Sensory Data Transmission Service Assisted by Midori Engineering" System

<sup>41</sup> Badan Pengkajian dan Penerapan Teknologi in Indonesian

- 1) Data such as water level of the dam, precipitation, etc. is measured and recorded by hand, so the process for data collection and analysis is time-consuming and prone to errors.
  - 2) Due to absence of data in real time, the amount of water released from the dam is not optimized for respective purposes such as irrigation, flood control, power generation, etc.
  - 3) Immediate and prompt action is hindered when emergency situations such as floods occur.
- To solve these issues, PJT II has requested the introduction of the SESAME System.

#### Background of BPPT and its Role

Through the SATREPS<sup>42</sup> project on “Wild Fire and Carbon Management in Peat Forests in Indonesia”, BPPT recognized the effectiveness of the SESAME System as a technology for collecting the field data required to analyze the impacts of climate change. BPPT has been further keen on evaluating the SESAME System on its versatile applicability and effectiveness for climate-change measures, particularly peat-fire prevention. With the verified results through the study described below (“the Study”), BPPT intended to promote the collection of real-time field data to various related organizations for formulating effective adaptation and mitigation measures against the problems caused by climate changes in Indonesia.

## 2. OUTLINE OF THE PILOT SURVEY FOR DISSEMINATING SME’S TECHNOLOGIES

### (1) Purpose

The Survey has the two objectives:

- 1) With an aim to support the efficient management of the multi-purpose dam and effective disaster management, introduce the SESAME System to automatically measure the field data in the Citarum River Basin.
- 2) With an aim to encourage the monitoring activities of the climate change, verify the versatile effectiveness of the SESAME System collecting various field data related to the climate change and disseminate the results of the Survey to the relevant organizations.

### (2) Activities

#### 1. Activities associated with Output 1 (for PJT II only):

1-1 Preparatory discussions to finalize the work plan

1-2 Determination of the location to install the Product and discussion of the operation and maintenance structure of the Product

1-3 Production of the Product in Japan, shipment of the Product and custom clearance

1-4 Grasp the situation of the current management of the water infrastructure associated with the dam

1-5 Installation of the Product

1-6 Operation and maintenance of the Product

1-7 Training of data processing and analysis

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<sup>42</sup> Science and Technology Research Partnership for Sustainable Development collaborated by Japan Science and Technology Agency (JST) and JICA

- 1-8 Monitoring of the management of the water infrastructure associated with the dam
- 1-9 Proposal of model concept for the management of the water infrastructure associated with the dam
- 1-10 Evaluation

2. Activities associated with Output 2 (for BPPT only):

- 2-1 Preparatory discussions to finalize the work plan

The verification activities related to mitigation measure of climate change are to be done in the 4 peatlands listed in Table 1.

Table 1: Verification activities related to Mitigation measure

Area	Partner Research Institute
Riau Province	University of Riau
Central Kalimantan Province	University of Palangkaray
Jambi Province	University of Jambi
West Kalimantan Province	University of Tanjungpura

The verification activities related to adaptation measure are to be done in the 3 locations listed in Table 2.

Table 2 Verification activities related to Adaptation measure

Site location	Area	Partner Research Institute	Objective
Katulampa Dam	Jakarta suburb	Jakarta Agency for Disaster Management	Effectiveness for a flood warning system
Jakarta City	Jakarta	Weather Modification Technical Unit of BPPT	Effectiveness for climate data measurement and climate change analysis
Paddy field near the university	Jogjakarta in Central Java Province	University of Gadjah Mada	Possibility for construction of irrigation water management system

- 2-2 Determination of the location to install the Product and discussion of the operation and maintenance structure of the Product
- 2-3 Production of the Product in Japan, shipment of the Product and custom clearance
- 2-4 Installation of the Product
- 2-5 Operation and maintenance of the Product
- 2-6 Training of data processing and analysis
- 2-7 Promotion activities to utilize the SESAME System as measures against the climate change
- 2-8 Evaluation

3. Activities associated with Output 3 (only for BPPT):

- 3-1 Preparatory discussions to finalize the work plan
- 3-2 Purchase and set up in Japan of the data server to be installed in Indonesia

- 3-3 Establishment of the operation and maintenance structure for the server in Indonesia
- 3-4 Installation of the server in Indonesia and switching from the server in Japan
- 3-5 Verification of the operation of the server
- 3-6 Promotion of common use of the field data required for the analysis of the climate change among the relevant government organizations
- 3-7 Announcement of the verification results of the local server's operation
- 3-8 Discussion of the common use and management of the server
- 3-9 Discussion of a consortium formation and an action plan to promote the common use of the data and server among the relevant government organizations
- 3-10 Evaluation

4. Activities associated with Output 4:

- 4-1 Local trainings on the Product for installation, operation and maintenance
- 4-2 On-the-job training (OJT) at the installation of the Product
- 4-3 Execution of the activities conducted in Japan
- 4-4 Technical trainings for operation and maintenance of the data server (for BPPT only)
- 4-5 Evaluation


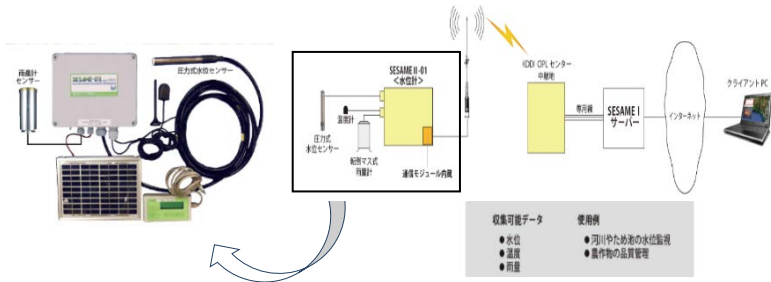
5. Activities associated with Output 5:

- 5-1 Promotion of the common use of the data server for the climate change in Indonesia and the discussion of a consortium formation
- 5-2 Promotion of the use of SESAME System in Indonesia
- 5-3 Presentation of the results of the Survey in the workshops and other available opportunities
- 5-4 Development of dissemination/business development plan on SESAME system

(3) Products and Technologies to be Provided

Table 3: List of major products to be provided

Item	Specification	Imported or locally procured
SESAME II-02	SESAME System main unit connected with water and rain gauges (standard type)	Imported
SESAME II-05	SESAME System main unit specialized with a weather robot sensor	Imported
SESAME II-06	SESAME System main unit specialized with a water quality sensor	Imported

Features:	The SESAME System can easily transmit the measured data by use of low-cost local mobile data networks available all over the world. Through the internet, the data is accumulated automatically and in real time on servers, from which it can be easily processed and monitored in the required form.
impact	<p>The SESAME System collects the field data (e.g., water level, rainfall, weather data) with sensors installed in the field, transmits it through a mobile data network automatically and in real time on servers, from which the accumulated data is processed in the required form, and reports the result to clients swiftly through the internet. It can run on a solar battery for more than one year without maintenance. The system consists of the sensors, the data logger, the mobile data transmission modem, the solar battery, the data server and the utility software.</p>  <p style="text-align: right;">SESAME System in a paddy field</p>  <p style="text-align: center;">Data logger containing the data transmission modem (SESAME 01) with a water level sensor and a rainfall gauge</p>
Sales record:	<ul style="list-style-type: none"> <li>• In Japan: 250 units</li> <li>• Overseas: 110 units</li> </ul>
Advantages over competing products:	The SESAME System offers many advantages, such as extremely low power consumption, high resistance to severe climate, remarkably low price, easy maintenance and low data transmission cost.

#### (4) Counterpart Organization

**PJT II:** It conducts verification of the SESAME System aiming at the effective management of the multi-purpose JH dam.

**BPPT:** It conducts verification with partner research institutions on versatile applicability the SESAME System on both mitigation and adaptation measures against climate changes.

With the results of the verification, both BPPT and PJT II promote the use of a telemetry system including the SESAME System to the related organizations to climate change measures.

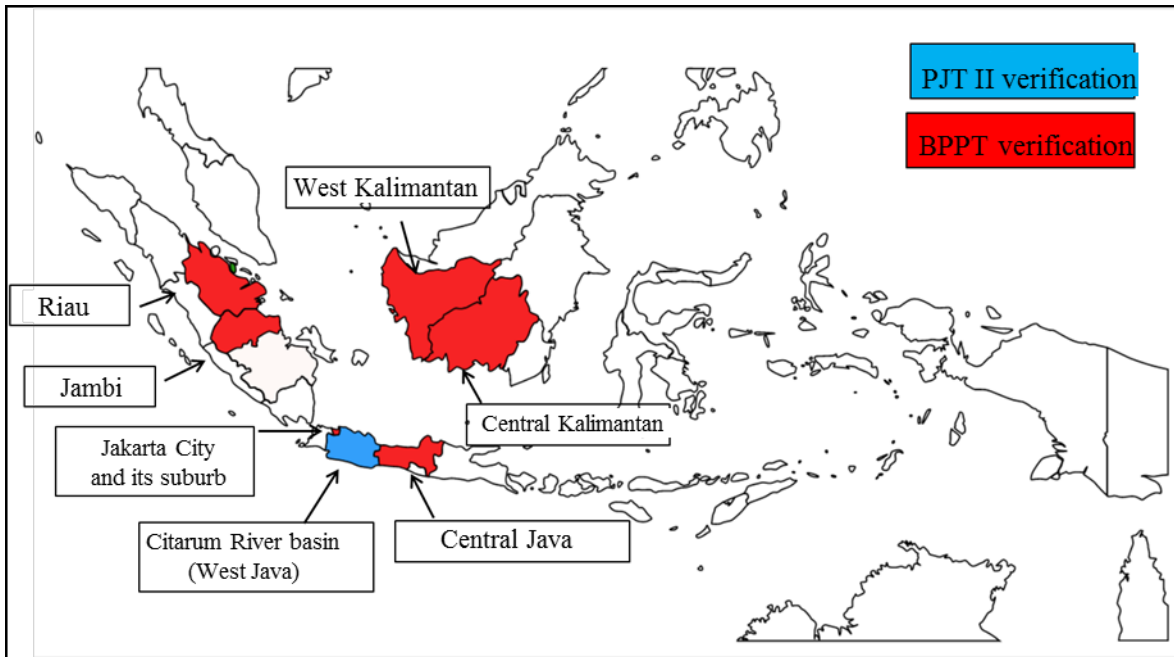
#### (5) Target Area and Beneficiaries

Target Area:

[PJT II] GHG in West Java Province

[BPPT] Central Kalimantan Province, Riau Province, West Kalimantan Province, Jambi Province, Jakarta City and its suburbs, Central Java Province

Target Area map



Source: <http://www.freemap.jp/>

Beneficiaries:

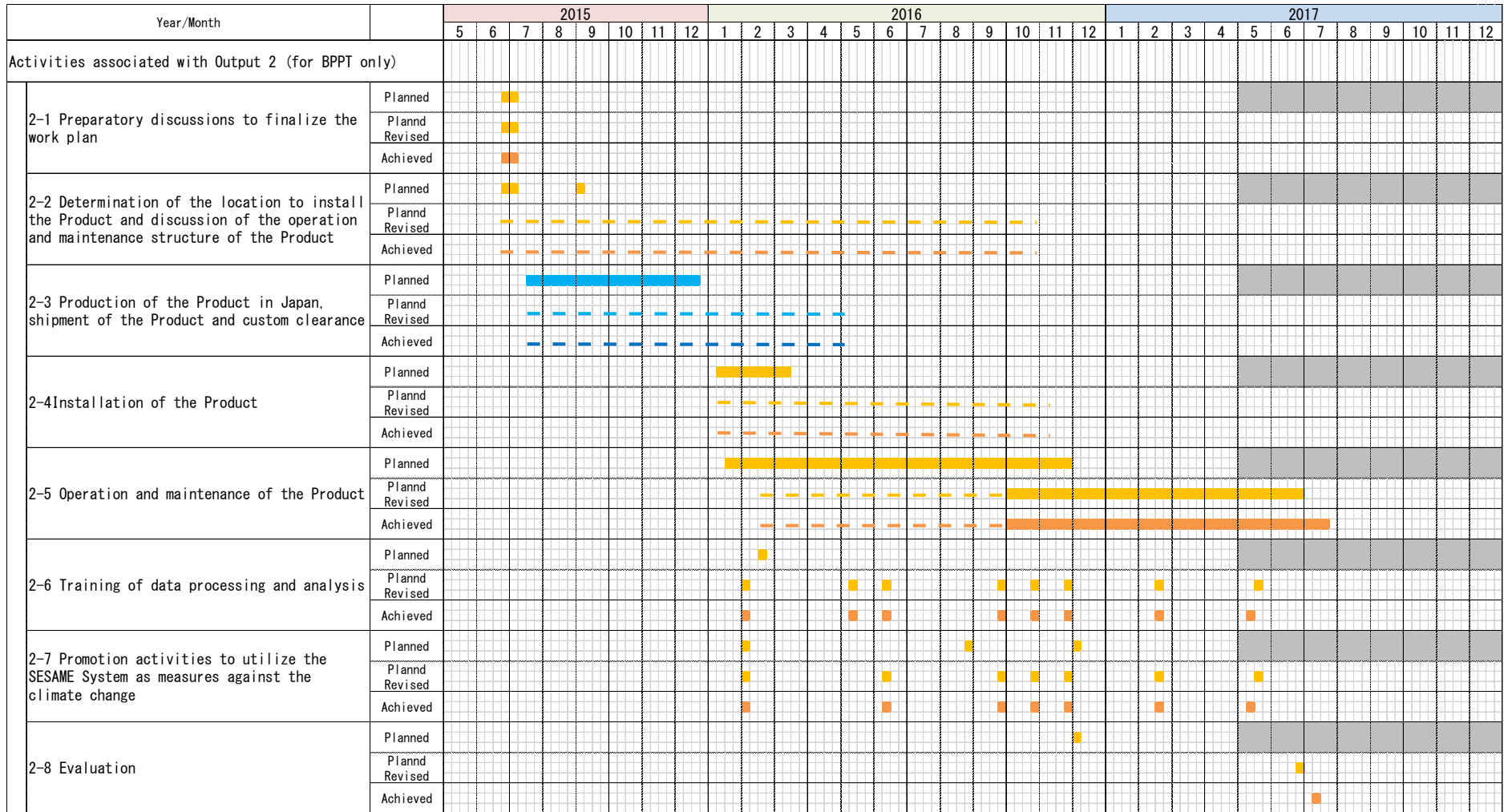
- PJT II and BPPT
- Relevant organizations in charge of climate change measures
- Jakarta City residents (about 10 million populations), residents at Citarum River basin
- Residents and farmers exposed to the climate change risks, such as floods and droughts

(6) Duration

From June 26, 2015 to November 30, 2017









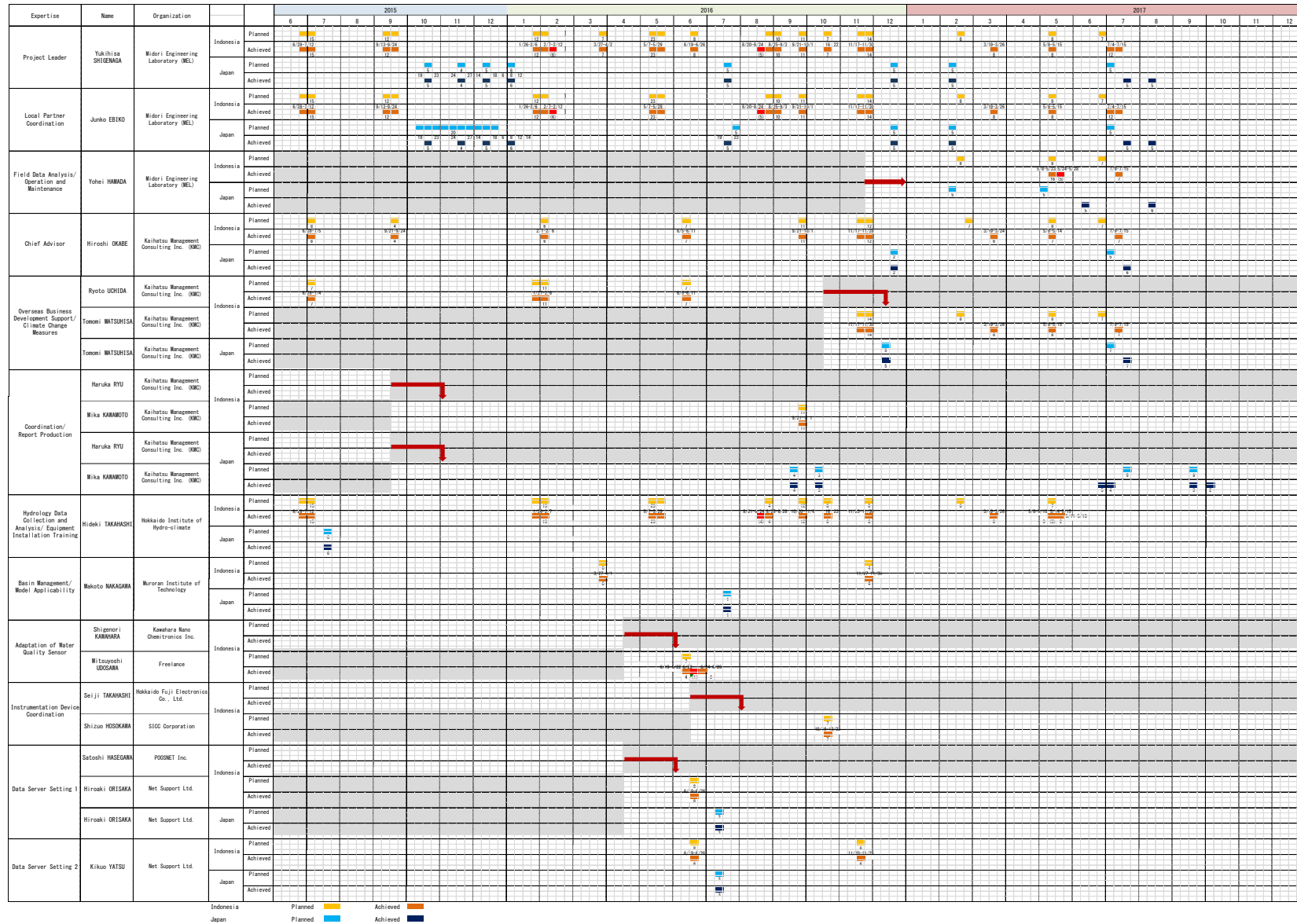
Year/Month		2015												2016												2017											
		5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12				
<b>Activities associated with Output 4</b>																																					
4-1 Local trainings on the Product for installation, operation and maintenance	Planned													■																							
	Planned Revised													■																							
	Achieved													■																							
4-2 On-the-job training (OJT) at the installation of the Product	Planned													■																							
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4-3 Execution of the activities conducted in Japan	Planned																									■											
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	Achieved																									■											
4-4 Technical trainings for operation and maintenance of the data server (for BPPT only)	Planned													■																							
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	Achieved													■																							
4-5 Evaluation	Planned																									■											
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5-3 Presentation of the results of the Survey in the workshops and other available opportunities	Planned																									■											
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	Achieved																									■											
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	Planned Revised	■												■												■											
	Achieved	■												■												■											

Indonesia  
Japan

Planned ■  
Achieved ■

Planned ■  
Achieved ■

(8) Manning Schedule



## (9) Implementation System

### a. Implementing Organizations

Japanese side: MEL

Indonesian side: PJT II and BPPT

### b. Support Structure for the Implementing Companies

A diagram of the organization for implementing the Survey is shown in the figure below. The consulting company, Kaihatsu Management Consulting, Inc. (KMC), supports MEL with overseas business development, project planning and management with PJT II and BPPT, etc. Six technology experts are involved to take the following responsibilities.

- NPO Hokkaido Institute of Hydro-climate: Guidance in collection and analysis of hydrological data and selection of locations for installing the SESAME System
- Muroran Institute of Technology Graduate School: Survey on river management and suggestion of a model concept to build for multi-purpose dam management
- Kawahara Nano Chemitronics: Survey on water quality sensors and their local adaptation
- Hokkaido Fuji Electric Co., Ltd.: Survey and recommendations on information that can be transmitted by the SESAME System
- POOSNET: Construction of the database structure on data servers in Indonesia and training of server administrators
- Net Support Co., Ltd.: Installation of data server in Indonesia and training of server operators

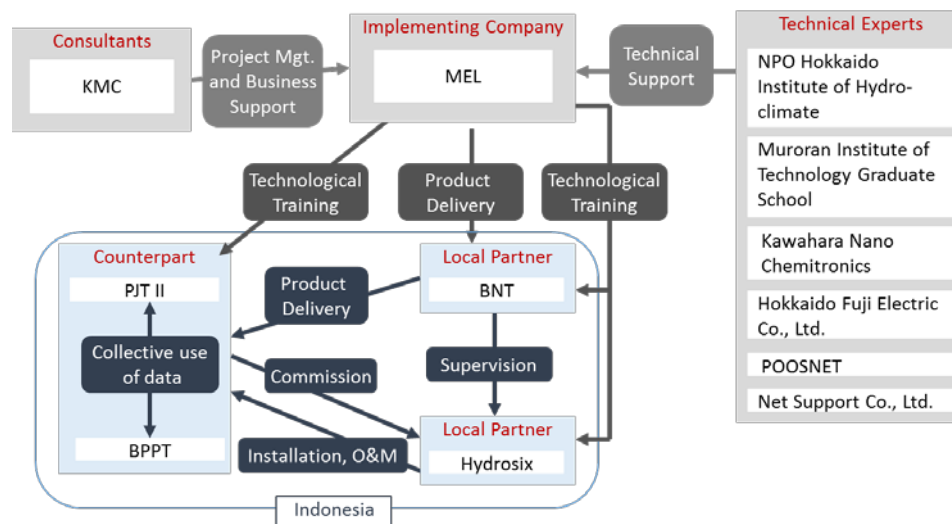


Figure 1: Diagram of implementing organization

### c. Local Support Structures

The structure for installing the SESAME System is shown in the figure above. The installation of the System is commissioned to Hydrosix, which has expertise and long experience in the installation of field instruments for telemetry systems. BNT administers custom clearance, installation and maintenance of the SESAME System. BNT also works as a local contact point with the counterparts and is in charge of providing general

support to customers for maintenance and repair of the System. General support does not include site visits because the System can mostly be repaired by sending back units or the parts of the System to BNT. In cases where site visits are required, Hydrosix shall be subcontracted for it.

### 3. Achievements of the Survey

#### (1) Outputs and Outcomes of the Survey

The expected outputs and outcomes of the Project are as follows:

#### **Expected Output 1**

PJT II is able to collect the real-time data and utilize such collected data for the efficient management of a multi-purpose dam.

In the long run, PJT II (i) discharges water from JH Dam more accurately in accordance with the demand, and (ii) establish a foundation of collecting accurate field data on rivers and other water resources, which enables PJT II to take quick actions against disasters, such as floods.

#### **Outcomes Associated with Output 1 (PJT II)**

##### a. Installation of the SESAME System and Data Collection

In total 50 SESAME units were installed in the Citarum River Basin. As of September 2017, the SESAME System is functioning well. PJT II was used to have field staff measure water levels only twice a day by visually reading a gauge. Field data from the SESAME System is transferred at 10 minute interval 24 hours a day to a server. After installation of the systems, PJT II was able to assess field data reliably at any time.



Figure 2: Field data from the Citarum River Basin as shown in the SESAME web application

b. Improvement in Accuracy of Data Collection

With the traditional method of measuring precipitation and water levels by field staff, data is sent to the servers by SMS. Under this arrangement, frequency of measurement and data transfer were insufficient, and human-error happened frequently in reading and data input.

With the SESAME System, PJT II can now obtain more accurate data. Consequently, it was revealed that measured results differed greatly between the traditional method and the SESAME system. This means that SESAME systems will contribute to the improvement of PJT II's water-management capability by providing more accurate data on precipitation and river levels.

c. Efficient Use of Saved Water

The Government has asked PJT II to increase the supply of domestic water to Jakarta, obliging PJT II to divert some water away from irrigation use and release more water to Jakarta. MEL installed the SESAME System with water gauges and water-quality meters at the Bekasi weir in response to a request by PJT II. PJT II is now able to grasp water quantity and quality more accurately.

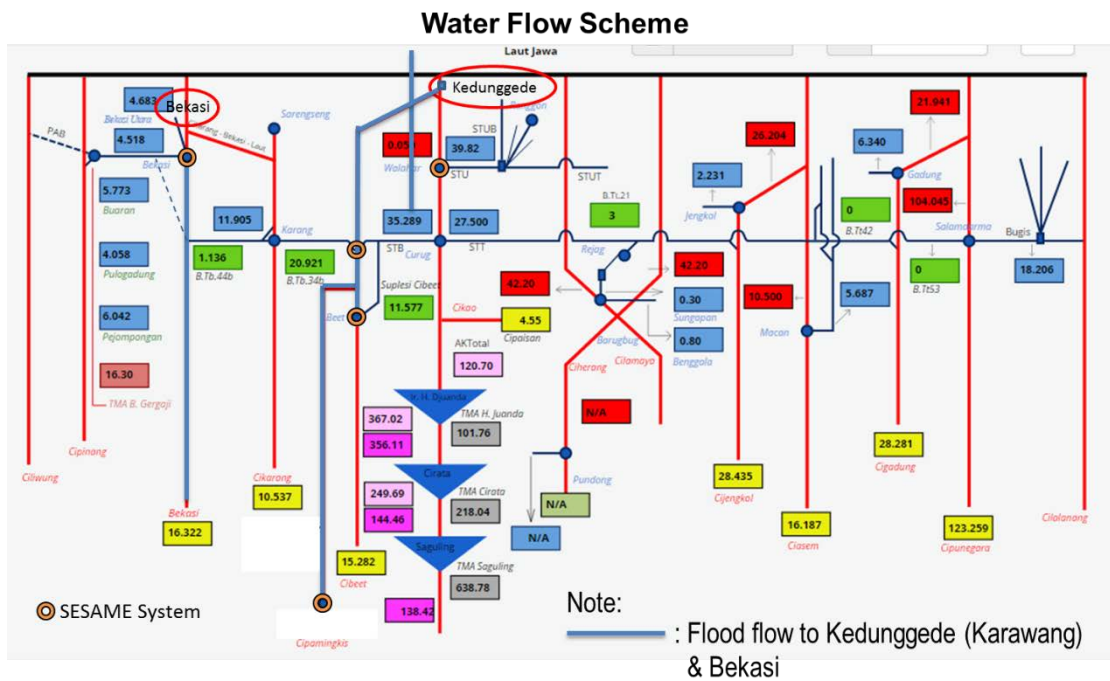


Figure 3: Water Flow in Citarum River Basin Managed by PJT II

d. Flood Control

PJT II has been trying to develop an early warning system for floods. The SESAME System will contribute to accelerating the development of such a system by providing the accurate data necessary for forecasting rainfall and surface water flow.

### **Expected Output 2**

BPPT is able to verify the SESAME System's applicability and effectiveness in obtaining data required for the analysis of climate change. As a result, BPPT continuously encourages and disseminates the use of SESAME System as an effective technology to collect field data for the measures against the climate change in Indonesia.

### **Outcomes Associated with Output 2 (BPPT)**

#### **a. Installation of the SESAME System and Collection of Data**

A total of seven SESAME System data-collection units were installed in accordance with recommendations by BPPT, at the locations listed below.

- BPPT Serpong
- University of Riau
- University of Palangkaraya
- University of Jambi
- University of Tanjungpura
- University of Gadjah Mada
- Katulampa Dam

As of September 2017, all SESAME System data-collection units function well except for one installed at Katulampa dam. Originally, BPPT asked MEL to install one data-collection unit at Kutulampa dam, to develop a flood warning system to be managed by the Jakarta Agency for Disaster Management. However, the agency is neither involved in nor interested in the SESAME System, so nobody is maintaining the System. If this situation continues, BPPT will transfer the SESAME System from Katulampa to any suitable place where proper operation and maintenance can be secured.

#### **b. Utilization of the SESAME System by Universities**

As mentioned above, five SESAME System data-collection units were installed at universities (Riau, Central Kalimantan, Western Kalimantan, Jambi, Central Java). Each university now has a plan to apply SESAME data to research on reducing CO<sub>2</sub> emissions from peatlands. A sample of their research topics is as follows:

- Analysis of correlations among groundwater levels, peatland fires and CO<sub>2</sub> emissions
- Development of a warning system for peatland fires based on groundwater-level analysis
- Fish farming in peatlands
- Forecasts of crop-disease epidemics based on groundwater levels and metrological data
- Canal blocking



c. Other applications toward Reducing CO<sub>2</sub> Emissions

BRG has prioritized seven provinces for peatland restoration and plans to implement joint research with 11 universities in those seven provinces, including universities in Riau, Central Kalimantan and Jambi. Recognizing the SESAME System's effectiveness, BRG has asked JICA to install more SESAME System data-collection units in those seven provinces. In another project, JICA has provided financing to BRG for installation of 14 SESAME System data-collection units.

**Expected Output 3**

BPPT is able to operate the data server installed by the BPPT-SESAME Project. The relevant government organizations start discussion how various data required for the analysis of climate change is shared among them, and as a result, an action plan to share the data is formulated by them.

**Outcomes Associated with Output 3 (BPPT)**

a. SESAME Server Installation

A data server for the SESAME system was installed at BPPT. As of September 2017, it works well.

b. Public Data Release

BPPT plans to release the data collected by 57 SESAME data-collection points on BPPT's website. A section and a few staff have been assigned in charge of the SESAME System.

c. Sharing and Mutual Use of SESAME Data

SESAME data from BPPT, five universities, PJT II and BRG has been integrated through the BPPT-SESAME server and will be shared among these organizations soon. Through this framework, the partners believe that a foundation has been built towards a national consortium in which the collected data can be shared and used collaboratively in the future.

**Expected Output 4**

PJT II and BPPT (in collaboration with research organizations) are able to operate and maintain the SESAME System.

**Outcomes Associated with Output 4 (BPPT and PJT II)**

a. Technical Training for Operation and Maintenance

In order to transfer the knowledge and technologies for the maintenance of the SESAME System, technical training was given to BPPT, PJT II and other related organizations, including universities and Hydrosix. This training consisted of installation training (February 2016), technical training in Japan (July 2016) and OJT training on installation and maintenance (several times during 2016).

MEL also gave instructions and advice to BPPT staff for SESAME server management when the company visited BPPT. As a result, the staff have acquired skills in utilizing SESAME data and maintaining servers.

The Survey Team expects that BPPT and PJT II will continuously provide effective management and maintenance of the SESAME System and utilize it to mitigate damage from peatland fires and other natural disasters.

b. Establishment of the Operation and Maintenance Structure

BPPT has assigned a monitoring team (four staff members) and an information-system team (three staff members) for SESAME system's operation and maintenance. In 2017 a budget of 2.5 billion IDR was approved for all of BPPT's activities. The budget necessary for the system's operation and maintenance will be allocated from this total amount.

The staff and budget mentioned above will be used to maintain the SESAME System installed at BPPT Serpong . For the System installed at the five universities, each university has already assigned staff and plans to allocate a maintenance budget. Obtaining the necessary budget is difficult, however, so BPPT suggested that the universities obtain financial support from BRG by sharing field data obtained from the SESAME System with BRG. BPPT is negotiating with BRG on the issue and reports that the negotiation is making good progress. As for the System installed at Katulampa, it may be transferred to another location where proper operation and maintenance can be secured as mentioned above.

PJT II has secured human and financial resources for all 50 units installed in four regions. The annual budget for SESAME operation and maintenance of 2017 has been approved, with the amounts for the 1<sup>st</sup> and 2<sup>nd</sup> quarters as shown in the table below.

Table 4 : PJT II budget for SESAME operation and maintenance in 2017

		Region 1	Region 2	Region 3	Region 4	Headquarters
1 <sup>st</sup> quarter		115,000,000	75,000,000	150,000,000	156,000,000	800,000,000
2 <sup>nd</sup> quarter		115,000,000	75,000,000	100,000,000	100,000,000	800,000,000
Total	IDR	230,000,000	150,000,000	250,000,000	256,000,000	160,000,000
	JPY	1,941,200	1,266,000	2,110,000	2,160,640	1,350,400

1JPY=0.00844 (JICA exchange rate : July 2017)

At the headquarters four employees (a manager plus staff for data collection, data management and system maintenance) were assigned for SESAME operation and maintenance. In each region 40 persons were assigned, including local staff members on hand to observe where the SESAME equipment is installed.

**Expected Output 5**

MEL, PJT II and BPPT develop the strategy and plan to disseminate the SESAME System in Indonesia.

**Outcomes Associated with Output 5 (BPPT and PJT II)****a. Workshops to share the progress of the SESAME verification survey**

Five workshops were held during the survey period on the usefulness of the SESAME data, plans to develop and improve the SESAME System, and the importance of the maintenance framework.

As a result of these workshops, a number of institutions and private companies confronting climate change issues became interested in the SESAME System. At BRG's request, 14 SESAME data collection units were installed through a JICA project. PJT II developed brochures to introduce its activities with the SESAME System.

**b. Introduction of SESAME at an International Symposium**

The SESAME system was introduced as an efficient telemetry system for peatland restoration at the BRG International Symposium Towards Integrated, Organized and Massive Peatland Restoration Action in Indonesia, held in Jakarta on 15 - 16 December 2016.

BRG also presented its plan to utilize SESAME systems for peatland restoration at its 2017 annual convention in Aberdeen, Scotland on May 28–31, 2017.

**c. Application of the SESAME System in a Research Project between BRG and JAXA**

With financing from JICA, in 2017 BRG and the Japan Aerospace Exploration Agency (JAXA) will implement a joint research project on the development of an information system for peatland monitoring by integrating groundwater-level data with satellite data. For this project, BRG has requested JICA to install more SESAME data collection units in Indonesia.

**d. Water-level Monitoring in Peatland by Private Companies**

The Government of Indonesia enforced a regulation in February 2017 that private companies with business activities in peatlands, such as palm oil plantations, must monitor groundwater level. Each company is responsible for selecting the equipment to measure the level. According to BRG, the Indonesian Government will recommend SESAME System to private companies as one of the most reliable systems for water level monitoring. This development offers MEL an opportunity to showcase the SESAME System.

**(2) Self-reliant and Continual Activities to be Conducted by Counterpart Organizations**

After completion of the Survey, BPPT and PJT II will continue the following activities in a sustainable manner for the effective and efficient use of the SESAME System.

a. BPPT

BPPT will use the seven SESAME System data collection units and 1 server for the following purposes.

**Demonstration:** The SESAME System units installed at BPPT Serpong will be used to demonstrate the System to parties interested in telemetry systems.

**Research and technical development:** The SESAME System data collection units installed at the five universities will be used to provide field data for research related to climate-change mitigation measures and new technologies for effective peatland use.

**Verification:** The reliability and stability of the SESAME System data collection units installed at Katulampa will show the reliability of SESAME data and the durability of the equipment under harsh environmental conditions. These units will be also utilized for analysis of actual situations in the field and to develop applications for public safety.

**Public data:** BPPT plans to release data to the public on its website. The data will be obtained from various measuring equipment, including the SESAME System. BPPT also plans to develop a warning system against peatland fires and other disasters.

b. PJT II

PJT II has been developing a database for holistic water management in the Citarum River Basin and a flood forecast model, by integrating the data obtained using the SESAME System with data from the traditional measuring method. As PJT II has been taking strong initiatives in these activities, the Study Team expects that the SESAME System will be self-reliantly utilized.

4. Future Prospects

(1) Impact and Effect on the Concerned Development Issues through Business Development of the Product/ Technology in the Surveyed Country

BRG announced that an additional 260 telemetry systems need to be installed to meet its institutional target for the year 2017, namely the monitoring 400,000 ha of peatland with a view to restoration.

According to the new regulation enforced by the Government in 2016, private companies, in particular palm oil companies, must install water gauges to monitor and report groundwater levels.

PJT II requires further 300 SESAME System data collection units to monitor and control 250,000 ha in the Citarum River Basin.

The following impact is expected through business development of the SESAME System.

- In a vast extent of peatland, real-time and reliable field data from SESAME System data collection units will contribute to the enforcement of urgent action for extinguishing fires and regulating business activities on peatland. The risk of peatland fires will be mitigated, resulting in reduction of GHG emissions. The Study Team expects a variety of databases compiled from field data will be developed and released.
- Thanks to the public data system to be developed by BPPT, residents in the region will be able to access real-time information and make their own decisions when emergencies take place.

- A flood forecast model and a holistic water management system to be developed by PJT II in the near future will contribute to mitigation of damage from natural disasters. In addition, PJT II will be able to economize irrigation water supply to the area and distribute more water to Jakarta.

## (2) Lessons Learned and Recommendations through the Survey

### a. Tax-exemption Procedures

The application for tax exemption was approved when SESAME System units were imported from Japan. However, it took unpredictably long time to complete the necessary procedures, as the Minutes of Meeting of the Survey had to be rewritten to transfer ownership of the 50 SESAME System data collection units from PJT II to BPPT. Consequently, installation of the systems was seriously delayed and the period for verification activities was shortened, even though the project period was extended by six months.

The Study Team recommends that the counterpart agencies in Indonesia make clear the requirements for tax exemption in advance when they implement a survey/project with JICA so that they can implement activities as scheduled.

### b. Training Opportunities for Field Staff

Throughout the Survey, MEL provided training to the staff working on climate change issues. The capability of the staff who participated in training was developed for proper operation and maintenance of the SESAME System. On the other hand, training opportunities were limited to the people at higher levels only, even though it is important also to develop the capacity of the field staff.

The Study Team recommends that the counterpart agencies in Indonesia seek training opportunities for field staff, so that the SESAME System will be utilized properly in the field.

### c. Fair Comparison among Different Telemetry Systems

Several telemetry systems are in use in Indonesia, including Morpalaga, which was developed with technical support from BPPT. It has been said that Morpalaga is more economical than the SESAME System. It is natural for a national product to be promoted for the country, and it is good if that product is of high quality.

According to an investigation by MEL, however, Morpalaga is not yet ready for use. Moreover, there is little difference in sale prices between Morpalaga and SESAME if the sensors attached to Morpalaga are of the same quality as those for the SESAME System.

MEL has asked BPPT to furnish the specifications of Morpalaga and compare them with the SESAME System, but as of this writing BPPT has not done so. Morpalaga and SESAME need to be compared under fair conditions in order to clarify the advantages and disadvantages of each system.

ATTACHMENT: OUTLINE OF THE SURVEY

**Indonesia**

**Verification Survey with the Private Sector for Disseminating Japanese Technologies for Efficient Management of the Multi-purpose Dam and Data Collection for the Climate Change with Real-Time Telemetry System (SESAME SYSTEM)**

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