



**NATIONAL WATER RESOURCES BOARD  
THE REPUBLIC OF THE PHILIPPINES**

**THE STUDY  
ON  
INTEGRATED WATER RESOURCES MANAGEMENT  
FOR  
POVERTY ALLEVIATION AND ECONOMIC DEVELOPMENT  
IN  
THE PAMPANGA RIVER BASIN  
IN  
THE REPUBLIC OF THE PHILIPPINES**

**FINAL REPORT  
VOLUME IV: SUPPORTING REPORTS**

**JANUARY 2011**



**JAPAN INTERNATIONAL COOPERATION AGENCY**



**CTI ENGINEERING INTERNATIONAL CO., LTD.**

**in association with**



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## Composition of Final Report

**Volume I: Summary**

**Volume II: Main Report**

**Volume III: Supporting Reports**

Sector A: Topography and Meteo-Hydrology

Sector B: Socio-Economy

Sector C: Agricultural and Fishery Water Management

Sector D: Municipal Water Supply, Sanitation and Sewerage System  
Management

Sector E: Flood and Sediment Disaster Management

Sector F: Water-related Environmental Management

Sector G: Watershed Management

Sector H: Water Resources Development and Management

**Volume IV: Supporting Reports**

Sector I: Socio-Environmental Consideration

Sector J: Guideline for Formulation of IWRM Plan

Sector K: Formulation of IWRM Plan

Sector L: Plans for Legal and Institutional Framework

Sector M: Water-related Data Management

Appendix: Minutes and Discussion Records on SC, TWG and Stakeholder  
Meetings

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(as of 31st December 2009)

***Sector I***

***Environmental and Social Considerations on***

***Programs and Projects of IWRM Plan***



# Sector I. Environmental and Social Considerations on Programs and Projects of IWRM Plan

## Table of Contents

	<u>Pages</u>
<b>I.1 Introduction .....</b>	<b>I-1</b>
<b>I.2 Existing Legislation and Legal Systems governing Environmental and Social Consideration in Philippines .....</b>	<b>I-2</b>
I.2.1 Current Overall Legal Framework.....	I-2
I.2.1.1 Environmental Impact Statement System, Presidential Decree No. 1586 (1978) .....	I-2
I.2.1.2 Presidential Proclamation No. 2146 (1981) and No. 803(1996) .....	I-2
I.2.1.3 DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007) .....	I-2
I.2.1.4 Recent Issued Memorandum Circulars (MCs) Relevant to PEISS.....	I-2
I.2.2 Procedures of Environmental Impact Assessment (EIA).....	I-2
I.2.2.1 Projects Covered by PEISS .....	I-3
I.2.2.2 Responsible Government Institutions for PEISS.....	I-5
I.2.2.3 Required Documents by PEISS.....	I-5
I.2.2.4 Outlines of Required Documents by PEISS .....	I-7
I.2.2.5 Public Participation in EIA Process.....	I-15
I.2.3 Laws, Regulations and Guidelines Concerning Land Acquisition and Involuntary Resettlement .....	I-16
I.2.3.1 Guidelines for the Acquisition of Certain Parcels of Private Land Intended for Public Use Including the Right-of-Way Easement of Several Public Infrastructure Projects, Administrative Order No. 50 (1999) .....	I-16
I.2.3.2 An Act to Facilitate the Acquisition of Right-of-Way, Site or Location for National Government Infrastructure Projects and for other Purposes, Republic Act 8974 (2000).....	I-16
I.2.3.3 The Agricultural Land Reform Code, Republic Act 6389 (1971) .....	I-16
I.2.3.4 Executive Order 1035 (1985) .....	I-16
I.2.3.5 Presidential Decree No. 1533 (1978) .....	I-16
I.2.3.6 Urban Development and Housing Act, Republic Act 7279 (1992) .....	I-16
I.2.3.7 Instituting the National Drive to Suppress and eradicate Professional Squatters and Squatting Syndicates, Executive Order No.153 (1999) .....	I-17
I.2.3.8 Executive order No.228 (1987) .....	I-17
I.2.3.9 Relevant Guidelines.....	I-17
I.2.4 Laws and Regulations Concerning the Environmental Standards and Social Aspects.....	I-17
I.2.4.1 Environment Code, Presidential Decree No. 1152 .....	I-17
I.2.4.2 Water Code, Presidential Decree No. 1067 .....	I-17
I.2.4.3 Clean Water Act, Republic Act 9275 .....	I-17
I.2.4.4 Clean Air Act of 1999, Republic Act No. 8749 .....	I-17
I.2.4.5 Ecological Solid Waste Management Act, Republic Act No. 9003 (2000) .....	I-18

I.2.4.6	Pollution Control Law, Presidential Decree No. 984 .....	I-18
I.2.4.7	Forestry Reform Code, Presidential Decree No. 705 .....	I-18
I.2.4.8	National Integrated Protected Areas System (NIPAS), Republic Act No. 7586 .....	I-18
I.2.4.9	Indigenous Peoples Rights Act, Republic Act No. 8731 .....	I-18
<b>I.3</b>	<b>Preliminary Evaluation of Potential Environmental and Social Impacts .....</b>	<b>I-19</b>
I.3.1	Outline of the Programs and Projects in IWRM Plan .....	I-19
I.3.2	Identification of the Projects covered by PEISS .....	I-19
I.3.3	Alternative Options for the Conceptual Projects Categorized as Environmentally Critical Project under PEISS .....	I-20
I.3.4	Screening and Scoping of the Programs and Projects based on the JICA Guidelines for Environmental and Social Considerations .....	I-21
I.3.5	Result of Initial Screening and Scoping of the Programs and Projects in IWRM Plan .....	I-21
I.3.6	Scoping Results and Proposed Mitigation Measures .....	I-21
I.3.5	Result of Initial Screening and Scoping of the Programs and Projects in IWRM Plan .....	I-21
I.3.6	Scoping Results and Proposed Mitigation Measures .....	I-22
I.3.6.1	Significant adverse impacts (A-) .....	I-22
I.3.6.2	Less significant adverse impacts (B-) .....	I-23
<b>I.4</b>	<b>Identification of the necessary monitoring items during the project cycles .....</b>	<b>I-27</b>
I.4.1	Construction phase .....	I-27
I.4.2	Operation phase .....	I-27
I.4.3	Throughout the project cycles .....	I-28
<b>I.5</b>	<b>Important Notice on Implementation of the Projects .....</b>	<b>I-29</b>

### List of Tables

#### List of Tables in Report

Table I.2.2.1	Summary of Environmentally Critical Projects (ECPs) .....	I-4
Table I.2.2.2	Summary of Environmentally Critical Areas (ECAs) .....	I-4
Table I. 2.2.3	Project Groups for EIA under PEISS .....	I-5
Table I. 2.2.4	Summary of Project Groups, EIA Report Types, Decision Documents, Deciding Authorities and Processing Duration .....	I-7
Table I. 3.1.1	Number of Proposed and Conceptual Projects under IWRM Plan .....	I-19
Table I. 3.2.1	Proposed and Conceptual Programs and Projects in IWRM Plan Covered by PEISS .....	I-19
Table I. 3.3.1	Alternative Options for Conceptual Projects Categorized as Environmentally Critical Projects .....	I-20
Table I. 3.4.1	Proposed and Conceptual Programs and Project in IWRM Plan with Possible Negative Environment Impacts Identified in Initial Screening Process .....	I-22
Table I. 3.4.2	Details, Timing of Occurrence and Mitigation Measures for Significant Adverse Impacts (A-) .....	I-23
Table I. 3.4.3	Details, Timing of Occurrence and Mitigation Measures for Less Significant Adverse Impacts (B-) .....	I-23

Table I. 3.5.1	Recommended Monitoring Measures of Environmental Parameters at Construction Phase .....	I-27
Table I. 3.5.2	Recommended Monitoring Measures of Environmental Parameters at Operation Phase .....	I-28

**List of Annex Tables**

Annex-T I.2.2.1	Project Grouping Matrix for Determination of EIA Report Types for New Single & Co-Located Projects .....	IT-1
Annex-T I.2.2.2	Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects .....	IT-3
Annex-T I.3.1.1	Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan .....	IT-18
Annex-T I.3.4.1	Summary of Environmental Scoping for Projects and Programs of IWRM Plan .....	IT-25

**List of Figures**

**List of Figures in Report**

Figure I. 2.2.1	Summary Flowchart of EIA Process .....	I-3
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**List of Annex Figures**

Annex-F I.2.2.1	Potential ECAs in Region III .....	IF-1
Annex-F I.2.2.2	Organization chart of DENR .....	IF-2
Annex-F I.2.2.3	Organization chart of EMB .....	IF-3





## **Sector I. Environmental and Social Considerations on Programs and Projects of the IWRM Plan**

### **I.1 Introduction**

The IWRM Plan prepared during the present study is consist of six (6) sectors including 18 proposed and 30 conceptual programs and projects<sup>1</sup>, which cover multi-sectoral fields, such as agricultural and irrigation development, municipality water supply, sanitation, sewerage, flood and disaster management, watershed management, water related environment management, and water resource management to support the Government of Philippines in managing water resources in a sustainable manner.

In order to assess if the implementation of any of the proposed programs and projects would create any adverse impacts on natural and social environments in the localities, the Study Team conducted a simple initial environmental examination (IEE) of the proposed projects by using screening and scoping methods. In addition, the present legislative and institutional framework governing environmental assessment in the country was also reviewed. The results of the simple IEE are summarized in the following sections.

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<sup>1</sup> The proposed programs and projects are planned by the relevant government agency, while the conceptual programs and projects are proposed by the Study Team and subjects for further revision to determine the project components. Basically, the programs and projects in the IWRM Plan have been prepared in consultation with the stakeholders in the course of the Study.

## **I.2 Existing Legislation and Legal Systems governing Environmental and Social Consideration in Philippines**

### **I.2.1 Current Overall Legal Framework**

In Philippines, any private or public projects or activities which are envisaged to have a negative impact on the environment are subjects of Environmental Impact Assessment (EIA) by Philippine Environmental Impact Statement System (PEISS). EIA is the preliminary analysis of the potential impacts of the project on the environment. Aware of the possible negative effects of the implementation of industrial and other activities, the government had instituted measures to encourage the use of EIA as a planning and decision making tool.

PEISS is a set of laws, regulations, administrative orders and guidelines for EIA. Among them some of the most important laws and guidelines are listed below.

#### **I.2.1.1 Environmental Impact Statement System, Presidential Decree No. 1586 (1978)**

An act establishing and centralizing the Environmental Impact Statement (EIS) System under the National Environmental Protection Council (NEPC), which merged with the National Pollution Control Commission (NPCC) in June 1987 to become the Environmental Management Bureau (EMB).

#### **I.2.1.2 Presidential Proclamation No. 2146 (1981) and No. 803(1996)**

It proclaims Environmentally Critical Projects (ECPs) to have significant impacts on the quality of the environment and Environmentally Critical Areas (ECAs) as environmentally fragile areas within the scope of the EIS System.

#### **I.2.1.3 DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007)**

It provides implementing rules and regulations of Presidential Decree No. 1586, establishing the Philippine Environmental Impact Statement System (PEISS). Also, detailed information in definitions of technical terms, procedures, related laws and regulations are described.

#### **I.2.1.4 Recent Issued Memorandum Circulars (MCs) Relevant to PEISS**

**(1) MC No. 2010-14, Standardization of Requirements and Enhancement of Public Participation in the Streamlined Implementation of the Philippine EIS System**

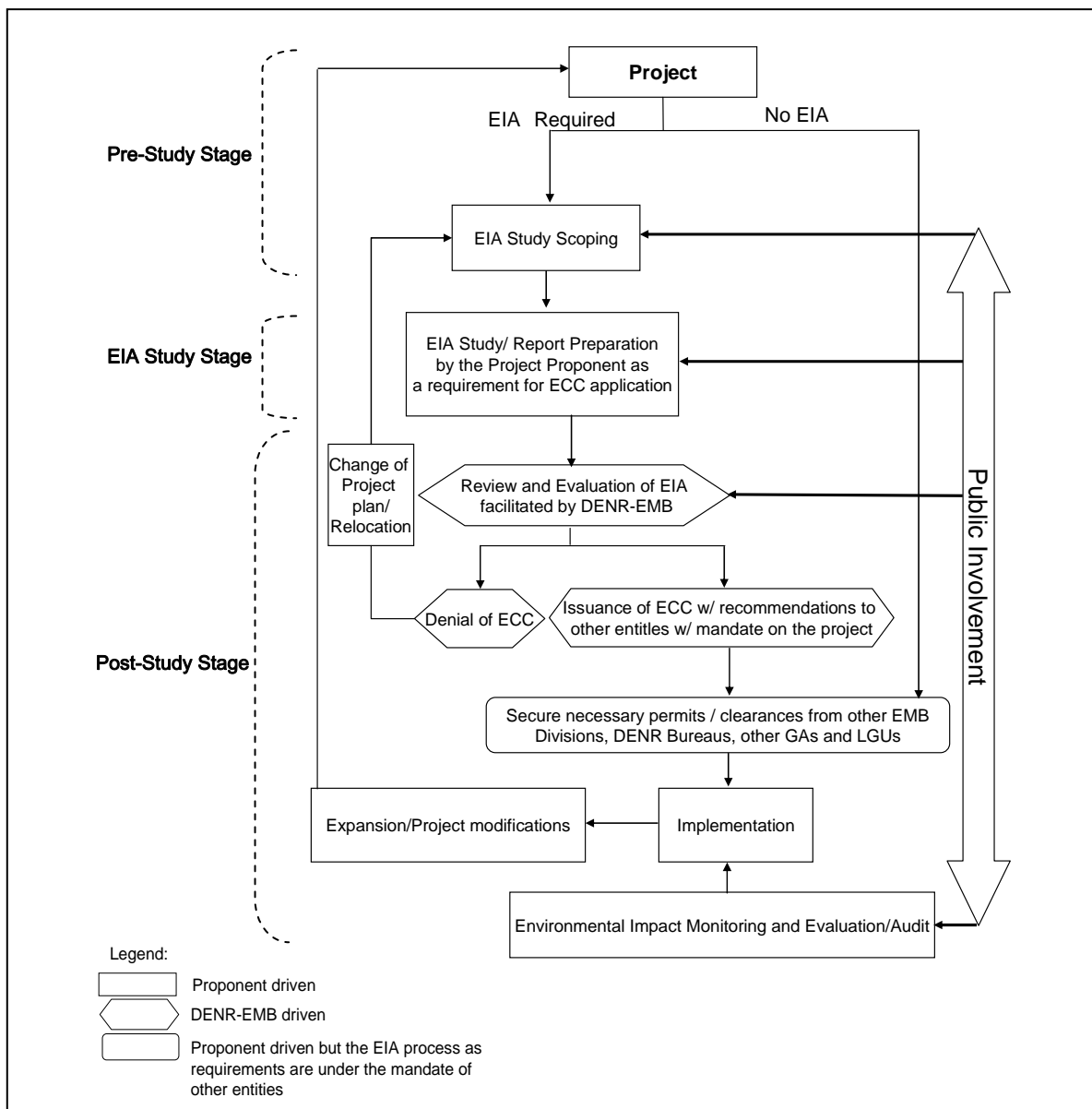
It prescribes streamlined procedures of PEISS, especially for application of ECC (Environmental Compliance Certificate) and CNC (Certificate of Non-Coverage) with the outlines of the relevant EIA reports and CNC application form required.

**(2) MC No. 2010-002, Clarification to DENR MC No.2010-14 and Other EIS System Policy Issuances**

It clarifies the outlines of EIA reports described in MC No.2010-14 for the relevant report types defined by DAO 03-30 Revised Procedural Manual as well as exemption of the certain projects from securing ECC regardless their location.

### **I.2.2 Procedures of Environmental Impact Assessment (EIA)**

The procedures of EIA can be grouped into; pre-study stage (screening and scoping), EIA study stage and the post-study stage (review, decision-making and monitoring) as shown in the following diagram.



Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

**Figure I. 2.2.1 Summary Flowchart of EIA Process**

### I.2.2.1 Projects Covered by PEISS

Projects which have been originally declared as Environmentally Critical Projects (ECPs) or projects in Environmentally Critical Areas (ECAs) are assumed to have significant impacts on the quality of the environment, and to be subjects of PEISS. The four (4) ECP project types and twelve (12) ECA categories have been declared through Proclamation No. 2146 (1981) and Proclamation No. 803 (1996), as summarized Table I.2.2.1 and 2.2.2, respectively.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I.2.2.1 Summary of Environmentally Critical Projects (ECPs)**

Main Categories	Sub-Category
A. Golf Course Project	- Golf course projects/complex
B. Heavy Industries	- Iron and Steel Metals - Non-ferrous Metal Industries - Petroleum and Petrochemical Industries - Smelting Plants
C. Resource Extractive Industries	- Fishery Projects-dikes for/and fishpond development projects - Forestry Projects - Major mining and quarrying projects
D. Infrastructure Projects	- Major Dams - Major Reclamation Projects - Major Power Plants (Proc No. 2146 declared types: fossil-fueled, nuclear fueled, hydroelectric or geothermal)

Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

**Table I.2.2.2 Summary of Environmentally Critical Areas (ECAs)**

ECA Categories	Examples
A. Areas declared by law as national parks, watershed reserves, wildlife preserves, and sanctuaries	Areas of the National Integrated Protected Areas System (NIPAS)
B. Areas set aside as aesthetic, potential tourist spots	Areas declared and reserved by the Department of Tourism or other authorities for tourism development
C. Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)	Areas inhabited by indeterminate species, threatened species, rare species, endangered species, such species categorized as Appendix I or II of CITES as well as listed in the The National List of Threatened Fauna
D. Areas of unique historic, archeological, geological, or scientific interests	- National historical landmarks, geological monuments, paleontological and anthropological reservations as designated or determined by the National Historical Institute, National Museum, National Commission for Culture and the Arts, National Commission on Geological Sciences, and other authorities
E. Areas which are traditionally occupied by cultural communities or tribes	- Areas that are occupied or claimed as Certificated Ancestral Domains/Lands by indigenous communities
F. Areas frequently visited and or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.	- Areas frequently visited or hard-hit by typhoons - Areas frequently visited or hard-hit by tsunamis - Areas frequently visited or hard hit by earthquakes - Storm surge-prone areas - Flood-prone areas - Areas prone to volcanic activities - Areas located along fault lines or within fault zones - Drought-prone areas
G. Areas with critical slope	- Lands with slope of 50% or more - Alienable and disposable forest lands and unclassified forests
H. Areas classified as prime agricultural lands	- Irrigated and irrigable areas and other areas mapped under the Network of Protected Areas for Agriculture (NPAA) of the Bureau of Soils and Water Management (BSWM)
I. Recharged areas of aquifers	- Areas of sources of water replenishment
J. Water bodies	- Areas that are tapped for domestic purposes - Areas which support wildlife and fishery activities
K. Mangrove Areas	- Tidal areas covered by salt-tolerant, intertidal tree species - Areas declared as mangrove swamp forest reserves
L. Coral Reefs	- Areas characterized by the assemblage of different types of marine plants and organisms - Areas identified by local sources such as PAWB-DENR to be rich in corals.

Source: Compiled by the Study Team based on Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

Since the official GIS data of ECAs is under preparation according to EMB<sup>2</sup>, the Study Team prepared the map of the potential ECAs located in Region 3 as shown in Annex- F I.2.2.1 based on the available GIS data referred to Annex-T.I.2.2.1.

### **I.2.2.2 Responsible Government Institutions for PEISS**

The review and supervision of PEISS are conducted by the Environmental Management Bureau (EMB), Department of Environment and Natural Resources (DENR). The respective organization charts of DENR and EMB are shown in Annex-F I.2.2.2 and 2.2.3, respectively.

DENR is the government entity which is mandated to handle issues related to following five tasks as described in the legislations concerned:

- Assure the availability and sustainability of the country's natural resources through judicious use and systematic restoration or replacement, whenever possible;
- Increase the productivity of natural resources in order to meet the demands for forest, mineral, and land resources of a growing population;
- Enhance the contribution of natural resources for achieving national economic and social development;
- Promote equitable access to natural resources by the different sectors of the population; and
- Conserve specific terrestrial and marine areas representative of the Philippine natural and cultural heritage for present and future generations.

Under the framework of PEISS, EMB is responsible for the issuance of decision making documents such as Environmental Compliance Certificate (ECC), Certificate of Non-Coverage (CNC) and Denial Letter. Also, EMB Regional Offices in respective regions are primary responsible for the consultation and supervision of development projects.

### **I.2.2.3 Required Documents by PEISS**

To help identifying required documents under PEISS for consultation and decision making by EMB - DENR, the projects are classified into five major groups as shown in Annex-T I.2.2.2 and summarized below.

**Table I. 2.2.3 Project Groups for EIA under PEISS**

Groups	Type and location of the project
Group I	ECPs in either ECAs or NECAs (Environmentally Critical Projects in either Environmentally Critical Areas or Non-Environmentally Critical Areas)
Group II	NECPs in ECAs (Non-Environmentally Critical Projects in Environmentally Critical Areas)
Group III	NECPs in NECAs (Non-Environmentally Critical Projects in Non-Environmentally Critical Areas)
Group IV	Co-located Projects in either ECA or NECA
Group V	Unclassified Projects

Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

EIA-covered projects listed above require either of follows depending on the project type, location, magnitude of potential impacts and project threshold.

- Environmental Impact Statement (EIS),
- Programmatic EIS (PEIS),
- Initial Environmental Examination Report (IEER),
- IEE Checklist (IEEC),
- Environmental Performance Report and Management Plan (EPRMP),

<sup>2</sup> Although the MC No.2010-004 prescribes the guidelines for use of screening and ECA map systems, the ECA map has not been completed yet according to the EMB staff.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

Programmatic Environmental Performance Report and Management Plan (PEPRMP), or  
Application form to be processed in the Automated Processing System (APS)<sup>3</sup>.

All documents should be prepared by the project proponent to be submitted together with the following information to the EMB Central Office or the Environmental Impact Assessment Division in respective EMB Regional Office:

Proof of compatibility with the existing land use plan, if necessary,

Proof of ownership or authority over the project site,

Accountability Statements of the proponent and the EIS preparers,

Photographs or plates of the project site, impact areas and affected areas and communities,

Duly Accomplished Project Environmental Monitoring and Audit Prioritization Scheme (PEMAPS)<sup>4</sup>  
Questionnaire,

Copy of Previous ECC (if any), and

Latest Self Monitoring Report(SMR)<sup>5</sup> (if with previous ECC, Compliance Monitoring Report  
(CMR)Format<sup>6</sup>).

The above information also can be included or attached to the respective EIA report. Then, the decision documents may either be an ECC, CNC or a Denial Letter, described as follows.

Environmental Compliance Certificate (ECC)

An ECC is issued as a certificate of Environmental Compliance Commitment to which the proponent conforms with after DENR-EMB explains the ECC conditions.

Certificate of Non-Coverage (CNC)

A CNC certifies that the project is not covered by the EIS System and is not required to secure an ECC, based on the review of submitted application form under APS.

Denial Letter

A Denial Letter is issued for disapproval of the application. It shall contain an explanation for the disapproval and guidance on how the application can be improved to a level of acceptability in the EIA process.

In addition, ECC amendment is one of the decision documents for the existing co-located projects for modification or re-starts up of the single or projects as well as the operating projects without ECCs.

Following table shows the types of EIA report, decision document, deciding authority and processing duration by project group.

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<sup>3</sup> Currently APS is an internal system managed by EMB RO although EMB plans to develop an online application system for CNC with the possible management system of the application fees according to the interview with EMB staff.

<sup>4</sup> PEMAPS is an internal EMB strategy for selecting and prioritizing projects to be subject to compliance monitoring, based on evaluation by EMB and the Proponent's responses to the Environmental Risk Categorization Questionnaire described in the Revised Procedural Manual for DAO 03-30.

<sup>5</sup> SMR is a detailed report on compliance to environmental standards specific to environmental laws as described in Revised Procedural Manual for DAO 03-30.

<sup>6</sup> CMR format is provided in Revised Procedural Manual for DAO 03-30.

**Table I. 2.2.4 Summary of Project Groups, EIA Report Types, Decision Documents, Deciding Authorities and Processing Duration**

Project Groups		Documents Required For ECC/CNC Application	Decision Document	Deciding Authority (MC-2010-14)	Processing Duration (Working Days) (MC2010-14)
I: ECPs (single projects) in either ECA or NECA	I-A: New	EIS	ECC	EMB Director / DENR Secretary	40 days
	I-B: Existing Projects for Modification, Re-start up or Operating without ECC	EPRMP			
II: NECPs (single projects) in ECA	II-A: New	EIS	ECC	EMB RO (Regional Office) Director	20 days
		IEER / IEEC	ECC		
		App. for APS	CNC	EMB RO Director	1 day
	II-B: Existing Projects for Modification, Re-start up or Operating without ECC	EPRMP	ECC	EMB RO Director	20 days
		App. for APS	CNC	EMB RO Director	1 day
III: NECPs (single projects) in NECA	III-A: New	App. for APS	CNC	EMB RO Director	1 day
IV: Co-located Projects	IV-A: New	PEIS	ECC	DENR Secretary/EMB Director	40 days
	IV-B: Existing Projects for Modification, Re-start up or Operating without ECC	PEPRMP	ECC/ECC Amendment	EMB RO Director	20 days
V: Unclassified Projects		App. for APS	CNC	EMB RO Director	1 day

Source: Prepared by the Study Team based on Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30) (2007), Memorandum Circular No.2010-14, and information obtained from the interview with EMB

Besides, Memorandum Circular No.2010-002 prescribes that the following projects shall be exempted from securing ECC regardless of the location:

LPG storage and refilling stations with less than or equal to one (1) ton storage capacity,

Gasoline stations prior to 1996 without any expansion or modification,

Low-cost subdivision/housing and resettlement area projects with total gross lot area of one (1) hectare or less including amenities, if any, and

Fast foods and restaurants with less than one (1) hectare total gross flood area including parking and other open spaces

#### **I.2.2.4 Outlines of Required Documents by PEISS**

Followings are outlines of the required documents for application of ECC or CNC in accordance with Memorandum Circular No.2010-14.

##### **(1) Outline of EIS, IEE and IEE Checklist<sup>78</sup> (Proposed New Single Projects)**

Executive Summary • Project Fact Sheet PD Summary • Process Documentation of the conduct of EIA (EIA Team, EIA Study Schedule & Area, EIA Methodology, Public Participation)
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<sup>7</sup> Existing approved IEE checklist report format may still be used until the issuance of updates based on the prescribed outline in accordance with MC 2010-14.

<sup>8</sup> Required degree of the description of each content shall be deferred corresponding to the type of the required documents and subjects to be determined at the technical scoping.

## Sector I: Environmental and Social Considerations on Programs and Projects of the IWRM Plan

<ul style="list-style-type: none"><li>• Summary of Baseline Characterization Key Environmental Impacts and Management &amp; Monitoring Plan and EMF &amp; EGF</li></ul> <p>Commitments</p> <p>I. Project Description</p> <p>1.1 Project Location and Area</p> <ul style="list-style-type: none"><li>• Map showing sitio, barangay, municipality, province, region boundaries, vicinity, proposed buffers surrounding the area and</li></ul> <p>Primary &amp; secondary impact areas</p> <ul style="list-style-type: none"><li>• Geographic coordinates (shape file data) of project area</li><li>• Rationale for selection primary &amp; secondary impact areas</li></ul> <p>1.2 Project Rationale</p> <p>Cite and focus on the need for the project based on national and local economic development and in terms of contribution to sustainable development agenda or current development thrusts of the Philippines</p> <p>1.3 Project Alternatives</p> <ul style="list-style-type: none"><li>• Cite criteria used in determining preliminary options for facility siting, development design, process/technology selection, resource utilization including discussion of the consequences of not proceeding with the project</li><li>• Reasons for selecting the preferred options delineated in terms of technical, commercial, social and natural environmental aspects</li><li>• summary of the comparative environmental impacts of each alternative</li></ul> <p>1.4 Project Components</p> <ul style="list-style-type: none"><li>• Major components</li><li>• other Support Facilities (Le. energy/power generating facility, water supply system)</li><li>• Pollution control devices and corresponding facilities being served or connected</li><li>• Footprint of proposed layout of project facilities</li></ul> <p>1.5 Process/ Technology Options</p> <ul style="list-style-type: none"><li>• Production process (indicate type of raw material &amp; final product) if process industry; Construction if infrastructure such as buildings, roads &amp; bridges</li><li>• Power generation &amp; water supply system</li><li>• Waste Management Systems</li></ul> <p>1.6 Project Size</p> <ul style="list-style-type: none"><li>• total project area in square meters or hectares</li><li>• annual production rate &amp; working days/hours if process industry</li></ul> <p>1.7 Development Plan, Description of Project Phases and Corresponding Timeframes</p> <p>Phases to be described in terms identifying specific activities (w/ special attention on those with significant environmental impacts) and corresponding projected implementation timeframes:</p> <ul style="list-style-type: none"><li>• Pre-construction (planning, acquisition of rights to use land,)</li><li>• Construction (land/site clearing, temporary housing, transport of materials, health and other services for the workforce)</li><li>• Operation (projected period of start-up/commissioning/full operation of various project components)</li><li>• Abandonment (Land/soil restoration, decontamination or remediation activities and procedures &amp; projected year of Abandonment).</li></ul> <p>1.8 Manpower</p> <p>Tabulate the following per project phase:</p> <ul style="list-style-type: none"><li>• manpower requirements;</li><li>• expertise/skills needed;</li><li>• nature &amp; estimated number of jobs available for men, women indigenous peoples (if sited in IP ancestral land); preferred scheme for sourcing locally from host and neighboring LGUs and those from outside</li></ul> <p>1.9 Indicative Project Investment Cost</p> <p>II. Analysis of Key Environmental Impacts</p> <p>2.1 Land</p> <p>2.1.1 Land Use and Classification</p> <ul style="list-style-type: none"><li>• Discuss inconsistencies/possible conflicts with existing land use/zoning/classification and encroachment in ECAs</li><li>• Discuss Projected change as a result of project implementation (Le. Loss of topsoil/overburden (for agricultural areas or adjacent to agricultural areas))</li></ul> <p>2.1.2 Geology/Geomorphology</p> <p>Discuss Projected change and change management as a result of project implementation such as the following:</p> <ul style="list-style-type: none"><li>• Change in surface landform/ topography/ terrain/slope</li><li>• Change in sub-surface/ underground geomorphology</li><li>• Inducement of subsidence/ collapse</li><li>• Inducement of landslides or other natural hazards</li></ul> <p>2.1.3 Pedology</p>
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## Sector I: Environmental and Social Considerations on Programs and Projects of the IWRM Plan

<p>Analyze project's impact and provide management measures for the following as may be needed:</p> <ul style="list-style-type: none"><li>• erodability potential</li><li>• bank stability</li><li>• Change in soil quality/fertility</li></ul> <p>2.1.4 Terrestrial Biology</p> <p>Analyze project's impact and provide management measures with regards to the following as may be needed:</p> <ul style="list-style-type: none"><li>• Vegetation removal and loss of habitat</li><li>• Threat to existence of important local species</li><li>• Threat to abundance, frequency and distribution of important species</li><li>• 4 Hindrance to wildlife access</li></ul> <p>2.2 WATER</p> <p>2.3.1 Hydrology/Hydrogeology</p> <p>Analyze project's impact and provide management measures with regards to the following as may be needed:</p> <ul style="list-style-type: none"><li>• Change in drainage morphology</li><li>• Change in stream, lake water depth</li><li>• Reduction in stream volumetric flow</li><li>• Inducement of flooding</li><li>• Water resource use and competition</li><li>• Reduction/Depletion of groundwater flow</li></ul> <p>2.3.2 Oceanography</p> <p>Analyze project's impact and provide management measures with regards to the following as may be needed:</p> <ul style="list-style-type: none"><li>• Change in circulation pattern</li><li>• Change in stream, lake water depth</li><li>• Change in bathymetry</li></ul> <p>2.3.3 Water Quality</p> <ul style="list-style-type: none"><li>• Identify specific source of possible pollution load and discuss assimilative capacity of the receiving water body (Le. groundwater, stream water, lake water, marine water)</li><li>• Include as part of the environmental management and monitoring plan, the sampling site map</li></ul> <p>2.3.4 Freshwater or Marine Ecology</p> <p>Identify source of threat to ecology and discuss assimilative capacity of the receiving ecosystem</p> <ul style="list-style-type: none"><li>• Threat to abundance, frequency and distribution of species</li><li>• Loss of important species</li><li>• Loss of habitat</li></ul> <p>2.3 AIR</p> <p>2.3.1 Meteorology/Climatology</p> <ul style="list-style-type: none"><li>• Discuss the project's possible effect on local climate if any</li><li>• Discuss the project's contribution to global greenhouse gas if any</li></ul> <p>2.3.2 Air Quality (&amp; Noise)</p> <ul style="list-style-type: none"><li>• Identify specific source of possible pollution load and discuss assimilative capacity considering the ambient air quality/noise levels in the area</li></ul> <p>2.4 PEOPLE<sup>9</sup></p> <p>2.4.1 Identify settlers that will be displaced from among the existing settlers</p> <p>2.4.2 Discuss the in-migration patterns impact as a result of project implementation</p> <p>2.4.3 Discuss the impacts on IPs and Culture/lifestyle (if any)</p> <p>2.4.4 Discuss the project implementation's threat to public health vis-a-vis the baseline health conditions in the area</p> <p>2.4.5 Discuss local benefits expected from project implementation</p> <p>2.4.6 Discuss how the project would affect the delivery of basic services and resource competition in the area</p> <p>2.4.7 Discuss how the project would affect traffic situation in the area</p> <p>2.4.8 Identify entity to be accountable for environmental management in the area</p> <p>2.4.9 Discuss how the project would affect existing properties in the area in terms of relocation and devaluation</p> <p>2.4.10 Identify affected properties</p> <p>III. ENVIRONMENTAUECOLOGICAL RISK ASSESSMENT</p> <p>Identify and provide management measures for:</p> <ul style="list-style-type: none"><li>• Chronic Risks</li><li>• Acute Risks / Worst Case Scenario</li></ul> <p>IV. IMPACTS MANAGEMENT PLAN</p> <p>Limit to most significant impacts per project phase and per environmental component arising from key environmental aspects</p> <p>The SOP and IEC Framework shall be required for all ECPs. These may be required for EIS-Based ECC applications for non ECPs based on the EMB-RO's discretion.</p>
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<sup>9</sup> This topic can include the resettlement action plans, compensation measures for land acquisition and livelihood development plans for the affected indigenous peoples

## Sector I: Environmental and Social Considerations on Programs and Projects of the IWRM Plan

The SOP of the project shall be derived from, and aligned with, the LGU's existing SOP. The project's SOP normally aims to prevent/mitigate and/or enhance a project's adverse and positive impacts, respectively, on people's livelihood, health and environment.

The SOP shall contain the following: a.) Livelihood or community development programs/activities, b.) Responsible community members/beneficiaries, c.) partner institutions(government, NGO, others), d.) timeframe implementation, and e.) source and amount per activity/component

The IEC Framework shall include the following information:

- a. Target Sector Identified as Needing Project IEC
- b. Major Topic/s of concern in Relation to Project
- c. IEC Scheme / Strategy / Methods
- d. Information Medium
- e. Indicative Timelines and Frequency
- f. Indicate Cost

The framework for compliance monitoring including environmental performance indicators shall serve as standards for determining compliance. This shall correspond to the baseline environmental parameter necessary to monitor the identified key environmental impacts for the specific sector/project type.

As a pro-active tool for minimization/elimination of adverse consequences to the environmental quality, the project proponent shall propose "Environmental Quality Performance Level" (EQPL) for each critical parameter identified above. At least two EQPLs are required namely the action and limit level. A third optional criterion is the early warning level which is actually a red-flagging alert level.

It shall also include description of the monitoring scheme and mechanisms to be employed:

- Self-Monitoring Plan
- Multi-sectoral Monitoring Framework (for ECPs and EIS-based Non-ECPs as deemed necessary by EMB RO)
- Environmental Guarantee and Monitoring Fund Commitment (for ECPs and EIS-based Non-ECPs as deemed necessary by EMB RO)

### VII. EMERGENCY RESPONSE POLICY AND GENERIC GUIDELINES

The policy and generic guidelines are to be consistent with the relevant agencies' requirements that are to be complied with after the EGG is issued, e.g. MGB has a prescribed ERP content for mining projects.

### VIII. ABANDONMENT /DECOMMISSIONING IREHABILITATION POLICIES AND GENERIC GUIDELINES

Statement on Proponent's policies and generic procedures; Detailed Abandonment/Decommissioning Plan to be submitted post-EGG, within a timeframe specified in the EGG

### IX. INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

Discuss the Table of Organization of the Proponent where the reporting line and manpower complement/positions of the EU, MEPEO or equivalent units to higher management and relationships with operating departments are shown

Source: Memorandum Circular No.2010-14

## (2) Outline of PEIS (Proposed New Co-located Projects) (Maximum of 350 pages )

PROJECT FACTSHEET
TABLE OF CONTENTS
EXECUTIVE SUMMARY
CHAPTER 1 INTRODUCTION
1.1 Project Background and Rationale
1.2 PEIA Approach and Methodology
1.3 PEIA Public Participation
1.4 The PEIA Team
1.5 PEIA Schedule
CHAPTER 2 PROCESS DESCRIPTION
2.1 Project Location and Area Coverage
2.2 Development Framework
2.3 General Land Use Allocation
2.4 Phasing and Site Development Components
2.5 Process Description of Locator Plant
2.6 General Stages of Development and Activities
2.7 Organization and Management
2.8 Project Schedule and Cost
CHAPTER 3 ECOLOGICAL PROFILING
FOR AIR, WATER, LAND AND PEOPLE SECTOR
• Study Area Coverage
• Environmental Management Goals and Indicator Limits
• Approach and Methodology
• Environmental Status Assessment
• Carrying Capacity Analysis
• Environmental Management Strategies
• Monitoring Needs Assessment
CHAPTER 4 IMPACTS, HAZARDS AND RISK ANALYSIS

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

- ENVIRONMENTAL HEALTH IMPACT ASSESSMENT (EHIA)
  - CHAPTER 4B INTEGRATED RISK ASSESSMENT
- CHAPTER ENVIRONMENTAL MANAGEMENT PLAN  
ANNEXES  
BIBLIOGRAPHY

Source: Memorandum Circular No.2010-14

**(3) Outline of EPRMP (Single Project Expansion/Modification)**

Executive Summary

- Project Fact Sheet PD Summary
- Process Documentation of the conduct of EIA (EIA Team, EIA Study Schedule & Area, EIA Methodology, Public Participation)
- Summary of Baseline Characterization Key Environmental Impacts and Management & Monitoring Plan and EMF & EGF Commitments

I. Project Description

1.1 Project Location and Area

- Map showing sitio, barangay, municipality, province, region boundaries, vicinity, proposed buffers surrounding the area and Primary & secondary impact areas
- Geographic coordinates (shape file data) of project area
- Rationale for selection primary & secondary impact areas

1.2 Project Rationale

Cite and focus on the need for the project based on national and local economic development and in terms of contribution to sustainable development agenda or current development thrusts of the Philippines

1.3 Project Alternatives

- Cite criteria used in determining preliminary options for facility siting, development design, process/technology selection, resource utilization including discussion of the consequences of not proceeding with the project
- Reasons for selecting the preferred options delineated in terms of technical, commercial, social and natural environmental aspects
- summary of the comparative environmental impacts of each alternative

1.4 Project Components

In Matrix form, describe / identify the existing, proposed expansion/modification & resulting final project scope in terms of:

- Major components
- other Support Facilities (Le. energy/power generating facility, water supply system)
- Pollution control devices and corresponding facilities being served or connected
- Footprint of proposed layout of project facilities

1.5 Process/ Technology Options

In Matrix form, describe / identify the existing, proposed modification & resulting final process/technology in terms of:

- Production process (indicate type of raw material & final product) if process industry; Construction if infrastructure such as buildings, roads & bridges
- Power generation & water supply system
- Waste Management Systems

1.6 Project Size

In Matrix form, describe the existing, proposed expansion & resulting total capacity/project scope in terms of:

- total project area in square meters or hectares
- annual production rate & working days/hours if process industry

1.7 Development Plan, Description of Project Phases and Corresponding Timeframes

Phases to be described in terms identifying specific activities (w/ special attention on those with significant environmental impacts) and corresponding projected implementation timeframes:

- Pre-construction (planning, acquisition of rights to use land.)
- Construction (land/site clearing, temporary housing, transport of materials, health and other services for the workforce)
- Operation (projected period of start-up/commissioning/full operation of various project components)
- Abandonment (Land/soil restoration, decontamination or remediation activities and procedures & projected year of Abandonment).

1.8 Manpower

Tabulate the following per project phase:

- manpower requirements;
- expertise/skills needed;
- nature & estimated number of jobs available for men, women indigenous peoples (if sited in IP ancestral land); preferred scheme for sourcing locally from host and neighboring LGUs and those from outside

1.9 Indicative Project Investment Cost

II. Analysis of Key Environmental Impacts

## Sector I: Environmental and Social Considerations on Programs and Projects of the IWRM Plan

### 2.1 LAND

#### 2.1.1 Land Use and Classification

• Discuss actual performance/experience in terms of how impacts were addressed in the implementation of the original project plan & any additional related issues with the proposed expansion/modification & how they will be addressed

• Discuss historical environmental performance & how it will be improved or maintained as needed

#### 2.1.2 Geology/Geomorphology

Discuss actual performance/experience in terms of how the impacts were addressed in the implementation of the original project plan & any additional related issues with the proposed expansion/modification & how they will be addressed

#### 2.1.3 Pedology

Discuss erosion history & change in soil quality/fertility with the implementation of the original project plan & any additional impact of the expansion/modification in terms of:

- erodability potential
- bank stability
- Change in soil quality/fertility

#### 2.1.4 Terrestrial Biology

Discuss actual environmental management performance/experience with the implementation of the original project plan & any additional impact of the expansion/modification with respect to the following:

- Vegetation removal and loss of habitat
- Threat to existence of important local species
- Threat to abundance, frequency and distribution of important species
- Hindrance to wildlife access

### 2.2 WATER

#### 2.3.1 Hydrology/Hydrogeology

Discuss actual environmental management performance/experience with the implementation of the original project plan & any additional impact of the expansion/modification with respect to the following:

- Change in drainage morphology
- Change in stream, lake water depth
- Reduction in stream volumetric flow
- Inducement of flooding
- Water resource use and competition
- Reduction/Depletion of groundwater flow

#### 2.3.2 Oceanography

Discuss actual environmental management performance/experience with the implementation of the original project plan & any additional impact of the expansion/modification with respect to the following:

- Change in circulation pattern
- Change in stream, lake water depth
- Change in bathymetry

#### 2.3.3 Water Quality

- Identify additional & total source of possible pollution load and discuss assimilative carrying capacity of the receiving water body (i.e., groundwater, stream water, lake water, marine water)
- Discuss actual environmental management performance/experience with the implementation of the original project plan & any additional impact of the expansion/modification
- Include as part of the environmental management and monitoring plan, the actual sampling site map and any changes in sampling site as a result of the expansion/modification

#### 2.3.4 Freshwater or Marine Ecology

Discuss actual environmental management performance/experience with the implementation of the original project plan & any additional impact of the expansion/modification with respect to the following:

- Threat to abundance, frequency and distribution of species
- Loss of important species
- Loss of habitat

### 2.3 AIR

#### 2.3.1 Meteorology/Climatology

- Discuss the existing project's effect on local climate and corresponding effect of the expansion/modification, if any
- Discuss the existing project's contribution to global greenhouse gas and corresponding effect of the expansion/modification, if any

#### 2.3.2 Air Quality (& Noise)

- Identify additional & total source of possible pollution load and discuss assimilative capacity considering the ambient air quality/noise levels in the area

### 2.4 PEOPLE

Discuss how the following were handled in the original project and identify additional of such for the expansion /modification:

#### 2.4.1 Displacement of settlers

#### 2.4.2 Impact of In-migration patterns as a result of project implementation

#### 2.4.3 impacts on IPs and Culture/Lifestyle (if any)

#### 2.4.4 project implementation's threat to public health vis-à-vis the baseline health conditions in the area

## Sector I: Environmental and Social Considerations on Programs and Projects of the IWRM Plan

<p>2.4.5 local benefits expected from project implementation</p> <p>2.4.6 Effect on the delivery of basic services and resource competition in the area</p> <p>2.4.7 Effect on traffic situation in the area</p> <p>2.4.8 Entity to be accountable for environmental management in the area</p> <p>2.4.9 Effect on existing properties in the area in terms of relocation and devaluation</p> <p>2.4.10 Other affected properties</p> <p>III. ENVIRONMENTAUECOLOGICAL RISK ASSESSMENT</p> <p>Discuss actual experience with the implementation of the original project plan &amp; any additional impact of the expansion/modification with respect to the following:</p> <ul style="list-style-type: none"><li>• Chronic Risks</li><li>• Acute Risks / Worst Case Scenario</li></ul> <p>IV. IMPACTS MANAGEMENT PLAN (IMP)</p> <p>Discuss occurrence of the projected impacts and how this was managed with the original project implementation. Discuss adjustments that should be made in consideration of the expansion/modification and present the revised IMP.</p> <p>V. Social Development Plan (SDP) and IEC Implementation</p> <p>The SDP and IEC Framework required for all ECPs and for EIS-Based ECC applications for non ECPs (at the EMB-RO's discretion) for the original project shall have been implemented.</p> <p>For the expansion/modification, this part of EIA Study Report shall be focused on the discussion of the status of implementation of SDP and IEC commitments. Any necessary change in the SDP and IEC in consideration of the expansion/modification shall be identified</p> <p>VI. ENVIRONMENTAL COMPLIANCE MONITORING</p> <p>An analysis of the "Environmental Quality Performance level" (EQPI) monitoring for each critical parameter identified for the original project implementation shall be discussed here. Additional monitoring parameters for the expansion/modification or identified lacking parameters based on the monitoring results shall be presented and incorporated in the revised monitoring plan.</p> <p>A description of the monitoring scheme and mechanisms actually being employed such as the following shall be discussed:</p> <ul style="list-style-type: none"><li>• Self-Monitoring Plan</li><li>• Multi-sectoral Monitoring Framework (for ECPs and EIS-based Non-ECPs as deemed necessary by EMB RO)</li><li>• Environmental Guarantee and Monitoring Fund Commitment (for ECPs and EIS-based Non-ECPs as deemed necessary by EMB RO)</li></ul> <p>Any proposed changes / addendum to the existing scheme shall be discussed</p> <p>VII. EMERGENCY RESPONSE POLICY AND GENERIC GUIDELINES</p> <p>Status of the implementation of the policy and generic guidelines and any proposed change shall be discussed here.</p> <p>VIII. ABANDONMENT IDECOMMISSIONING IREHABILITATION POLICIES AND GENERIC GUIDELINES</p> <p>IX. Status of the implementation of the policy and generic guidelines and any proposed change shall be discussed here.</p> <p>X. INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION</p> <p>Update on the Table of Organization of the Proponent where the reporting line and manpower complement/positions of the EU, MEPEO or equivalent units to higher management and relationships with operating departments are shown</p>
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Source: Memorandum Circular No.2010-14

### **(4) Outline of PEPRMP (Expansion/Modification Projects) (maximum of 200 pages)**

<p>Project Fact Sheet</p> <p>Table of Contents</p> <p>Executive Summary</p> <ol style="list-style-type: none"><li>1) Brief Description of the Co-located Projects vis-a-vis the proposed expansion or changes</li><li>2) Brief Summary of Project's EIA Process</li><li>3) Brief description of the baseline environmental conditions focused on the critical parameters</li><li>4) Summary on the EIA Findings on the Key Significant Impacts of the Project and corresponding EMP highlights</li><li>5) Summary of the Environmental Monitoring Plan on the most significant impacts and key measures</li></ol> <p>DRAFT MAIN PEPRMP</p> <p>1.0 BASIC PROJECT INFORMATION</p> <p>2.0 DESCRIPTION OF THE PROJECT'S EIA PROCESS</p> <ol style="list-style-type: none"><li>2.1 Terms of Reference of the EIA Study</li><li>2.2 EIA Team (Proponent &amp; Preparer Team members, module of involvement, expertise)</li><li>2.3 EIA Study Schedule</li><li>2.4 EIA Study Area (project area up to extent of coverage of study)</li><li>2.5 EIA Methodology (per module)</li><li>2.6 EIA Public Participation Initiatives (if any)</li></ol> <p>2.0 PROJECT DESCRIPTION</p> <p>Identify scope of original ECC and/or existing facilities and proposed expansion/modification. Discuss the master plan of the original project vis-à-vis the actual project implementation and changes in the master plan.</p>
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Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

4.0 IMPACT ASSESSMENT & MITIGATION (limit to relevant modules) This section shall discuss carrying capacity for the applicable regulated pollutant based on actual discharges. It shall also discuss discharge allocation and 'maximum allowable limits' (MAL) status with the implementation of the original project and corresponding plans with the implementation of the expansion/modification projects. The following sectors shall be tackled here: 4.1 The Land 4.2 The Water 4.3 The Air 4.4 People 5.0 ENVIRONMENTAL PERFORMANCE BASED ON THE ORIGINAL ECC-COVERED ENVIRONMENTAL MANAGEMENT PLAN - (This section shall discuss actual and applicable environmental management and monitoring plan including any EMS.) 5.1. Impact(s) Mitigation Plan (IMP) 5.2. Environmental Monitoring Plan (EMoP) and other Monitoring Modes 5.3. Information, Education and Communication (IEC) and Social Development Program (SOP) or Community Assistance Program (CAP) 5.4. Environmental Risk Management and Emergency Response Programs (ERP) 5.5. Abandonmen/Rehabilitation Programs 5.6. Institutional Set-up 5.7. Achievements/Awards and Outstanding Accomplishments on the Environment 6.0 ENVIRONMENTAL RISK ASSESSMENT - (when applicable - this section shall discuss the safety records of the preceding two years. Highlights of the hazard assessment/analysis, ORA or other safety studies should also be discussed.) 7.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR CURRENT PROJECT & PROPOSED MODIFICATIONNI EXPANSION - including EMF and EGF 8.0 BIBLIOGRAPHY 9.0 ANNEXES 9.1. Commitments or Agreements 9.2. Accountability Statements of Preparers & Proponent 9.3. Photographs or plates of the project site, impact areas an affected areas and communities 9.4. Environmental Data NOTE: The EIA Findings on the project's environmental impacts and management measures will advise DOH if the project will pose a public health risk to the environment. For this purpose, DOH shall provide DENR-EMB with a declaration of Health Sensitive Projects and Health Sensitive Areas. Until such time, DOH shall review EHIA independently of the EIA Process. Further, workers' HIA component of the EHIA is recommended to be coordinated by DOH with DOLE for the latter's consideration in its requirement of an Occupational Health and Safety Program from the Proponent.
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Source: Memorandum Circular No.2010-14

**(5) 1-Page Application Form for CNC under APS**

1.Name of the Project 2.Project Location 3.Proponent Name 4.Proponent Address 5.Contact Person 6.Proponent Means of Contact 7.Project Type/Undertaking 8.Project Size 9.Description of Project Activities (i.e., during preconstruction, construction, operation and abandonment)
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Source: Memorandum Circular No.2010-14

As per the projects with high risk or impact due to geohazard status of the proposed location, e.g., housing projects on critical slopes, high rise buildings and dams, the EIA study for abovementioned shall include the identification of geohazards in the area, which shall be basis for the recommendation in the ECC for further geological assessment and preparation of Geological Identification Report (GIR) or Geohazard Assessment Report (GAR) or Engineering Geological Assessment Report (EGGAR) for submission to and review by the relevant competent agencies<sup>10</sup>.

<sup>10</sup> Memorandum Circular No.2010-002, issued in September 2010, EMB

Also, Social Development Program (SDP) shall be required for all ECPs, while may only be required for EIS-based NECPs with high social impacts to be determined by the EMB Regional Office (RO)<sup>11</sup>.

### **I.2.2.5 Public Participation in EIA Process**

#### **(1) Information, Education and Communication (IEC) and Public Scoping**

One of operating principles of the PEISS is to make an accurate disclosure of relevant information by Project Proponents and other stake holders in the EIA process. DENR Administrative Order No. 30 Series of 2003 (DAO 03-30) states that Information, Education and Communication (IEC) of Local Government Unit (LGU) is required at the minimum of EIS-based applications as part of the social preparation process at pre-Scoping. In fact, the IEC serves as a basis for preliminary identification of stakeholders and related issues in preparation for the Public Scoping to be conducted for EIS-based applications.

#### **(2) Further Public Participation in PEISS**

Consistent with the basic policy of PEISS wherein the EIA process shall be based on a timely, well-informed public participation of potentially affected communities, stakeholders in both direct and indirect impact areas need to be informed of, and consulted on, the project proposal at earliest EIA stage as possible<sup>12</sup>.

With an aim of disclosure of the EIA findings for ECPs, Public Hearing or Public Consultation shall be implemented with the participation of all the stakeholders.

With an aim of disclosure of the EIA findings, Public Hearing shall be implemented for EIS-based applications wherein Public Scoping was undertaken. A wavier of the Public Hearing requested by the Proponent may be granted by the DENR-EMB if there is no mounting opposition or written request for one with valid basis. In such cases, the Public Consultation might be conducted instead.

The notice of Public Hearing shall provide explicit instruction on registration, access to the EIA report, preparation of position papers, and on mechanics how issues may be received before or during the hearing. Prior to Public Hearings or Public Consultations, the proponents is required to give copies of EIA report and relevant documents to EMB regional offices, LGUs and other stakeholders for a well-informed participation in the hearing/consultation process.

#### **(3) Involvement of Indigenous Peoples in decision-making process**

In 2006, NCIP Administrative Order No.1, namely, the Free and Prior Informed Consent (FPIC) guidelines, was promulgated by the National Commission of Indigenous People (NCIP). The objective of the guideline is to ensure genuine participation of Indigenous Cultural Communities (ICC) and Indigenous Peoples (IPs) in decision-making as well as to protect the rights of ICCs/IPs in the introduction and implementation of activities that will impact upon their Ancestral Domains/Lands(ADs/ALs).

Also, the guideline details the process for conducting Field Based Investigation (FBI) and obtaining the Certification Precondition from the NCIP attesting that the applicant has complied with the requirements for securing the affected ICC/IP's FPIC. It is required for the EIS (Environment Impact Statement)-based projects which can affect the ADs to follow the FCIP procedures.

NCIP regional office is responsible for receiving applications for the issuance of Certificate Precondition as well as implementing FBI and overseeing the process to obtain the FPIC from the IPs/ICCs.

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<sup>11</sup> Memorandum Circular No.2010-002, issued in September 2010, EMB

<sup>12</sup> MC 2010-14 provides the guidelines for determining direct and indirect impact areas as well as those for stakeholder identification.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

### **I.2.3 Laws, Regulations and Guidelines Concerning Land Acquisition and Involuntary Resettlement**

#### **I.2.3.1 Guidelines for the Acquisition of Certain Parcels of Private Land Intended for Public Use Including the Right-of-Way Easement of Several Public Infrastructure Projects, Administrative Order No. 50 (1999)**

The order is an amendment of the procedures for acquisition of property, declared by Presidential Decree No. 1533 mentioned in the latter section.

With respect to the conditions to be complied with during the negotiated sale, the order states that all the government agencies which are engaged in public infrastructure projects shall first negotiate with the owner for the acquisition of parcels of private land intended for public use including the right-of-way easement of such projects, by offering in writing a purchase price of an amount equivalent to 10% higher than the zonal value of the said property. During the negotiation, the landowner shall be given 15 days within which to accept the amount offered by the concerned government agency as payment for the land.

After the abovementioned period and no acceptance is made by the landowner, the concerned agency, in coordination with the Solicitor General, shall initiate expropriation proceedings in the proper court, depositing 10% of the offered amount.

Besides, the order prescribes the standards for the assessment of the value of the land subject of expropriation proceeding.

#### **I.2.3.2 An Act to Facilitate the Acquisition of Right-of-Way, Site or Location for National Government Infrastructure Projects and for other Purposes, Republic Act 8974 (2000)**

It declares that private property shall not be taken for public use without just compensation. Towards this end, the State shall ensure that owners of real property acquired for national government infrastructure projects are promptly paid just compensation. The Act also provides Guidelines for Expropriation Proceedings including compensation of the property which shall be appraised by determining the market values of lands and improvements. The Sec. 8 states that the implementing agency shall take into account the ecological and environmental impact of the project.

#### **I.2.3.3 The Agricultural Land Reform Code, Republic Act 6389 (1971)**

The Act amended the agricultural land reform code. The agricultural lessee shall be entitled to disturbance compensation equivalent to five times the average of the gross harvests on his landholding during the last five preceding calendar years.

#### **I.2.3.4 Executive Order 1035 (1985)**

The order provides the procedures and guidelines for the acquisition of private properties or rights for development projects by the government, including government-owned or controlled corporations and state colleges and universities.

Acquisition shall be done either through negotiated sale or expropriation. The order gives authority to the government implementing agency/instrumentality concerned to immediately institute expropriation proceedings if the parties fail to agree in negotiation of the sale. The just compensation to be paid for the property acquired through expropriation shall be in accordance with the provisions of P.D. No. 1533 under-mentioned.

#### **I.2.3.5 Presidential Decree No. 1533 (1978)**

It establishes a uniform basis for determining just compensation and the amount of deposit for immediate possession of the property involved in eminent domain proceedings.

#### **I.2.3.6 Urban Development and Housing Act, Republic Act 7279 (1992)**

This Act provides policy to undertake, in cooperation with the private sector, a comprehensive and continuing Urban Development and Housing Program. The program is aimed to uplift the conditions of the underprivileged and homeless citizens in urban areas and in resettlement areas by making



available to them decent housing at affordable cost, basic services, and employment opportunities. The Program covers lands in urban and urbanizable areas, including existing areas for priority development, zonal improvement sites, slum improvement and resettlement sites. Under this Act, eviction and demolition are allowed in danger areas such as railroad tracks, garbage dumps, riverbanks, shorelines, waterways, and other public places such as sidewalks, roads, parks, and playgrounds.

**I.2.3.7 Instituting the National Drive to Suppress and eradicate Professional Squatters and Squatting Syndicates, Executive Order No.153 (1999)**

The Act states that the Housing and Urban Development Coordinating Council (HUDCC) and the Department of Justice (DOJ) shall have authority to call on the relevant government agencies to give their assistance and cooperation to intensify the national drive against the professional squatters and squatting syndicates.

Also, the Act prescribes that the National Police Task Force shall be strengthened as the operational arm of the HUDCC in the implementation of the provisions of the order.

**I.2.3.8 Executive order No.228 (1987)**

The Act describes that the landowner is exempt from capital gains tax on the compensation paid to him/her when payment is made for agricultural land acquired by the government.

**I.2.3.9 Relevant Guidelines**

Some of the guidelines prepared to put the above-mentioned laws into effect are listed below.

Implementing Rules and Regulations Governing the Registration of Socialized housing Beneficiaries (1993)

Implementing Guidelines for the Acquisition, Validation, Disposition and Utilization of Lands for Social Housing (1993)

Implementing Rules and Regulations to Ensure the Observance of Proper and Humane Relocation and Resettlement Procedures Mandated by the Urban Development and Housing Act (1992)

Guidelines for Land Validation for Socialized Housing, Local Financial Circular 3-92 (1992)

Guidelines of Executive Order No.153

**I.2.4 Laws and Regulations Concerning the Environmental Standards and Social Aspects**

**I.2.4.1 Environment Code, Presidential Decree No. 1152**

Known as the Philippine Environment Code, it launches a comprehensive program on environmental protection and management. It also provides for air, water quality, land use, natural resources and waste management for fisheries and aquatic resources; wildlife; forestry and soil conservation; flood control and natural calamities; energy development; conservation and utilization of surface and ground water and mineral resources.

**I.2.4.2 Water Code, Presidential Decree No. 1067**

A decree instituting a water code which revises and consolidates the laws governing the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources.

**I.2.4.3 Clean Water Act, Republic Act 9275**

An Act which aims to protect the country's water bodies from pollution of all possible sources (industrial, commercial, agriculture and household activities). It provides for a comprehensive and integrated strategy to prevent and minimize pollution through a multi-sectoral and participatory approach involving all the stakeholders.

**I.2.4.4 Clean Air Act of 1999, Republic Act No. 8749**

An Act which lays down policies to prevent and control air pollution. The act sets standards of exhaust gas from vehicles, manufacturing plants and so on to follow. All potential sources of air pollution must

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

comply with the provisions of the Act. As such, all emissions must be within the air quality standards set under the law. It also imposes the appropriate punishments for violators of the law.

**I.2.4.5 Ecological Solid Waste Management Act, Republic Act No. 9003 (2000)**

An Act providing for an ecological solid waste management program, creating the necessary institutional mechanisms and incentives, declaring certain acts prohibited and providing penalties, appropriating funds therefore, and for other purposes.

**I.2.4.6 Pollution Control Law, Presidential Decree No. 984**

An Act that serves as the foundation for managing industrial activities impacting air and water quality. It empowers the DENR to impose ex-parte cease and desist orders (CDO) on the grounds of immediate threat to life, public health, safety or welfare, or to animal or plant life when wastes or discharges exceed the normal.

**I.2.4.7 Forestry Reform Code, Presidential Decree No. 705**

The Forestry Reform Code of the Philippines recognizes that there is an urgent need for proper classification; management and utilization of the lands of the public domain to maximize their productivity to meet the demands of the increasing population of the Philippines. It surmises that to achieve the above purpose, it is necessary to reassess the multiple uses of forest lands and resources before allowing any utilization to optimize the benefits that can be derived. It also emphasizes not only the utilization but more so on the protection, rehabilitation and development of forest lands to ensure the continuity of their productive condition.

**I.2.4.8 National Integrated Protected Areas System (NIPAS), Republic Act No. 7586**

An Act that aims to protect and maintain the natural biological and physical diversities of the environment notably on areas with biologically unique features to sustain human life and development as well as plant and animal life. It establishes a comprehensive system of integrated protected areas within the classification of national park as provided for in the Constitution to secure for the Filipino people of present and future generations the perpetual existence of all native plants and animals. It encompasses outstandingly remarkable areas and biologically important public lands that are habitats of rare and endangered species of plants and animals, bio-geographic zones and related ecosystems, whether terrestrial, wetland or marine.

**I.2.4.9 Indigenous Peoples Rights Act, Republic Act No. 8731**

An Act that prescribes provision for the promotion and recognition of the rights of Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) with an aim to preserve their culture, traditions and institutions to ensure the equal protection and non-discrimination of members. Also, the Act determines the definition of the Ancestral Domains and Ancestral Lands with the procedures on how to delineate the corresponding area as well as the issuance of certificate of ancestral domain title (CADT).

In addition, the Act states establishment of the National Commission on Indigenous Cultural Communities/Indigenous Peoples (NCIP) as a primary government agency for the assistance of ICCs/IPs as well as creation of the Ancestral Domain Fund to cover compensation of expropriated lands, delineation and development of ancestral domains.

## I.3 Preliminary Evaluation of Potential Environmental and Social Impacts

### I.3.1 Outline of the Programs and Projects in IWRM Plan

The IWRM Plan prepared in November 2010 is composed of six (6) sectors including 18 proposed and 30 conceptual programs and projects as listed below. Annex-T I 3.1.1 gives the outlines and scopes of the respective programs and projects.

**Table I. 3.1.1 Number of Proposed and Conceptual Projects under IWRM Plan**

Sector	Proposed Projects	Conceptual Plans*	Total
1. Agriculture/Irrigation and Fishery	11	3	14
2. Municipal Water Supply, Sanitation and Sewerage	4	11	15
3. Flood and Sediment Disaster Management	2	3	5
4. Watershed Management	-	4	4
5. Water-related Environment Management	1	4	5
6. Inter-sector for Water Resources Management	-	5	5
<b>Total</b>	<b>18</b>	<b>30</b>	<b>48</b>

Note (\*): Proposed by JICA Study Team  
Source: JICA Study Team

### I.3.2 Identification of the Projects covered by PEISS

In accordance with PEISS mentioned in Section I.2.2, in total 22 programs and projects included in the IWRM Plan may require preparation of the documents for ECC/CNC application at least in their F/S, as shown in Annex-T I.3.1.1 and summarized in Table I.3.2.1.

**Table I. 3.2.1 Proposed and Conceptual Programs and Projects in IWRM Plan Covered by PEISS**

Groups	Description	Documents Required For ECC/CNC Application	Code of Projects Concerned* <sup>1</sup>
Group I	ECPs (Environmentally Critical Projects) in either ECAs (Environmentally Critical Areas) or NECAs (Non-Environmentally Critical Areas)	Environmental Impact Statement (EIS)/ Environmental Performance Report and Management Plan (EPRMP)	AI-P-01, 02* <sup>2</sup> , 09, IS-C-02, MW-P-04, MW-C-05, 06, FL-C-01,
Group II	NECPs (Non-Environmentally Critical Projects) in ECAs	EIS/EPRMP Initial Environmental Examination Report (IEER) / Initial Environmental Examination Checklist (IEEC) / App. for Application form to be processed in the Automated Processing System (APS)	AI-P- 04,11, AI-C-01, MW-P-02, MW-C-01~04, FL-P-01~02, WQ-P-01, WQ-C-04 (Group II or III, depending on the project locations)
Group III	NECPs in NECAs	App for APS	
Group IV	Co-located Projects in either ECA or NECA	Programmatic Environmental Impact Statement (PEIS)/ Programmatic Environmental Performance Report and Management Plan (PEPRMP)	-
Group V	Unclassified Projects	App for APS	AI-P-03, 05

Note: 1\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

2\*:- The original ECC was issued on 21<sup>st</sup> of January, 1992 based on the Environmental Impact Assessment undertaken in 1986. An updated EIS was prepared during the F/S study conducted in 2009 due to the possible changes of the base line data.

Source: JICA Study Team

As shown above, there are four (4) proposed and four (4) conceptual projects identified as Environmentally Critical Project (ECP) under Group I which requires EIS for ECC application. While, there are six (6) proposed and six (6) conceptual projects defined as NECP, which shall be categorized into Group II or III depending whether the project site is located in ECAs or not since there is

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

limitation of the information to determine the project sites at this stage. Besides, there are two (2) projects categorized as Group V which requires preparation of the application format for Automated Processing System (APS).

In addition, other conceptual and planned projects of the IWRM plan could be categorized into above-mentioned groups when their project components and sites are determined.

**I.3.3 Alternative Options for the Conceptual Projects Categorized as Environmentally Critical Project under PEISS**

As mentioned in the previous section, there are four (4) conceptual projects proposed by the Study Team and categorized as ECP under Group I. In order to mitigate the potential adverse impacts by the projects, the alternative options for the projects are considered as tabulated below.<sup>13</sup>

**Table I. 3.3.1 Alternative Options for Conceptual Projects Categorized as Environmentally Critical Projects**

Code of Projects*	Alternative options examined	Outline/Scope of the Program/Project	Remarks
MW-C-05/ IS-C-02	Option 1 Bayabas storage dam	Major activity is the construction of the dam (H=110m) and its relevant structures with an aim to have the reservoir with 144 MCM storage capacity.	-
	Option 2 Balintingon storage dam and conveyance to AMRIS	Major activities are the construction of the facilities: Rock-fill center-core dam (H=140m) and its appurtenant structures with an aim to have the reservoir with 572 MCM storage capacity. Open-type powerhouse equipped with 2 Francis type turbines with the capacity of 15 MW Diversion weir (L=140m) Irrigation facilities: main canal (L=109km), laterals(L=168km) and sub-laterals, main and supplementary farm ditches, drainage channels (L=210km), and access roads	Same as AI-P-01
	Option 3 Upgrading and improvement of irrigation facilities and water management of AMRIS	Major activity is to upgrade the main canals in AMRIS by concrete lining to reduce the conveyance loss in the canals.	-
	Option 4 Excess water for MWSS from Ipo Dam (Laiban Dam)	Major activity is the construction of Laiban Dam which is expected to correspond to the future water demand of Metro Manila.	-
MW-C-06	Option 1 Residual groundwater at surrounding cities/municipalities	Major activity is the installation of wells with the pipelines with pumps for water intake from neighboring municipalities.	-
	Option 2 Direct abstraction of surface water of Pampanga River at Cong Dadong Dam	Major activity is the installation of the systems for direct abstraction of surface water of Pampanga river through the reservoirs	-
	Option 3 Gumain Reservoir Project	Major activity is construction of 108m high, zoned embankment dam to store irrigation water which covers 11,000 ha of paddy field and 5,200 ha of sugarcane plantation and to increase the water supply in 7,900 ha of Porac-Gumain & Caulaman River Irrigation System.	Same as AI-P-09
FL-C-01	Option 1 River Channel Improvement	Major activities are construction of riverbank and channel dredging/excavation at the downstream of Pampanga river.	-
	Option 2 Flood Retarding Basin	Major activity is construction of dike to set up the flood retarding basin in Pampanga river basin.	-

Note\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

Source: JICA Study Team

<sup>13</sup> Since the project components shall be revised in the further studies, the alternative options are subject to be changed to select the optimum option in the following studies. Therefore, this report limits to the simple initial IEE for each option without the selection of the optimum options.

### **I.3.4 Screening and Scoping of the Programs and Projects based on the JICA Guidelines for Environmental and Social Considerations**

All the proposed and conceptual programs and projects of the IWRM Plan were re-examined in accordance with JICA Guidelines for Environmental and Social Considerations, so that the Study Team could formulate the IWRM Plan to minimize any adverse impacts. To do so, the following procedures were taken.

- Step 1 Screening: All the 18 proposed and 30 conceptual programs and projects including the alternative options were screened by using a checklist as shown in Annex-T I.3.4.1.
- Step 2 Scoping: The potential impacts which are expected by a project were further reviewed to evaluate the extent and nature of the respective impacts.
- Step 3 Selection of the mitigation measures: Based on the evaluation, mitigation measures to the projects with potential adverse impacts were proposed.

### **I.3.5 Result of Initial Screening and Scoping of the Programs and Projects in IWRM Plan**

As for the impact assessment of the Screening, the relevant environmental impact items were ranked depending on its environmental and social significance in accordance with rating criteria listed below.

#### Rating Criteria

- A+/-: Significant positive/negative impact is expected.
- B+/-: Some positive/negative impact is expected.
- C+/-: Extent of positive/negative impact is unknown. (A further examination is required in the further project formulation)
- -: No negative impact is expected.

The results of the initial screening of all the proposed and conceptual programs and projects in the IWRM Plan are shown in Annex-T I.3.4.1. Accordingly, there are 11 programs and projects including 10 options with the rating of A- and/or B- on the relevant environmental impact items as summarized below.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I. 3.5.1 Proposed and Conceptual Programs and Project in IWRM Plan with Possible Negative Environment Impacts Identified in Initial Screening Process**

Code of Projects Concerned*	Possible Negative Environment Impacts by the Project	
	Items expected to be affected by significant adverse impacts (A-)	Items expected to be affected by less adverse impacts (B-)
AI-P-01/ MW-C-05/ IS-C-02 ( Option-2 )	- <u>Planning phase:</u> Involuntary resettlement, Social vulnerable groups	- <u>Construction phase:</u> Topography, Landscape, Air pollution, Waste, Noise and vibration - <u>Construction and operation phase:</u> Inequality between beneficiaries and project-affected peoples, Water use right, Water pollution, - <u>Operational phase:</u> Flow regime of lake and river, Flora and fauna, Bottom sediment
AI-P-02	- <u>Planning phase:</u> Involuntary resettlement, Social vulnerable groups	- <u>Construction phase:</u> Topography, Landscape, Air pollution, Waste, Noise and vibration - <u>Construction and operation phase:</u> Inequality between beneficiaries and project-affected peoples, Water use right, Flora and fauna, Water pollution - <u>Operational phase:</u> Flow regime of lake and river, Bottom sediment, National park or equivalent area in terms of its ecological importance
AI-P-04	-	- <u>Operation phase:</u> Flow regime of lake and river
AI-P-09/ MW-C-06 ( Option-3 )	-	- <u>Construction phase:</u> Topography, Landscape, Air pollution, Waste - <u>Construction and operation phase:</u> Water use right, Flora and fauna, Water pollution - <u>Operational phase:</u> Flow regime of lake and river, Bottom sediment
MW-P-01/02	-	- <u>Operational phase:</u> Flow regime of lake and river
MW-P-04	-	- <u>Construction phase:</u> Topography and geology, Landscape, Waste - <u>Construction and operation phase:</u> Water use right, Water pollution - <u>Operational phase:</u> Flow regime of lake and river, Bottom sediment
MW-C-05/ IS-C-02 ( Option-1 )	-	- <u>Construction phase:</u> Topography and geology, Landscape, Air pollution, Waste - <u>Construction and operation phase:</u> Water use right, Flora and fauna, Water pollution - <u>Operational phase:</u> Flow regime of lake and river, Bottom sediment
MW-C-05/ IS-C-02 ( Option-4 )	- <u>Planning phase:</u> Involuntary resettlement, Social vulnerable groups	- <u>Construction phase:</u> Topography and geology, Landscape, Air pollution, Waste, Noise and vibration - <u>Construction and operation phase:</u> Inequality between beneficiaries and project-affected peoples, Flora and fauna, Water pollution - <u>Operational phase:</u> Flow regime of lake and river, Bottom sediment
MW-C-06 ( Option-1 )	-	- <u>Planning phase:</u> Conflict of interests
MW-C-06 ( Option-2 )	-	- <u>Operation phase:</u> Flow regime of lake and river
FL-C-01 ( Option-1 )	- <u>Planning phase:</u> Involuntary resettlement	- <u>Construction phase:</u> Air pollution, Water pollution, Waste, Noise and Vibration - <u>Construction and operation phase:</u> Inequality between beneficiaries and project-affected peoples
FL-C-01 ( Option-2 )	- <u>Planning phase:</u> Land use and utilization of local resources	- <u>Planning phase:</u> Conflict of interests - <u>Construction and operation phase:</u> Existing social infrastructure, National park or equivalent area in terms of its ecological importance, Flora and fauna, Water pollution - <u>Operation phase:</u> Flow regime of lake and river

Note\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

Source: JICA Study Team

### I.3.6 Scoping Results and Proposed Mitigation Measures

#### I.3.6.1 Significant adverse impacts (A-)

As a result of the screening mentioned in the former section, significant adverse impacts (A-) would be expected for the following three (3) environmental components. The following table also indicates the timing of the occurrence of the impacts and the corresponding possible mitigation measures.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I. 3.6.1 Details, Timing of Occurrence and Mitigation Measures  
for Significant Adverse Impacts (A-)**

Environmental Components	Details of the adverse impacts	Projects*	Timing of the occurrence of the impacts	Mitigation measures
<b>i) Involuntary resettlement</b>	The installation of the infrastructures would cause involuntary resettlement at the project sites.	AI-P-01, 02, MW-C-05(Opt.2,4), IS-C-02(Opt.2,4), FL-C-01(Opt.1) <sup>14</sup>	Planning phases	- Selection of the alternative project sites with less number of affected households through the discussion with the community - Proper planning, implementation and monitoring of appropriate resettlement action plans
<b>ii) Land use/ utilization of local resources</b>	Land acquisition for the flood retarding basin (approx.16,000 ha) could be happened.	FL-C-01(Opt.2)	Planning phase	- Proper planning, implementation and monitoring of compensation measures for the land owners
<b>iii) Social vulnerable groups</b>	Involuntary resettlement would involve communities of Indigenous Peoples.	AI-P-01, 02, MW-C-05(Opt.2,4), IS-C-02(Opt.2,4),	Planning phases	- Enhancement of full participation of IPs in accordance with Free and Prior Informed Consent (FPIC) guidelines in coordination with NCIP - Preparation, implementation and monitoring of the action plans to recover the livelihoods for the indigenous peoples affected considering their culture and traditional customs

Note\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

### I.3.6.2 Less significant adverse impacts (B-)

Also, less significant adverse impacts (B-) would be expected for the following 14 environmental components as tabulated below.

**Table I. 3.6.2 (1/4) Details, Timing of Occurrence and Mitigation Measures  
for Less Significant Adverse Impacts (B-)**

Environmental Components	Details of the adverse impacts	Projects*	Timing of the occurrence of the impacts	Mitigation measures
<b>i) Existing Social Infrastructures</b>	Some of the existing roads could be affected by the construction of the dike.	FL-C-01(Opt.2)	Construction and operation phases	- Supplementary infrastructures at the junctions of the existing roads and planned dike with the aim to secure the current accessibility of the communities.
<b>ii) Inequality between beneficiaries and project-affected peoples</b>	The resettlement could impact the income level of the project-affected peoples.	AI-P-01, 02, MW-C-05(Opt.2,4), IS-C-02(Opt.2,4), FL-C-01(Opt.1)	Construction and operation phases	- Proper planning, implementation and monitoring of appropriate resettlement action plans

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<sup>14</sup> For AI-P-01, and MW-C-05/IS-C-02(Opt.2), 800-1,000 families would be expected to be resettled by the project, based on the interview with General Tino. In case for AP-P-02, 548 families would be expected to be resettled according to the information from the interview with NIA. Also, MW-C-05/IS-C-02 (Opt.4) could affect 4,300 families. As for FL-C-01 (Opt.1), the involuntary resettlement of 2,365 families would be expected based on Pampanga Delta Development Project (Flood Control Component) Review Study for Phase-2. 2003, Nippon Koei Co., Ltd.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I. 3.6.2 (2/4) Details, Timing of Occurrence and Mitigation Measures  
for Less Significant Adverse Impacts (B-)**

Environmental Components	Details of the adverse impacts	Projects*	Timing of the occurrence of the impacts	Mitigation measures
<b>iii) Conflict of interests</b>	Some conflict may be arisen between relevant LGUs in terms of the allocation of required ground water sources.	MW-C-06(Opt.1)	Planning phase	- Information sharing between relevant LGUs from the early stage of the project - Organizational setup of inter-municipal bodies to mediate disputes
	Some conflict of the interest may be arisen between the implementing agencies and some environmental organizations due to the potential impacts on the biodiversity in the locality.	FL-C-01(Opt.2)	Planning phase	- Information sharing between relevant stakeholders from the early stage of the project
<b>iv) Water use right and common land use right</b>	Some conflict of the water use right would be expected considering that current status of water use right may not be conferred on the implementing agencies for respective project purposes.	AI-P-01,02,09, MW-P-04, MW-C-05 (Opt.1,2), MW-C-06(Opt.3), IS-C-02(Opt.1,2)	Construction and operation phases	- Information sharing with the holders of current water use right at the project relevant area from the early stage of the project in order to reach the mutual consensus on possible transference of the water right for project implementation - Organizational setup to mediate disputes among stakeholders
<b>v) Topography and geology</b>	Some changes on topography and geographical features are expected due to the relevant earthworks.	AI-P-01,02,09, MW-P-04, MW-C-05 (Opt.1,2,4), MW-C-06(Opt.3), IS-C-02(Opt.1,2,4)	Construction phases	- Introduction of the slope protection works in case of the high risk of the soil erosion -Examination of the alternative project sites which require less arthworks
<b>vi) Flow regime of lake and river</b>	Some changes on flow regime of lake, river and swamp would be expected due to storage or extraction of river water by the infrastructure to be constructed.	AI-P-01,02,04, 09, MW-P-01,02,04, MW-C-05 (Opt.1,2,4), MW-C-06(Opt.2,3) ,IS-C-02(Opt.1,2,4 )	Operation phases	- Examination and securement of the amount of water flow required for the livelihood activities and biodiversity in the down streams

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Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I. 3.6.2 (3/4) Details, Timing of Occurrence and Mitigation Measures  
for Less Significant Adverse Impacts (B-)**

Environmental Components	Details of the adverse impacts	Projects*	Timing of the occurrence of the impacts	Mitigation measures
<b>vii) National park or equivalent area in terms of the ecological importance</b>	Installation of the reservoir may result in a habitat change of the area which is connected to Zambales range considered as Important Bird Area <sup>15</sup> .	AI-P-02	Operation phase	- Examination and consideration of the amount of water flow required for the habitats of flora and fauna in the respective area.
	The project implementation may alter the current condition of Candaba swamp which has been declared as a bird sanctuary by LGU as well as recognized as a Ramsar candidate site and part of the East Asian-Australasian Flyway.	FL-C-01(Opt.2)	Construction and operation phases	- Conservation measures for the habitats of the important species, especially waterfowls, such as restoration of the vegetations cleared in course of the project implementation, and securement of the necessary water flow for the species. - Examination of the alternative project site
<b>viii) Flora and Fauna</b>	The distribution of flora and fauna in the area may be altered due to the clearance of vegetation by the construction works and change of the flow regime in and around the area.	AI-P-01, 02, 09, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.2), IS-C-02(Opt.1,2,4)	Construction and operation phases	- Minimal cleaning of vegetation - Restoration of the vegetation cleared by the project implementation, especially at the habitats of vulnerable species - Examination and consideration of the amount of water flow required for the habitats of flora and fauna in the respective area
<b>ix) Landscape</b>	The original landscape can be changed by the slope cutting works at the installation of the facilities.	AI-P-01, 02, 09, MW-P-04, MW-C-05 (Opt.1,2,4), MW-C-06(Opt.3), IS-C-02(Opt.1,2,4)	Construction phase	- Plantation of grasses at the slope with installation of the structure measures if necessary
<b>x) Air pollution</b>	Air pollution due to equipment use for installation of the infrastructures may impact on air quality in and around the project site.	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1)	Construction phase	- Proper maintenance of the equipments
	Dust and particulate generation could impact on air quality.	IS-C-02(Opt.1,2,4)		- Spraying water on exposed surfaces of the construction area

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<sup>15</sup> Balog-Balog Multipurpose Project Stage II Feasibility Updating Study, December, 2009, National Irrigation Administration

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I. 3.6.2 (4/4) Details, Timing of Occurrence and Mitigation Measures  
for Less Significant Adverse Impacts (B-)**

Environmental Components	Details of the adverse impacts	Projects*	Timing of the occurrence of the impacts	Mitigation measures
<b>xi) Water pollution</b>	Soil inflow due to the earthworks could deteriorate water quality of the localities.	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1) IS-C-02(Opt.1,2,4)	Construction Phase	- Quarrying of the gravels at the site apart from the rivers - Slope protection works with vegetation covers
	Soil inflow into the water bodies due to the erosion of upper catchments could impact on water quality of the localities.	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), IS-C-02(Opt.1,2,4)	Operation phase	- Slope protection works with vegetation covers - Check dams at the critical tributaries
<b>xii) Waste</b>	The increment of the workers at the construction stage can increase the amount of the waste or generate waste scrap materials.	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1) IS-C-02(Opt.1,2,4)	Construction phases	- Proper treatment of the waste in coordination with LGUs
<b>xiii) Noise and vibration</b>	The local residents in and around the project sites would be disturbed by noise due to the construction works	AI-P-01,02, MW-C-05(Opt.2,4) , FL-C-01 (Opt.1), IS-C-02(Opt.2,4)	Construction phases	- Time-limited use of the equipments
<b>xvi) Bottom sediment</b>	Some impacts caused by the bottom sediment at the water storages, such as limitation of the water storage capacity of the dams or water pollution, would be expected	AI-P-01,02,09, MW-P-04, MW-C-05(Opt.1,2,4) MW-C-06(Opt.3), IS-C-02(Opt.1,2,4)	Operation phases	- Slope protection works with vegetation covers - Check dams at the critical tributaries

Note\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

## I.4 Identification of the necessary monitoring items during the project cycles

Based on the adverse impacts identified in the former section, necessary items to be monitored were identified by phase of the project cycle.

### I.4.1 Construction phase

There are five (5) environmental parameters, such as soil erosion, air quality, water quality, waste, noise and vibration to be monitored during the construction phase. The recommended monitoring measures including location, frequency of monitoring and analysis measures are summarized below.

**Table I. 4.1.1 Recommended Monitoring Measures of Environmental Parameters at Construction Phase**

Parameters to be monitored	Projects*	Location	Frequency of monitoring	Analysis measures
a. Soil erosion	AI-P-01,02,09, MW-P-04, MW-C-05 (Opt.1,2,4), MW-C-06(Opt.3), IS-C-02(Opt.1,2,4)	Project sites	Monthly	- Measurement of the size of soil erosion and slope failures
b. Air quality/ Dust pollution Total Suspended Particulate (TSP)	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1), IS-C-02(Opt.1,2,4)	Project sites and their surrounding area	Prior to operation	- Gravimetric method
c. Water quality/ BOD, PH, DO	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1), IS-C-02(Opt.1,2,4)	Project sites	Quarterly	- Water sampling
d. Waste	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1), IS-C-02(Opt.1,2,4)	Project sites and camping sites	Twice a week	- Waste characterization - Waste Volume measurement
e. Noise and vibration	AI-P-01,02, MW-C-05(Opt.2,4), FL-C-01 (Opt.1), IS-C-02(Opt.2,4)	Project sites and their surrounding areas	Quarterly	- Use of Sound Level Meter

Note\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

### I.4.2 Operation phase

As well, the recommended monitoring measures for three (3) environmental parameters at the operation phase, such as biodiversity, water quality and bottom sediment are tabulated below.

Sector I: Environmental and Social Considerations  
on Programs and Projects of the IWRM Plan

**Table I. 4.2.1 Recommended Monitoring Measures of Environmental Parameters at Operation Phase**

Parameters to be monitored	Projects*	Location	Frequency of monitoring	Analysis measures
a. Biodiversity	AI-P-01, 02, 09, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.2), IS-C-02(Opt.1,2,4)	Project sites and/or affected surrounding area	Yearly	- Reconnaissance survey to grasp the current condition of fauna and flora - Counting of the important species
c. Water quality/ BOD, PH, DO	AI-P-01, 02, 09, MW-P-04, MW-C-05(Opt.1,2,4), MW-C-06(Opt.3), FL-C-01 (Opt.1) IS-C-02(Opt.1,2,4)	Outfall of spillway, reservoir zone	Quarterly	- Water sampling
b. Bottom sediment	AI-P-01,02,09, MW-P-04, MW-C-05(Opt.1,2,4) MW-C-06(Opt.3), IS-C-02(Opt.1,2,4)	Reservoir	Once in 5 years	- Measurement with the equipments such as echo sounder

Note\*: The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

### I.4.3 Throughout the project cycles

As per the impact on the project affected peoples including indigenous people to be generated by the involuntary resettlement and land acquisition, implementation of the resettlement action plan, compensation plan and other action plans for the recovery of the livelihoods of the project affected people shall be monitored by the implementation agencies throughout the project cycles.

## **I.5 Important Notice on Implementation of the Projects**

When the environmental and social consideration of the project, which consists of the IWRM Plan, is examined, the comments, suggestions and recommendations of the stakeholders have to be incorporated through stakeholder meetings. Moreover, the methodologies and procedures for organizing of the stakeholder meetings shall accord to the standards in the Philippines, and those in of the donor, if the project is implemented through assistance from the donor.



# *Annex-Tables*





Annex-T I.2.2.1 (1/2) Summary of Environmentally Critical Areas (ECAs)

ECA Categories	Examples	GIS data collected for the preparation of the maps by the Study Team	
		Data collected	Sources
A. Areas declared by law as national parks, watershed reserves, wildlife preserves, and sanctuaries	Areas of the National Integrated Protected Areas System (NIPAS)	- Initial Component of NIPAS for establishment - Proclaimed/Declared Protected Areas	- Protected Areas and Wildlife Bureau, DENR - JICA Study Team
B. Areas set aside as aesthetic, potential tourist spots	Areas declared and reserved by the Department of Tourism or other authorities for tourism development	- Nature-based Tourism Sites	- Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Manila Bay Area Environmental Atlas
C. Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)	Areas inhabited by indeterminate species, threatened species, rare species, endangered species, such species categorized as Appendix I or II of CITES as well as listed in the The National List of Threatened Fauna	-	-
D. Areas of unique historic, archeological, geological, or scientific interests	- National historical landmarks, geological monuments, paleontological and anthropological reservations as designated or determined by the National Historical Institute, National Museum, National Commission for Culture and the Arts, National Commission on Geological Sciences, and other authorities	- Historical and Cultural Sites	- PEMSEA, Manila Bay Area Environmental Atlas
E. Areas which are traditionally occupied by cultural communities or tribes	- Areas that are occupied or claimed as Certificated Ancestral Domains/Lands by indigenous communities	- Ancestral Domains with approved (Certificate of Ancestral Domain Title) CADT - Ancestral Domains with on-going social preparation - Ancestral Domains with completed survey - Ancestral Domains with on-going survey	- National Commission on Indigenous Peoples (NCIP) - JICA Study Team
F. Areas frequently visited and or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.	- Areas frequently visited or hard-hit by typhoons - Areas frequently visited or hard-hit by tsunamis - Areas frequently visited or hard hit by earthquakes - Storm surge-prone areas - Flood-prone areas - Areas prone to volcanic activities - Areas located along fault lines or within fault zones - Drought-prone areas	- Active Volcanoes	- Philippine Institute of Volcanology and Seismology (PHIVOLCS)
G. Areas with critical slope	- Lands with slope of 50% or more - Alienable and disposable forest lands and unclassified forests	- Earthquake Epicenters	- U.S. Geological Survey (USGS)

Annex-T I.2.2.1 (2/2) Summary of Environmentally Critical Areas (ECAs)

ECA Categories	Examples	GIS data collected for the preparation of the maps by the Study Team	
		Data collected	Sources
H. Areas classified as prime agricultural lands	- Irrigated and irrigable areas and other areas mapped under the Network of Protected Areas for Agriculture (NPAA) of the Bureau of Soils and Water Management (BSWM)	- Faultlines	- DENR Region III
I. Recharged areas of aquifers	- Areas of sources of water replenishment	- Flood-prone Areas	- JICA Study Team
J. Water bodies	- Areas that are tapped for domestic purposes - Areas which support wildlife and fishery activities	- Tropical Cyclone frequency	- Philippine Atmospheric, Geophysical & Astronomical Services Administration (PAGASA)
K. Mangrove Areas	- Tidal areas covered by salt-tolerant, intertidal tree species - Areas declared as mangrove swamp forest reserves	- Slope	- JICA Study Team
L. Coral Reefs	- Areas characterized by the assemblage of different types of marine plants and organisms - Areas identified by local sources such as PAWB-DENR to be rich in corals.	- Strategic Agriculture and Fisheries Development Zones(SAFDZ)	- BSWM, DA - JICA Study Team

Source: Compiled by the Study Team based on Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

Annex-T I.2.2.2 (1/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP I: ENVIRONMENTALLY CRITICAL PROJECTS (ECPs)<sup>2</sup> in both Environmentally Critical Areas (ECAs) and Non-ECAs, as declared in and Presidential Proclamation No.803(1996) for Golf Courses, and Presidential Proclamation No. 2146 (1961) for Heavy and Resource Extractive Industries &amp; Infrastructure Projects</b>			
<b>Project Type</b>		<b>Project Size Parameter</b>	<b>EIA Report Type Required / Decision Document</b>
			<b>Environmental Impact Statement (EIS) / EDC</b>
	<b>A.</b>	<b>GOLF COURSES</b>	
1.	A.1	<b>Golf course projects/complex</b>	number of holes
			regardless of number of holes
	<b>B.</b>	<b>HEAVY INDUSTRIES</b>	
2.	B.1	<b>Iron Steel Mills<sup>4</sup></b>	annual production rate
			≥ 30,000 MT
3.	B.2	<b>Non-Ferrous Metal Industries<sup>5</sup></b>	annual production rate
			≥ 30,000 MT
	B.3	<b>Petroleum and Petrochemical Industries<sup>6</sup></b>	
4.	B.3.a.	Petrochemical industry projects	annual production rate
			> 30,000 MT
5.	B.3.b.	Recycling of oil and other petroleum chemicals	daily recycling rate
			> 10 MT
6.	B.3.c.	Refineries	annual production rate
			≥ 30,000 barrels
7.	B.4	<b>Smelting Plants<sup>7</sup></b>	annual smelting rate of raw material
			≥ 15,000 MT
	<b>C.</b>	<b>RESOURCE EXTRACTIVE INDUSTRIES</b>	
	C.1	<b>FISHERY PROJECTS - DIKES FOR/AND FISHPOND DEVELOPMENT PROJECTS<sup>8</sup></b>	
8.	C.1.a.	Fishery/Aquaculture Projects (inland-based, e.g., lakes, rivers, etc.)	total water spread area to be utilized
			≥ 25 hectares
9.	C.1.b.	Fishery/Aquaculture Projects in water bodies (coastal areas)	total water spread area to be utilized
			≥ 100 hectares
	C.2.	<b>FORESTRY PROJECTS</b>	
	C.2.a.	Logging Projects	
10.	C.2.a.1.	Communit Based Forest Resources Utilization (CBFRU) <sup>9</sup>	volume of trees to be cut
			≥ 10,000 m <sup>3</sup>
11.	C.2.a.2.	Integrated Forest Management Agreement (IFMA) projects <sup>9</sup>	volume of trees to be cut
			≥ 10,000 m <sup>3</sup>
12.	C.2.a.3.	Timber License Agreement (TLA)	volume of trees to be cut
			≥ 10,000 m <sup>3</sup>
13.	C.2.b.	Grazing Projects <sup>9, 10</sup>	grazing capacity
			> 1 head/hectare
14.	C.2.c.	Introduction of Exotic Fauna in Public and Private Forests	
			Regardless of number or area
15.	C.2.d.	Major Wood Processing Projects	equivalent annual production rate
			> 8,000 m <sup>3</sup>
16.	C.2.b.1.	Pulp and Paper Industries	annual production capacity
			≥ 50,000 MT
	C.3.	<b>MAJOR MINING AND QUARRYING PROJECTS</b>	
17.	C.3.a.	Coal Mining	annual extraction rate
			> 70,000 MT
	C.3.b.	Extraction of metallic ores (on shore)	
18.	C.3.b.1.	- Open pit method with mechanical operations, blasting or combinations thereof	annual extraction rate OR area to be mined
			≥ 100,000 MT OR > 25 hectares
19.	C.3.b.2	- Other methods	annual extraction rate OR area to be mined
			≥ 150,000 MT OR > 25 hectares

Annex-T I.2.2.2 (2/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP I: ENVIRONMENTALLY CRITICAL PROJECTS (ECPs)<sup>2</sup> in both Environmentally Critical Areas (ECAs) and Non-ECAs, as declared in and Presidential Proclamation No.803(1996) for Golf Courses, and Presidential Proclamation No. 2146 (1961) for Heavy and Resource Extractive Industries &amp; Infrastructure Projects</b>				
20.	C.3.c.	Extraction of non-metallic ores with or without explosive - Limestone/shale/silica/clay/placer and other non-metal ores - Aggregates (sand, stone, gravel) - Dredging activities resulting to commercial use or ore recovery	annual extraction rate OR quarry area	≥ 75,000 MT OR ≥ 20 hectares
	C.3.d.	Extraction of Oil and Gas (Land-based) <sup>11</sup>		
21.	C.3.d.1.	- Commercial extraction of oil	daily commercial extraction rate	≥ 4,000 barrels (or equivalent)
22.	C.3.d.2.	- Commercial extraction of gas	daily commercial extraction rate	≥ 250,000 m <sup>3</sup>
23.	C.3.e.	Metallic Mineral or ore processing (e.g. copper, lead, nickel, cobalt, zinc, silver, magnesium and manganese, gold)	annual processing (inputs)	> 70,000 MT
24.	C.3.f.	Non-metallic mineral processing plants like cement, other cement products, clinker, limestone	annual production rate	> 50,000 MT
25.	C.3.g.	Non-metallic mineral processing projects like ceramic industries, manufacture of glass and glass products, manufacture and processing of calcium	annual production rate	> 70,000 MT
26.	C.3.h.	Off-shore mining (including commercial extraction of oil and gas, deuterium) <sup>11</sup>		Regardless of commercial capacity or area
	<b>D.</b>	<b>INFRASTRUCTURE PROJECTS</b>		
27.	D.1.	<b>MAJOR DAMS</b>	Reservoir flooded area OR meter storage capacity	≥ 25 hectares OR ≥ 20 million m <sup>3</sup>
28.	D.2.	<b>MAJOR RECLAMATION PROJECTS</b>	area reclaimed	≥ 50 hectares
	D.3.	<b>MAJOR ROAD &amp; BRIDGES</b>		
29.	D.3.a.	Bridges and viaducts, new construction	length	≥ 10.0 km
30.	D.3.b.	On-grade railway system, new		Regardless of length and width
31.	D.3.c.	Roads, new construction, widening (including RO-RO facilities)	length with no critical slope OR length with critical slope	≥ 20.0 km OR ≥ 10.0 km
32.	D.3.d.	Tunnels and sub-grade roads and railways	length	≥ 1.0 km
	D.4.	<b>MAJOR POWER PLANTS (Proc No. 2146 declared types: fossil-fueled, nuclear fueled, hydroelectric or geothermal)</b>		
33.	D.4.a.	Fuel Cell	total power production capacity	≥ 100 km
34.	D.4.b.	Gas-fired thermal power plants	total power production capacity	≥ 50 km
35.	D.4.c.	Geothermal facilities	total power production capacity	≥ 50 km
36.	D.4.d.	Hydropower facilities	water impounding capacity	≥ 20 million cubic meters
37.	D.4.e.	Other thermal power plants (e.g., diesel, bunker, coal, etc.)	total power production capacity	≥ 30 MW

Annex-T I.2.2.2 (3/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>					
<b>First Set of Group II Projects under similar Project Types as declared in Presidential Proclamation No. 2146</b>					
<b>Project Type</b>			<b>Project Size Parameter</b>	<b>EIA Report Type for Corresponding Project Size/Threshold/ Decision Document</b>	
				<b>Initial Environment Examination<sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC</b>	<b>Project Description Report<sup>12</sup> / CNC</b>
	<b>A.</b>	<b>HEAVY INDUSTRIES</b>			
38.	A.1.	<b>Iron and Steel Mills<sup>4</sup></b>	annual production rate	> 200 MT but < 30,000 MT	≤ 200 MT annually AND ≤ 1.0 MT daily
39.	A.2.	<b>Non-Ferrous Metal Industries<sup>5</sup></b>	annual production rate	> 200 MT but < 30,000 MT	≤ 200 MT annually AND ≤ 1.0 MT daily
	A.3.	<b>Petroleum and Petrochemical Industries<sup>6</sup></b>			
40.	A.3.a.	Petrochemical industry projects	annual production rate	> 200 MT but < 30,000 MT	≤ 200 MT annually AND ≤ 1.0 MT daily
41.	A.3.b.	Recycling of oil and other petroleum-based chemicals	daily recycling rate	> 1.0 MT but < 10 MT	≤ 1.0 MT daily AND ≤ 200 MT annually
42.	A.3.c.	Refineries	annual production rate	> 200 barrels but < 30,000 barrels	≤ 200 barrels annually AND ≤ 1.0 barrels daily
43.	A.4.	<b>Smelting Plants<sup>7</sup></b>	annual smelting rate of raw material	> 200 MT but < 15,000 MT	≤ 200 MT annually AND ≤ 1.0 MT daily
	<b>B</b>	<b>RESOURCE EXTRACTIVE INDUSTRIES</b>			
	B.1	<b>FISHERY PROJECTS - DIKES FOR/AND FISHPOND DEVELOPMENT PROJECTS<sup>8</sup></b>			
44.	B.1.a.	Fishery /Aquaculture Projects (inland-based, e.g., lakes, rivers, etc.	total water spread area to be utilized	≥ 1 hectare but < 25 hectares	< 1 hectare
45.	B.1.b.	Fishery/Aquaculture Projects in water bodies (coastal areas)	total water spread area to be utilized	≥ 1 hectare but < 100 hectares	< 1 hectare
	B.2.	<b>FORESTRY PROJECTS</b>			
	B.2.a.	Logging Projects			
46.	B.2.a.1.	Community Based Forest Resources Utilization (CBFRU) <sup>9</sup>	volume of trees to be cut	< 10,000 m <sup>3</sup>	
47.	B.2.a.2.	Integrated Forest Management Agreement (IFMA) projects <sup>9</sup>	volume of trees to be cut	< 10,000 m <sup>3</sup>	
48.	B.2.a.3.	Private land timber utilization (PLTU) <sup>9</sup>	volume of trees to be cut	> 100 m <sup>3</sup>	< 100 m <sup>3</sup>
49.	B.2.a.4.	Timber License Agreement (TLA)	volume of trees to be cut	< 10,000 m <sup>3</sup>	
50.	B.2.b.	Grazing Projects <sup>9, 10</sup>	Grazing capacity		1 head/hectare (but not more than 100 heads/100 hectares)
51.	B.2.c.	Introduction of Exotic Flora in Public and Private Forests		regardless of number or area	
52.	B.2.d.	Minor Wood Processing Projects <sup>9</sup>	equivalent annual AND production rate	≥ 1,000 to 8,000 m <sup>3</sup>	< 1,000 cubic meters

Annex-T I.2.2.2 (4/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>					
<b>First Set of Group II Projects under similar Project Types as declared in Presidential Proclamation No. 2146</b>					
<b>Project Type</b>			<b>Project Size Parameter</b>	<b>EIA Report Type for Corresponding Project Size/Threshold/ Decision Document</b>	
				<b>Initial Environment Examination<sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC</b>	<b>Project Description Report<sup>12</sup> / CNC</b>
53.	B.2.d.1.	Pulp and Paper Industries	annual production capacity	< 50,000 MT	
	B.3.	<b>MINOR MING &amp; QUARRYING PROJECTS</b>			
54.	B.3.a.	Batching Plant (with or without crushing)		All batching plants	
55.	B.3.b.	Coal mining	annual extraction rate	Up to 70,000 MT	
	B.3.c.	Extraction of metallic ores (on shore)			
56.	B.3.c.1.	· Open pit method with mechanical operations, blasting or combinations thereof	annual extraction rate AND area to be mined	< 100,000 MT AND < 25 hectares	
57.	B.3.c.2.	· Other methods	annual extraction rate AND area to be mined	> 200 MT but < 150,000 MT AND < 25 hectares	≤ 200.0 MT per year AND ≤ 1.0 MT daily extraction
58.	B.3.d.	Extraction of non-metallic ores with or without explosive · limestone/shale/silica/clay/placer and other non-metal ores · Aggregates (sand, stone, gravel) · Dredging activities resulting to commercial use or ore recovery	annual extraction rate AND quarry area	< 75,000 MT AND < 20 hectares	
	B.3.e.	Extraction of Oil and Gas (Land-based) <sup>11</sup>			
59.	B.3.e.1.	· Commercial extraction of oil	daily commercial extraction rate	< 4,000 barrels (or equivalent)	
60.	B.3.e.2.	· Commercial extraction of gas	daily commercial extraction rate	< 250,000 m <sup>3</sup>	
61.	B.3.f.	Marble slab processing plant		All marble slab processing plants	
62.	B.3.g.	Metallic Mineral or ore processing (e.g., copper, lead, nickel, cobalt, zinc, silver, magnesium and			
63.	B.3.g.1.	· With physical or mechanical processing	annual processing (inputs)	> 200.0 MT annually but < 70,000 MT	≤ 200.0 MT annually AND < 1.0 MT daily
64.	B.3.g.2.	· With chemical processing	annual processing (inputs)	< 70,000 MT	
65.	B.3.h.	Non-commercial Geothermal Exploitation Projects		Regardless of area or number of wells	

Annex-T I.2.2.2 (5/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>					
<b>First Set of Group II Projects under similar Project Types as declared in Presidential Proclamation No. 2146</b>					
Project Type			Project Size Parameter	EIA Report Type for Corresponding Project Size/Threshold/ Decision Document	
				Initial Environment Examination <sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC	Project Description Report <sup>12</sup> / CNC
66.	B.3.i.	Non-commercial mineral and fossil mining projects: core drilling/sampling, exploration (drilling and testing); feasibility studies; geo-scientific, physical surveys; gravity survey; piloting; reconnaissance; research and development activities; seismic survey, and similar activities with no significant earth moving activities, etc.			regardless of capacity or area
67.	B.3.j.	Non-metallic mineral processing plants like cement, either cement products, clinker, limestone, sulfur	annual production rate	> 200 MT but < 50,000 MT	≤ 200.0 MT annually AND ≤ 1.0 MT daily
68.	B.3.k.	Non-metallic mineral processing projects like ceramic industries, manufacture of glass and glass products, manufacture and processing of calcium	annual production rate	> 200 MT but < 70,000 MT	≤ 200.0 MT annually AND ≤ 1.0 MT daily
	<b>C.</b>	<b>INFRASTRUCTURE PROJECTS</b>			
69.	C.1.	<b>MINOR DAMS</b>	Reservoir flooded area AND water storage capacity	< 25 hectares AND < 20 million m <sup>3</sup>	
	C.2.	<b>MINOR POWER PLANTS (Proc. No. 2146 declared types: fossil-fueled, nuclear fueled, hydroelectric or geothermal)</b>			
70.	C.2.a.	Small power plants	total power production capacity		≤ 1 MW unless specified below
71.	C.2.b.	Fuel Cell	total power production capacity	≥ 5MW but < 100 MW	< 5 MW
72.	C.2.c.	Gas-fired thermal power plants	total power production capacity	≥ 10.0MW but < 50.0 MW	< 10.0 MW
73.	C.2.d.	Geothermal facilities	total power production capacity	>10MW but < 50.0 MW	≤ 1 MW
74.	C.2.e.	Hydropower facilities		< 20 million cubic meters water impounding capacity	Run-of-river system
75.	C.2.f.	Other thermal power plants (e.g, diesel, bunker, coal, etc.)	total power production capacity	≥ 5.0 MW but < 30.0 MW	< 5.0 MW

Annex-T I.2.2.2 (6/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>						
<b>First Set of Group II Projects under similar Project Types as declared in Presidential Proclamation No. 2146</b>						
Project Type			Project Size Parameter		EIA Report Type for Corresponding Project Size/Threshold/ Decision Document	
					Initial Environment Examination <sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC	Project Description Report <sup>12</sup> / CNC
76.	C.3.	<b>MINOR RECLAMATION PROJECTS</b>		area reclaimed	< 50 hectares	
	C.4.	<b>MINOR ROADS &amp; BRIDGES</b>				
77.	C.4.a.	Bridges and viaducts, new construction		length	> 80 m but < 10.0 km	Regardless of length for foot bridges; <80 m for other bridges
78.	C.4.b.	Roads, new construction, widening (including RO-RO facilities)		length with no critical slope OR length with critical slope	> 2 km but < 20.0 km OR > 2 km but < 10.0 km	< 2 km
79.	C.4.c.	Elevated roads, flyover/cloverleaf/interchanges			Regardless of length and width	
80.	C.4.d.	Tunnels and sub-grade roads and railways		length	< 1.0 km	
81.	C.4.e.	Pedestrian passages			All underpass projects	
	C.5.	<b>OTHER POWER PLANTS &amp; POWER FACILITIES (not listed in Proclamation No. 2146)</b>				
82.	C.5.a.	Small power plants	total power production capacity			≤ 1 MW unless specified below
83.	C.5.b.	Powerbarge	total power production capacity		> 1 MW but < 10 MW	≤ 1 MW
84.	C.5.c.	Power transmission lines	power carrying capacity		≥ 138 KV	
85.	C.5.d.	Renewable energy projects such as ocean, solar, wind, tidal power except waste-to-energy and biogas projects	total power production capacity	≥ 100 MW	≥ 5 MW but < 100 MW	< 5 MW
86.	C.5.e.	Substations switchyard	power output		> 220 Kv	≤ 220 kV
87.	C.5.f.	Waste- to-energy projects including biogas projects	total power production capacity	≥ 50.0 MW	> 1 MW but < 50 MW	≤ 1 MW
88.	C.5.g.	Wind farms/Wind projects	total power production capacity		> 5 MW but < 100 MW	< 5 MW



Annex-T I.2.2.2 (7/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>						
<b>Second Set of Group II Projects as defined by DENR-EMB (not included in declared Project Types as declared in Presidential Proclamation No. 2146)</b>						
Project Type			Project Size Parameter	EIA Report Type for Corresponding Project Size/Threshold/ Decision Document		
				Initial Environment Examination <sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC	Project Description Report <sup>12</sup> / CNC	
	<b>D.</b>	<b>AGRICULTURE INDUSTRY</b>				
89.	D.1.	Agricultural plantation (e.g. orchards, including rubber plantation)	Area to be developed	≥ 1,000 hectares	≥ 100 hectares but < 1,000 hectares	< 100 hectares
90.	D.2.	Agricultural processing facilities	annual production rate	≥ 50,000 MT	≥ 5,000 MT but < 50,000 MT	< 5,000 MT
91.	D.3.	Cut-flower industry Projects				regardless of capacity or area
	D.4.	Livestock Production				
92.	D.4.a.	Pigs/Goats (enclosed)	stock population	> 5,000 heads	> 100 heads but < 5,000 heads	< 100 heads
93.	D.4.b.	Poultry/birds <sup>13</sup>	stock population	≥ 100,000 heads	≥ 10,000 heads but < 100,000 heads	< 10,000 heads
94.	D.4.c.	Rice mill	milling rate		> 1 ton/hr	< 1 ton/hr
	<b>E.</b>	<b>Buildings, Storage Facilities and Other Structures</b>				
95.	E.1.	Cemetery	Area to be developed		≥ 5.0 hectares	< 5.0 hectares
96.	E.2.	Commercial (Business centers with residential units (mixed use), malls, supermarkets, public markets) · Fastfood/Restaurant Projects · Commercial Establishments (i.e. Showrooms)	total /gross floor area including parking and other areas	≥ 2.5 hectare	≥ 1 hectare but < 2.5 hectares	< 1 hectare; All other commercial establishments that sell only non-perishable goods and/or showrooms for motor vehicles and similar products
97.	E.3.	Commercial (office spaces only) Institutional and other related facilities: religious, government, and educational	total /gross floor area including parking and other areas		≥ 1 hectare	< 1 hectare
98.	E.4.	Facilities for Barangay Micro-Business Enterprise (BMBE) Projects <sup>14</sup>				regardless of capacity or area
99.	E.5.	Family dwellings/Apartments type	total /gross floor area including parking and other areas			Regardless of area
100.	E.6.	Funeral parlors, crematorium, columbarium	total /gross floor area including parking and other areas		≥ 1 hectare	< 1 hectare

Annex-T I.2.2.2 (8/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>							
<b>Second Set of Group II Projects as defined by DENR-EMB (not included in declared Project Types as declared in Presidential Proclamation No. 2146)</b>							
<b>Project Type</b>			<b>Project Size Parameter</b>		<b>EIA Report Type for Corresponding Project Size/Threshold/ Decision Document</b>		
					<b>Initial Environment Examination<sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC</b>	<b>Project Description Report<sup>12</sup> / CNC</b>	
101.	E.7.	Institutional and other related facilities: medical facilities			Primary, Secondary, Tertiary hospitals or Medical Facilities	Clinics (out-patient, health centers, dental clinics) including rural health units	
102.	E.8.	Institutional and other structures with laboratory facilities			Regardless of size or area		
103.	E.9.	Motels, Hotels, Condominium/Apartelles (residential)	total /gross floor area including parking and other areas		≥ 1 hectare	< 1 hectare	
104.	E.10.	LPG storage and refilling	storage capacity		Regardless of capacity		
105.	E.11.	Refilling station projects/gasoline station projects	storage capacity		≥ 20 kL	< 20 kL	
106.	E.12.	Storage of petroleum, petrochemical or related products	storage capacity	≥ 5,000 kL	< 5,000 kL but ≥ 20 kL	< 20 kL	
107.	E.13.	Storage facilities, non-toxic/hazardous materials, substances or products	total /gross floor area including parking and other areas		≥ 1 hectare	< 1 hectare	
108.	E.14.	Storage facilities, toxic/hazardous materials, substances or products	storage capacity	≥ 1,000 MT	≥ 0.1 MT but < 1,000 MT	< 0.1 MT	
109.	E.15.	Subdivision and housing projects, resettlement projects, economic and socialized housing project, open market housing and other similar (horizontal) and development projects	total land area, including all common and other areas		Regardless of area		
110.	E.16.	Telecommunication Projects <sup>15</sup>				Regardless of type	
	<b>F.</b>	<b>Chemical Industries (For associated building requirements, refer to Group E.14/E.15)</b>					
111.	F.1.	Manufacturing, processing and/or use of substances included in the Priority Chemical List	quantity of toxic chemicals to be used per month	≥ 1.0 MT	> 0.001 MT but < 1.0 MT	≤ 0.001 MT	
112.	F.2.	Manufacture of explosives, propellants and industrial gases	daily production rate	≥ 5 MT	> 0.001 MT but < 5 MT	≤ 0.001 MT	
113.	F.3.	Manufacture of agri-chemicals and other industrial chemicals not in the PCL	annual production rate	≥ 30,000 MT	> 200 MT but < 30,000 MT	≤ 200 MT annually AND ≤ 1 MT daily	

Annex-T I.2.2.2 (9/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>						
<b>Second Set of Group II Projects as defined by DENR-EMB (not included in declared Project Types as declared in Presidential Proclamation No. 2146)</b>						
<b>Project Type</b>				<b>Project Size Parameter</b>	<b>EIA Report Type for Corresponding Project Size/Threshold/ Decision Document</b>	
					<b>Initial Environment Examination<sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC</b>	<b>Project Description Report<sup>12</sup> / CNC</b>
114.	F.4.	Pharmaceutical industries and manufacture of soap and detergents, health and beauty products, and other consumer products	annual production rate	≥ 50,000 MT	> 200 MT but < 50,000 MT	≤ 200 MT annually AND ≤ 1 MT daily
115.	F.5.	Surface coating industries (paints, pigments, varnishes, lacquers, anti-capacity fouling coating, printing inks)	annual production rate	≥ 30,000 MT	> 200 MT but < 30,000 MT	≤ 200.0 MT annually AND ≤ 1.0 MT daily
116.	<b>G.</b>	<b>Cottage Industries<sup>16</sup></b>				regardless of capacity or area
117.	<b>H.</b>	<b>Demonstration and Pilot Projects</b>				regardless of capacity or area
	<b>I.</b>	<b>Environmental Enhancement and Environmental Mitigation Projects<sup>12</sup> ( PD Report required)</b>				
118.	I.1.	Artificial Reef				regardless of capacity or area
119.	I.2.	Pollution control devices or facilities required under the ECC condition/s of the "main" projects covered under Groups I or II.				regardless of capacity or area
120.	I.3.	Pollution control devices or similar facilities intended to prevent emissions and/or discharges beyond allowable limits (e.g. for compliance with Clean Air Act or Clean Water Code)				no Groups I and II components wherein thresholds are required an EIS, IEER or IEEC
121.	I.4.	Prevention or proactive measures against potential natural hazards (such as shore protection, river embankment/river bank stabilization, seawall, etc.)				no Groups I and II components wherein thresholds are required an EIS, IEER or IEEC
122.	I.5.	Reforestation projects				capacity or area based on the recommendations and endorsement of FMB and/or PAWB on a case-to-case basis

Annex-T I.2.2.2 (10/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>							
<b>Second Set of Group II Projects as defined by DENR-EMB (not included in declared Project Types as declared in Presidential Proclamation No. 2146)</b>							
Project Type			Project Size Parameter	EIA Report Type for Corresponding Project Size/Threshold/ Decision Document			
				Initial Environment Examination <sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC	Project Description Report <sup>12</sup> / CNC		
	<b>J.</b>	<b>Food and Related Industries<sup>17</sup> (For associated building requirements, refer to Group II E.14/E.15)</b>					
123.	J.1.	Animal products processing (fish/meat processing, canning, slaughterhouses, etc.	daily production rate	≥ 10,000 kg	≥ 500 kg but < 10,000 kg	< 500 kg	
124.	J.2.	Coconut processing plants (including production of coconut based products)	monthly production rate	≥ 25,000 MT	< 25,000 MT		
125.	J.3.	Distillation and Fermentation Plants (e.g. bio-ethanol project)	annual production rate	≥ 50,000	< 50,000 MT		
126.	J.4.	Food preservation (e.g., drying, freezing) and other methods aside from canning				regardless of capacity	
127.	J.5.	Fruit and vegetable processing	daily production rate	> 500 kg	< 500 kg		
128.	J.6.	Leather and related industries	daily processing rate of raw hides		≥ 1 MT	< 1.0 MT	
129.	J.7.	Other types of food (and other food by-products, additives, etc.) processing industries	annual production rate	≥ 50,000 MT	< 50,000 MT		
130.	J.8.	Processing of dairy products	monthly production rate	≥ 100,000 L (liquid) OR > 100,000 kg (solid)	<100,000 L (liquid) OR < 100,000 kg (solid)		
131.	J.9.	Sugar Mills	annual production rate	≥ 50,000 MT	< 50,000 MT		
	<b>K.</b>	<b>Manufacture of Other Products, e.g. Packaging Materials<sup>18</sup> (For associated building requirements, refer to Group II D.12/D.13)</b>					
132.	K.1.	Glass-based products	annual production rate		≥ 30,000 MT	< 30,000 MT	
133.	K.2.	Metal-based products (including Semi-Conductor/Electronic Industries)	annual production rate		≥ 15,000 MT	< 15,000 MT	
134.	K.3.	Paper and plastic-based products	annual production rate		≥ 15,000 MT	< 15,000 MT	
135.	<b>L.</b>	<b>Pipeline Projects</b>					
136.	L.1.	Fuel pipelines	length	> 25 km	< 25 km		
137.	L.2.	Other pipelines	length	> 50 km	< 50 km		

Annex-T I.2.2.2 (11/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>							
<b>Second Set of Group II Projects as defined by DENR-EMB (not included in declared Project Types as declared in Presidential Proclamation No. 2146)</b>							
Project Type			Project Size Parameter		EIA Report Type for Corresponding Project Size/Threshold/ Decision Document		
					Initial Environment Examination <sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC	Project Description Report <sup>12</sup> / CNC	
138.	M.	Service industries which do not emit pollutants except for domestic wastes and occupying a space equal to or less than limits specified in Groups I or II for infrastructures or other applicable project components needed in the service industry. <sup>19</sup>				regardless of capacity or area	
	N.	<b>Textile, Wood, Rubber Industries ( For associated building requirements, refer to Group II E.14./E.15.)</b>					
139.	N.1.	Textile, Wood, Rubber Industries <sup>20</sup>	annual production rate	> 50,000 MT	< 50,000 MT	Garment manufacturing <sup>21</sup> w/o dyeing and only involves spinning, cutting and sewing regardless of capacity or area	
140.	N.2.	Wood and Metal Furniture Assembly <sup>22</sup>					
	O.	<b>Tourism Industry</b>					
141.	O.1.	Resorts and other tourism/leisure projects	Area to be developed	≥ 25 hectares	> 0.1 hectares but < 25 hectares	< 0.1 hectare	
	P.	<b>Transport Terminal Facilities</b>					
142.	P.1.	Airports	functional size	larger than a private strip		Private airstrips	
143.	P.2.	Land transport terminal (for buses, jeepneys and other modes of transportation)	total land area		1 hectare to > 2 hectares	< 1 hectare without service facilities	
144.	P.3.	Sea port, causeways, and harbors	Area to be developed	> 15.0 hectares with reclamation OR ≥ 25.0 hectares (w/o reclamation)	< 15.0 hectares reclamation OR < 25.0 hectares (w/o reclamation)	< 1.0 hectares (w/o reclamation)	
145.	Q.	Treasure Hunting Projects (located in NIPAS areas)			regardless of capacity or area		
	R.	<b>Waste Management Projects</b>					
146.	R.1.	Compost/fertilizer making	quantity of waste to be treated annually		≥ 15 MT	< 15 MT	
147.	R.2.	Domestic wastewater treatment facility	quantity of waste to be treated annually	≥ 5,000 m <sup>3</sup>	< 5,000 m <sup>3</sup>	< 30 m <sup>3</sup>	

Annex-T I.2.2.2 (12/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP II - Non-ECPs in Environmentally Critical Areas (ECAs)</b>						
<b>Second Set of Group II Projects as defined by DENR-EMB (not included in declared Project Types as declared in Presidential Proclamation No. 2146)</b>						
Project Type			Project Size Parameter	EIA Report Type for Corresponding Project Size/Threshold/ Decision Document		
				Initial Environment Examination <sup>3</sup> (IEE Report IEER or IEE Checklist: IEEC) / ECC	Project Description Report <sup>12</sup> / CNC	
148.	R.3.	Hazardous waste treatment, recycling, and/or disposal facilities (for recycling of lead, see details in Group I - Heavy industries)	quantity of waste to be treated annually	≥ 10.0 MT	< 10.0 MT	
149.	R.4.	Industrial and hospital waste (non-hazardous) materials treatment facilities	number of users	≥ 50 m <sup>3</sup>	< 50 m <sup>3</sup>	
150.	R.5.	Landfill for industrial and other wastes	kind of activity	Multi-users	Single-user	
151.	R.6.	Materials Recovery Facilities	quantity of waste to be treated annually		with composting facilities (see category of composting above)	material segregation only
152.	R.7.	Receiving facilities, paper, plastic, and other materials recycling	daily waste input	≥ 300,000 MT	< 300,000 MT OR involving the use of chemicals	involve manual or mechanical sorting only
153.	R.8.	Sanitary landfill for domestic wastes only		> 1,000 MT	<u>&lt; 1,000 MT</u>	
	<b>S.</b>	<b>Water Supply, Irrigation or Flood Control Projects</b>				
154.	S.1.	Impounding System or Flood Control Project	reservoir flooded area	≥ 25 hectares	"< 25 hectares OR impounded water < 20 million m <sup>3</sup> "	
155.	S.2.	irrigation System (Distribution System only)	service area	≥ 1,000 hectares	> 300 hectares but < 1,000 hectares	< 300 hectares
156.	S.3.	Water Supply Systems (Complete System)	number of production wells	> 6 wells and other systems (e.g. infiltration gallery, etc.	≤ 6 wells	
157.	S.4.	Water Supply System (Distribution only)	distribution supply level		Level III - with household connection and water treatment	Level II - communal faucet and Level I - deep wells
158.	<b>T.</b>	<b>Wildlife Farming or any related projects<sup>23</sup> as defined by PAWB</b>			regardless of area	butterfly farming

Annex-T I.2.2.2 (13/15) Project Grouping Matrix for Determination of EIA Report Types for New Single Co-Located Projects<sup>1</sup>

<b>GROUP III - Non-Environmentally Critical Projects in Non-Environmentally Critical Areas (NECPs in NECAs) - non-covered projects</b>		
	A.	All Group II Project Types in NECA : Application for Automated Processing System (APS) required to be submitted for Enhancement and Mitigation Projects as basis for confirmation of benign nature of proposed activity, and CNC is required to be secured. All other projects shall be at the option of the Proponent to prepare an App. form for APS as basis for a CNC, should the Proponent opt to secure one.

<b>GROUP IV - CO-LOCATED PROJECTS<sup>1</sup></b>		
159.	A.	Co-located projects (mix of single projects in a contiguous area <u>optionally applied as one project</u> under one area/zone administrator) shall be automatically required a Programmable EIS regardless of capacity, area and number of locators/components.

<b>GROUP V - UNCLASSIFIED PROJECTS</b>		
<b>All Unclassified Projects shall submit</b> a Project Description as an interim documentary requirement. Unclassified Projects may be covered or non-covered by the EIS		
		Project Type required to submit an App. form for APS
160.	A.	Projects using new processes/technologies with uncertain impacts
161.	B.	All other projects not listed in <b>Groups I, II, III and IV</b>

Annex-T I.2.2.2 (14/15) Project Grouping Matrix for Determination of EIA Report Types for New  
Single Co-Located Projects<sup>1</sup>

**ENDNOTES TO Annex-T I.2.2.1**

1. **Single Projects** may be an individual project listed in this Annex-T I.2.2.1, or a multi-component project applied as a single project under one (1) ownership or proponent, i.e. combination of related individual projects need to support the main project being applied for, e.g., a nickel mining project with components comprised of road network, bridge, port/causeway, buildings, and power plant, max threshold among project components will apply.  
**Single Projects** may also include individual projects of locators within an economic or industrial zone or park, opting to apply for individual ECCs. However, if the administrator of the zone, park or any integrated development within a defined contiguous area, adopts the option to apply for one (1) ECC for the entire program of development within such contiguous area, the group of projects shall be collectively called “**Co-located Projects**” which shall then be required a **Programmatic EIS**.
2. Per **NECP Office Circular No. 3 of 1983**, and updated by EMB with DTI concurrence on 06 July 2004 as authorized by Sections 2-D and 3-A of AO 42 issued on 02 November 2002 by the President of the Philippines.
3. **The IEE documentary requirement** may either be an IEE Report or an IEE Checklist. DENR-EMB requires the usage of the 28 checklists available at the EMB offices or downloadable from the EMB website. These are marked with © superscript in the IEE columns by Project Groups I and II.
4. **Iron and steel mills** refer to the organized and coordinated arrangement of manufacturing processes designed to prepare or smelt or process iron ores, steel scraps and/or primary iron and steel mill products into marketable products except when process involves reheating or resizing only.
5. **Non-ferrous metal industries** refer to the organized and coordinated arrangement of manufacturing processes designed to prepare smelt or process non-ferrous metals into marketable products. This shall include projects characterized by any of the following specification: a) classified as large industrial plants under the implementation rules of LOI No. 950 and b) will process non-ferrous metals such as cadmium, chromium and lead.
6. **Petroleum/Petrochemical Industries** shall refer to the organized and coordinated arrangement of manufacturing processes designed to physically and/or chemically transform petroleum and its derivatives into marketable products. Projects listed in this grouping with thresholds  $\geq 5,000$  MT shall be covered by Level 1 or Level 2 ERA requirement, as appropriate.
7. **Smelting plant projects** shall refer to the organized and coordinated arrangement of manufacturing processes designed to smelt metals or alloys and cast the same into some special form.
8. **Dikes for/and Fishpond Development Projects** shall refer to natural or artificial water impoundment involving dike construction and harvesting the same as marketable size and quantities.
9. Processing shall be done at the EMB Regional Office, however **approval will be at the EMB Central Office for logging projects involving cutting of trees equal to or greater than 5,000 cubic meters and for wood processing with greater than 4,000 cum** if equivalent product per year, per Dec. 13, 2006 DENR Secretary Memorandum Circular.
10. **Grazing Projects** shall refer to the management of forest range resources for forage productivity needed to support livestock production. Exceedance of the natural grazing capacity of 1 head/hectare is considered critical as specified in MNR AO No. 50 (1982).
11. The reckoning of “**commercial extraction**” of onshore and offshore oil & gas projects shall be after DOE’s approval of the Service Contractor’s Declaration of Commerciality.
12. **Poultry/birds** covers all avian species regardless whether these are ostrich, quails, ducks or fighting cocks, while the term head or pigs refer to individual heads of pigs not the sow level.
13. **Facilities for Barangay Micro-Business Enterprises (BMBE) Projects** as defined by R.A. 9178 including similarly-scaled projects with less than PhP 3.0 million capitalization involving only assembly of components, molding, sculpturing, cutting, sowing, knitting, weaving, briquetting, and carpentry works.
14. **Telecommunication Projects** – including a) broadcasting towers, monopole/guyed towers, three and four-legged self supporting towers and other similar structures; b) Indoor Antennae; c) based Transceiver Station (refers to equipment housing only and does not involve installation of a tower, based transceiver station antenna without equipment room or tower, and based transceiver station mounted on any existing structures; d) On top of a building (Mounted on a Building) wall mounted and floor mounted; e) Pole and Parapet Mounted Antennae; f) Monopole Tower. Structural integrity of telecommunication and broadcasting towers, including similar structures, is deemed to be under the jurisdiction of the LGUs (in line with the building code requirements). And, radiation concerns are deemed to be under the jurisdiction of DOH.



Annex-T I.2.2.2 (15/15) Project Grouping Matrix for Determination of EIA Report Types for New  
Single Co-Located Projects<sup>1</sup>

15. **Cottage Industries** – manufacture of stuffed toys, handicraft, souvenir items, decorative accessories, paper boxes, rope twines, throw pillow, etc. that do not generate toxic or hazardous materials and/or strong/highly, pollutive wastes; abaca trays, bags, belts; baseboards, baskets, beads, bird cage; blinds; boat shelves; bone products, candle; ceramics; chandeliers, Christmas ornaments; cloth hat; cords, decorative accessories; decorative angels decorative flowers or ornamental; decorative statues; doll house, fashion accessories; flower pots; food bowl; fossil stones; fruit bowls; garden accents; gift wares; hemp nets; hand painted terracotta; handcrafted carabao horns; handicrafts; house wares; jewelry case, key holder; laces; lamp base; lighting fixtures; lighting accessories, other; mini airplanes; mirror frames; molding frames; native fiber décor; nativity cards; paper boxes, paper mache; pencil case, porcelain and fiberglass items; religious decors; ribbons, rope, salad server; shell furniture; shirt printing; shoes; souvenir items; stainless steel kitchen equipment; stretcher; throw pillow; topiaries; torcher floor lamps; toys and stuffed toys; twines; vases, wall decors; wallet; wheel chairs, wine caddies, wire decors; wooden antiques; wooden hand painted cabinets; wooden mini boats.
16. **Food and Related Industries** – shall refer to the organized and coordinated arrangement of manufacturing processes designed to produce food, food by-products and beverages from various raw materials sources into marketable goods. The following projects or undertaking falls under this category: sugar mills, distillation and fermentation plants, fruit and vegetable processing, processing of dairy products, Animal products processing (fish/meat processing, canning, slaughterhouses, etc.), food preservation (e.g., drying, freezing) and other methods aside from canning, leather tanning and related industries, Gelatin, adhesives and other food by-products processing plants, coconut processing plants, and other types of food processing industries.
17. **Manufacture of Other Products, e.g. Packaging Materials** shall refer to the organized and coordinated arrangement of manufacturing processes designed to produce paper, plastics, glass and metal-based packaging materials and other marketable products from various raw material sources using molding, heating and other mechanical processes only.
18. **Service Industry** is defined as the sector of economy that supplies the needs of consumers but produces no tangible goods. Examples include information technology services, vehicle emission testing centers, consultancy services, broker-forwarding business, sea and air freight services, importation or purchase of equipment, containerized shipping services, trucking, banks, lending institutions, telecommunications and broadcasting towers, trading (of securities, stocks, etc.) business and similar activities.
19. **Textile, Wood and Rubber Industries** – shall refer to the organized and coordinated arrangement of manufacturing processes designed to produce marketable products and secondary raw materials from fibers, woods, rubber, paper and similar materials.
20. **Garment manufacturing** includes production of apron; blouses; bottle cover; cardigan for ladies and children; carpets and rugs; children garments; coin purse; crochet slipper and shoes; dresses; embroidered kitchen linens and table tops; face towel; hand woven embroidered piña barong; hats; knit tops; knitted sweaters; knitting pullover; leather gloves; mats; napkin rings; napkin; oven mittens; panel curtains, pants; pillowcase; placemats; pot holder; shirts; skirts and overall; sweatshirts; table cloth; table linens; table runner; telephone cover; trousers.
21. **Wood and Metal Furniture Assembly** (antique reproduction, buri furniture, dining sets; iron chairs and table; iron frames; rattan furniture; sala set; tables and chairs; and similar projects).
22. **Wildlife Farming** – establishments or facilities for wildlife farming, protection, conservation, commercial purposes.

Annex-T I.3.1.1 (1/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
1. Agriculture/Irrigation and Fisheries	AI-P-01: Balintongan Reservoir Multipurpose Project (BRMP)	Major activities are the construction of the facilities: <ul style="list-style-type: none"> <li>· Rock-fill center-core dam (H=140m) and its appurtenant structures with an aim to have the reservoir with 572 MCM storage capacity.</li> <li>· Open-type powerhouse equipped with 2 Francis type turbines with the capacity of 15 MW</li> <li>· Diversion weir (L=140m)</li> <li>· Irrigation facilities: main canal (L=109km), laterals(L=168km) and sub-laterals, main and supplementary farm ditches, drainage channels (L=210km), and access roads</li> </ul>	Group I	EIS
	AI-P-02: Balog-Balog Multipurpose Project Phase 2	Major activities are construction of the facilities: <ul style="list-style-type: none"> <li>· High earth and rock fill dam (H=113.5m) with the storage capacity of 625 MCM (effective storage: 525 MCM)</li> <li>· Hydropower plant with the capacity of 43.5MW</li> <li>· 150 to 200 deep production wells to develop ground water for supplementation of the irrigation water supply</li> <li>· Fishery component consisting of the construction and production of tilapia species in fixed floating cages of at least 150 ha within the Balog-Balog reservoir area. Estimated fishery production per cage is 6,300 kg/year*cage.</li> </ul>	Group I	EIS
	AI-P-03: Sector Loan on Rehabilitation of Irrigation Facilities	Major activity is rehabilitation of diversion works, canal system, drainage system, road, and O&M facilities.	Group V	App. for APS
	AI-P-04: Casecnan Multi-purpose Power & Irrigation Project Irrigation Component Phase 2	Major activities are: <ul style="list-style-type: none"> <li>· New construction of extension of Super Diversion Canal, construction of lateral, and sub-lateral canals, drainage canals and related structures</li> <li>· Rehabilitation/Improvement of UPRIS, such as rehabilitation of PENRIS main and lateral canals, and related structures</li> </ul>	Group II/III	EIS/App. for APS
	AI-P-05: Procurement of Pumps, Drilling Rigs & Related Equipment	Major activity is procurement of the following materials: <ul style="list-style-type: none"> <li>· 1,000 units of centrifugal pumps</li> <li>· 1 units of trailer mounted rotary/percussion type drilling rigs</li> <li>· 2 units of resistively machines &amp; electric logger</li> </ul>	Group V	App. for APS
	AI-P-06: Irrigation Water Resources Augmentation Pump Establishment Project	Major activities are: <ul style="list-style-type: none"> <li>· Procurement of 1,330 units of pumps including diesel engines</li> <li>· Installation of 301 units of shallow tube wells</li> <li>· Installation of 1,029 units of surface water pump irrigation to cover the entire target area</li> </ul>	-	-
	AI-P-07: Appropriate Irrigation Technologies for Enhanced Agricultural Production	Major activity is installation of the irrigation system with drip sprinkler and flood irrigation operated by the solar power	-	-

Annex-T I.3.1.1 (2/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
I. Agriculture/ Irrigation and Fisheries	AI-P-08: Central Luzon Groundwater Irrigation Systems Reactivation Project	Major activities are: · Construction of 100 deep well pump systems covering 5,000 ha · Provision of rural water supply in the selected barangays · Procurement of equipment	-	-
	AI-P-09: Gumain Reservoir Project	Major activity is construction of 108m high, zoned embankment dam to store irrigation water which covers 11,000 ha of paddy field and 5,200 ha of sugarcane plantation and to increase the water supply in 7,900 ha of Porac-Gumain & Caulaman RIS.	Group I	EIS
	AI-P-10: Rehabilitation of AMRIS	Major activity is rehabilitation of Bustos, Lower & Upper Maasim Dam.	-	-
	AI-P-11: Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects (SWIP), Small Diversion Dam Projects (SDD)	Major activities are: · Construction of SWIP and SDD in the above-mentioned provinces · Rehabilitation of SDD and SWIP in Nueva Ecija	Group II/III	IEE checklist/ App. for APS
	AI-C-01: New Construction of Small Scale Irrigation Project under BSWM	Major activity is construction of small scale irrigation systems which are not covered by on-going and planned projects under BSWM such as: · Diversion Dam (18 nos in 959 ha) · Small Water Impounding Projects (24 nos in 1,635 ha) · Small Farm Reservoir (4 nos in 112 ha) · Shallow Tube Well (STW) and others	Group II/III	IEE checklist/ App. for APS
	AI-C-02: Introduction of Water Saving Irrigation Technology	Major activities are: · Trial and research on water saving irrigation technology · Operation of demonstration farms on water saving irrigation technology · Training to trainers and technical campaign to Irrigator's Associations · Monitoring with close coordination among related agencies, such as DA, NIA, PhilRice, IRRI, and JICA technical cooperation project, etc. · Capacity development of IAs	-	-
	AI-C-03: Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	Major activities are: · Installation of additional discharge measurement device · Improvement of discharge monitoring system · Review of calibration of conversion tables · Establishment of communication system · Capacity development	-	-

Annex-T I.3.1.1 (3/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
2. Municipal Water Supply, Sanitation and Sewerage	MW-P-01: Rehabilitation of Umiray-Macua Facilities	Major activities is permanent rehabilitation works which includes: <ul style="list-style-type: none"> <li>• Complete restoration of the access road to tunnel outlet</li> <li>• Construction of permanent RCDG bridge for tunnel outlet</li> <li>• Widening of ox-bow channel at the tunnel outlet</li> <li>• Intake structures such as various mechanical gates; trash rack, waterway protection works, retaining wall, ogee dam, etc.</li> <li>• Rehabilitation of mini-hydro plant</li> <li>• Construction of log arresters</li> <li>• Installation of power/communication cables inside the tunnel</li> <li>• Village/Housing relocation</li> </ul>	-	-
	MW-P-02: Sumag River Diversion Project	Major activity is construction works such as: <ul style="list-style-type: none"> <li>• Intake facilities</li> <li>• Connection canal to the tunnel</li> </ul>	Group II/III	IEE/App. for APS
	MW-P-03: Bulacan Treated Bulk Water Supply Project	Major activity is construction works such as: water supply facilities, including a raw aqueduct, a treatment plant, reservoirs, pumping station and primary lines which cover 10 municipalities of Bulacan.	-	-
	MW-P-04: Metro Clark Bulk Surface Water Project	Major activity is installation of the water system with possible construction of storage dams at some of the potential sites such as Marimula, Sacobia and Bangut.	Group I	EIS (Possible amendment for existing ECC)
	MW-C-01: Additional Level 3,2,1 facilities towards 2025 in Bulacan	Major activities are: <ul style="list-style-type: none"> <li>• Development of water supply systems:                             <ol style="list-style-type: none"> <li>1) Installation of new water system</li> <li>2) Expansion and rehabilitation of the existing water system</li> </ol> </li> <li>• Soft components:                             <ol style="list-style-type: none"> <li>1) Utilization of high technology equipment in development of water system</li> <li>2) Immediate water repairs</li> <li>3) Provision of water meters</li> </ol> </li> </ul>	Group II/III	IEE/App. for APS
	MW-C-02: Additional Level 3,2,1 facilities towards 2025 in Pampanga			
	MW-C-03: Additional Level 3,2,1 facilities towards 2025 in Nueva Ecija			
	MW-C-04: Additional Level 3,2,1 facilities towards 2025 in Tarlac			
MW-C-05: Extended Bulacan Bulk Water Supply Project	There are four (4) options proposed: <ul style="list-style-type: none"> <li>• Bayabas Storage Dam</li> <li>• Balintongon Storage Dam (same as AI-P-01)</li> <li>• Upgrading and improvement of irrigation facilities and water management of AMRIS, consisting of installation of the water pipes/aqueducts</li> <li>• Excess water for MWSS from the dams such as Ipo dam which can be constructed outside the Pampanga river basin</li> </ul>	Group I	EIS	

Annex-T I.3.1.1 (4/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
2. Municipal Water Supply, Sanitation and Sewerage	MW-C-06: Pampanga Bulk Water Supply Project	There are three (3) options proposed: <ul style="list-style-type: none"> <li>· Residual groundwater at surrounding cities/municipalities</li> <li>· Pampanga river at Cong Dadong dam</li> <li>· Gumain storage dam, same as AI-P-09</li> </ul>	Group I	EIS
	MS-C-01: Additional sanitary facilities towards 2025 in Bulacan	Major activities are: <ul style="list-style-type: none"> <li>· Installation of conventional toilets and ecosan toilets</li> </ul>	-	-
	MS-C-02: Additional sanitary facilities towards 2025 in Pampanga	<ul style="list-style-type: none"> <li>· Capacity development of the implementing agencies for social preparation for users</li> </ul>	-	-
	MS-C-03: Additional sanitary facilities towards 2025 in Nueva Ecija		-	-
	MS-C-04: Additional sanitary facilities towards 2025 in Tarlac		-	-
	MP-C-01: Septage Treatment and Disposal Facility	Major activity is purchase of trucks for transportation of septage to the septage treatment and disposal facilities, such as the existing sanitary landfill in Kalangitan, Capas, Tarlac.	-	-
3. Management of Flood and Sediment Disasters	FL-P-01: Flood Control Measures in Mt. Pinatubo Devastated Area-Focus on Pasac Delta	Major activities are: <ul style="list-style-type: none"> <li>· Widening of the existing “pilot third river channel” (22.6 km in length from the confluence with Abacan river/San Fernando river) from the existing bottom width of 30 to 60 m</li> <li>· Excavation of the Pasac river as an eastern alignment of the pilot third river channel</li> <li>· Local drainage improvement connecting the San Fernando river to the Third river and the excavation of San Fernando river (total length:29.6m)</li> <li>· Key road raising to ensure that the transportation routes can be maintained during floods</li> </ul>	Group II/III	The type of the document for ECC shall require further discussion with EMB
	FL-P-02: Bacolor Comprehensive Rehabilitation Master Plan	Major activities are: <ul style="list-style-type: none"> <li>· Construction of Gugu ring dike (7.8 km in length)</li> <li>· Completion of the unfinished portion of Gugu Dike (1.0 km in length)</li> <li>· Channel excavation of Gugu creek and other various creeks (20 km in length)</li> <li>· Slope protection of various creeks in Bacolor municipality (11.0 km in length)</li> <li>· Construction of new drainage canals (47.5 km in length)</li> <li>· Installation of floodwater pumps in the southern part of Bacolor (2 units)</li> <li>· Construction of diversion channel for Pasig-Potrero river</li> </ul>	Group II/III	The type of the document for ECC shall require further discussion with EMB
	FL-C-01: Flood Mitigation for Pampanga Delta	The options proposed are: <ul style="list-style-type: none"> <li>· Construction of riverbank and channel dredging/excavation at the downstream of Pampanga river</li> <li>· Development of the flood retarding basin through construction of the dike</li> </ul>	Group I	EIS

Annex-T I.3.1.1 (5/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
3. Management of Flood and Sediment Disasters	FL-C-02: Community Based Flood Early Warning System for Provinces of Pampanga, Tarlac and N. Ecija	Major activities are: <ul style="list-style-type: none"> <li>· Establishment of the simple monitoring and communication system managed by the community for flood warning</li> <li>· Capacity building for the municipal and barangay personnel for operation, maintenance and management of the flood warning system</li> <li>· Information, Education and Communication (IEC) for the residents on the eligible flood evacuation routes/evacuation centers</li> </ul>	-	-
	FL-C-03: Maintenance, Rehabilitation and Improvement for Drainage and Flood Control Facilities under Jurisdiction of LGUs	Major activity is implementation of the maintenance, rehabilitation and improvement works for drainage and flood control facilities.	-	-
	FL-C-04: Integration of Salient Points of IWRM for Pampanga River Basin into School Curricula	Major activity is awareness raising activities targeting the students.	-	-
4. Watershed Management	WS-C-01: Upland Development Program	Possible component of the project is capacity development of upland farmers through the trainings, such as FFS with provision of the necessary equipments.	-	-
	WS-C-02: Protected Area Management Program	Major activities are: <ul style="list-style-type: none"> <li>· Characterization of watershed (basic resource inventory, assessment and mapping, and socio-economy survey)</li> <li>· Designation and ground delineation of the management zones</li> <li>· Organization of PAMBs and establishment of IPAF</li> <li>· Formulation of Protected Area Management Plans and harmonization with ancestral domain plans, forest land use plans and comprehensive landuse plans to address conflicting land use issues</li> <li>· Setting up of the mechanism to streamline compliance with FPIC requirements in ancestral domain areas</li> <li>· Initial implementation of priority action plans: <ul style="list-style-type: none"> <li>- Community-based reforestation through assisted natural regeneration in 5,615 ha of degraded forests</li> <li>- Biodiversity and wildlife conservation</li> <li>- Alternative livelihood for forest occupants</li> <li>- IEC campaigns</li> </ul> </li> </ul>	-	-
	WS-C-03: Urban Greening Program	Major activities are: <ul style="list-style-type: none"> <li>· Community/volunteers organization</li> <li>· Planting of timber and non-timber species</li> </ul>	-	-

Annex-T I.3.1.1 (6/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
4. Watershed Management	WS-C-04: Eco-tourism Program	Major activities are: <ul style="list-style-type: none"> <li>· Capacity development of the communities on guiding tours and relevant business management</li> <li>· Installation/renovation of the relevant facilities</li> </ul>	-	-
5. Water-related Environment Management	WQ-P-01: Clean Development Mechanism	Major activities are: <ul style="list-style-type: none"> <li>· Installation of facilities for wastewater and waste collection</li> <li>· Installation of treatment facilities to capture and convert methane gas, and to produce electricity</li> </ul>	Group II/III	IEE/App. for APS
	WQ-C-01: Capacity Development to Upgrade Water Quality monitoring and Data Management Program	Major activities are: <ul style="list-style-type: none"> <li>· Revision and rationalization of the existing monitoring system of water quality/effluent</li> <li>· Preparation of inventory and identification of the pollution sources</li> <li>· Capacity development of the staffs on laboratory management with the provision of appropriate facilities and equipments</li> <li>· Capacity development of WQMA governing board, private industries and other stakeholders</li> <li>· Strength the regulatory and coordination mechanism among the DENR-EMB, the LGUs and relevant agencies</li> <li>· IEC</li> </ul>	-	-
	WQ-C-02: Capacity Development to Improve Water Quality and Aquaculture Fisheries Management	Major activities are: <ul style="list-style-type: none"> <li>· Assessment of carrying capacity studies</li> <li>· Capacity building of relevant agencies</li> <li>· Setup the information management systems</li> </ul>	-	-
	WQ-C-03: Capacity Development Project to Improve Industry Adoption of Cleaner Production Options	Major activities are: <ul style="list-style-type: none"> <li>· Organization of the counterpart team</li> <li>· Preparation of inventory of non-compliant industries</li> <li>· Evaluation of production and environmental management system of the participating industries</li> <li>· Needs assessment and priority setting</li> <li>· Setting up of institutional, policy, market-based financial support mechanisms</li> <li>· Preparation of the industry-specific clean production manuals</li> <li>· Trainings</li> <li>· IEC</li> </ul>	-	-

Annex-T I.3.1.1 (7/7) Outlines of Proposed and Conceptual Projects and Programs of IWRM Plan

Sector	Proposed/Conceptual Program/Project	Outline/Scope of the Program/Project	Groups under PEISS	Possible Documents Required For ECC/CNC Application
5. Water-related Environment Management	WQ-C-04: Construction of Sanitary Landfills and Support Facilities in Nueva Ecija and Cluster Waste Transfer Stations in Bulacan and Pampanga	Major activities are: <ul style="list-style-type: none"> <li>· Construction of 5 sanitary landfills in Nueva Ecija, with the capacity for the 485,802 populations:                             <ol style="list-style-type: none"> <li>1) Provincial sanitary landfill at Gen.Tino</li> <li>2) Sanitary landfills at Munoz City, San Jose City, Palayan City and St. Rosa</li> <li>3) Materials Recovery Facilities : 12 municipalities</li> </ol> </li> <li>· Construction of 4 cluster transfer station-cum-materials recovery facilities for a cluster of LGUs in Bulacan and Pampanga, with the capacity for 2,020, 740 populations                             <ol style="list-style-type: none"> <li>1) Construction of 1 cluster transfer station each for a) Baliuag and Calumpit, b) Hagonoy and Malolos City, c) Angeles City and Guagua, d) Mabalacat and San Fernando City</li> </ol> </li> </ul>	Group II/III	IEE-checklist/ App. for APS
6. Inter-sector for Water Resources Management	IS-C-01: Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin	Major activities are: <ul style="list-style-type: none"> <li>· Installation of monitoring wells</li> <li>· Setting up of the monitoring network with the database management system</li> <li>· Capacity development of NWRB in ground water resource monitoring, which may include policy setting up for the groundwater regulation.</li> </ul>	-	-
	IS-C-02: Project for Recovery of Reliability of Water Supply in Angat-Umiray System	There are four (4) options proposed which could be combined depending on the results of the following studies : <ul style="list-style-type: none"> <li>· Bayabas Storage Dam</li> <li>· Balintingon Storage Dam (same as AI-P-01)</li> <li>· Upgrading and improvement of irrigation facilities and water management of AMRIS, consisting of installation of the water pipes/aqueducts</li> <li>· Excess water for MWSS from the dams such as Ipo dam which can be constructed outside the Pampanga river basin</li> </ul>	Group I	EIS
	IS-C-03: Enhancement of Monitoring System for Surface Water in Pampanga River Basin	Major activities are: <ul style="list-style-type: none"> <li>· Establishment of monitoring networks with proper database management</li> <li>· Capacity development of NWRB/RBO in monitoring of surface water to obtain the necessary data for control of water permits</li> </ul>	-	-
	IS-C-04: Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution	Major activities are: <ul style="list-style-type: none"> <li>· Capacity development of NWRB and relevant agencies on 1) improvement of water permit system, especially irrigation water use in Angat-Umiray system, and 2) operation of water allocation and its monitoring in Angat-Umiray system</li> <li>· Identification of potential/existing critical area for water</li> </ul>	-	-



### Annex-T I.3.4.1 (1/4) Summary of Environmental Scoping for Projects and Programs of IWRM Plan

	Sector	Agriculture/Irrigation and Fishery															
		Project Code*/ Impact Items	AI-P-01	AI-P-02	AI-P-03	AI-P-04	AI-P-05	AI-P-06	AI-P-07	AI-P-08	AI-P-09	AI-P-10	AI-P-11	AI-C-01	AI-C-02	AI-C-03	
Social Environment	1	Involuntary resettlement	A-	A-	C-	C-	-	-	-	-	C-	C-	C-	C-	-	-	
	2	Local Economy such as Employment & Livelihood, etc.	B+/C-	B+/C-	B+	B+	B+	B+	B+	B+	B+/C-	B+	B+	B+	B+	C+	
	3	Land use & Utilization of Local Resources	B+/C-	B+/C-	B+	B+/C-	B+	B+	B+	B+	B+/C-	C+/C-	B+	B+	B+	C+	
	4	Regional severance	C-	C-	-	C-	-	-	-	-	C-	-	C-	C-	-	-	
	5	Existing social infrastructure & Services such as Traffic/Existing Public Facilities	C+/C-	B+/C-	B+	C-	-	-	C+	-	B+	B+	-	-	B+	-	
	6	Social vulnerable groups such as the poverty and ethnic minority	C+/A-	C+/A-	C+/C-	C+/C-	C+/C-	C+/C-	-	C+/C-	C+/C-	C+/C-	C+/C-	C+/C-	C+/C-	-	-
	7	Inequality between beneficiaries and project-affected peoples	B-	B-	-	-	-	-	-	-	C-	C-	C-	C-	-	-	
	8	Cultural heritage	C-	C-	-	-	-	-	-	-	C-	-	C-	C-	-	-	
	9	Conflict of interests	C-	C-	C-	C-	C-	C-	-	C-	C-	C-	C-	C-	-	-	
	10	Water use right and common land use right	B-	B-	C-	C-	C-	C-	-	C-	B-	C-	C-	C-	C+	-	
	11	Sanitation	C-	C-	C-	C-	C-	C-	-	C-	C-	C-	C-	C-	-	-	
Natural Environment	12	Disaster (natural risk) and epidemic as HIV	B+/C-	B+/C-	C-	C-	C-	C-	-	C-	B+/C-	C-	C-	C-	-	-	
	13	Topography and geology	B-	B-	-	-	C-	C-	-	-	B-	-	-	-	-	-	
	14	Soil erosion	C-	C-	-	C-	-	-	-	-	C-	C-	C-	C-	-	-	
	15	Ground water	C+/C-	C+/C-	-	-	C-	C-	-	C-	C+/C-	C-	C+/C-	C+/C-	-	-	
	16	Flow regime of lake and river	B-	B-	C-	B-	C-	C-	-	-	B-	C-	C-	C-	-	-	
	17	National Park or equivalent area in terms of its ecological importance	C-	B-	C-	C-	-	C-	C-	C-	C-	C-	C-	C-	-	-	
	18	Coastal and sea area	C-	C-	C-	C-	C-	C-	-	C-	-	C-	C-	C-	-	-	
	19	Flora and fauna	B-	B-	C-	C-	C-	-	-	C-	B-	C-	C-	C-	-	-	
	20	Climate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21	Landscape	B-	B-	-	-	-	-	-	-	B-	-	C-	C-	-	-	
Pollution	22	Global warming	-	-	-	-	-	-	C+	-	-	-	-	-	-		
	23	Air pollution	C-	C-	C-	C-	C-	C-	-	C-	C-	C-	C-	C-	-	-	
	24	Water pollution	B-	B-	C+/C-	C+/C-	C+/C-	C+/C-	C+/C-	C+/C-	B-	C+/C-	C+/C-	C+/C-	-	-	
	25	Soil pollution	C-	C-	C+/C-	C+/C-	C+/C-	C+/C-	C+/C-	C+/C-	C-	-	C+/C-	C+/C-	-	-	
	26	Waste	B-	B-	C-	C-	C-	C-	-	C-	B-	C-	C-	C-	-	-	
	27	Noise and vibration	B-	B-	C-	C-	-	-	-	-	C-	C-	C-	C-	-	-	
	28	Ground subsidence	-	-	-	-	C-	C-	-	C-	-	-	C-	C-	-	-	
	29	Offensive odor	C-	C-	C-	C-	C-	C-	-	C-	C-	C-	C-	C-	-	-	
	30	Bottom sediment	B-	B-	-	-	-	-	-	-	B-	-	C-	C-	-	-	
	31	Accident	C-	C-	C-	C-	C-	C-	-	C-	C-	C-	C-	C-	-	-	

Note: Evaluation categories are as follows;

A+/-: Significant positive/negative impact is expected.

B+/-: Some positive/negative impact is expected to some extent.

C+/-: Positive/negative impact is unknown in the scoping stage (Further study was required.).

-: No negative impact is expected. Therefore, the item under this category is not subject to the EIA/IEE

\* The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

### Annex-T I.3.4.1 (2/4) Summary of Environmental Scoping for Projects and Programs of IWRM Plan

	Sector	Municipal Water Supply, Sanitation and Sewerage															
		Project Code*/ Impact Items	MW-P- 01	MW-P- 02	MW-P- 03	MW-P- 04	MW-C - 01	MW-C - 02	MW-C - 03	MW-C - 04	MW-C - 05				MW-C - 06		
											Opt.1	Opt.2	Opt.3	Opt.4	Opt.1	Opt.2	Opt.3
Social Environment	1	Involuntary resettlement	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-
	2	Local Economy such as Employment & Livelihood, etc.	C+	C+	C+	C+	C+	C+	C+	C+	C+	C+	C+	C+	C+	C+/C-	B+/C-
	3	Land use & Utilization of Local Resources	B+	B+	B+	B+	C+	C+	C+	C+	C+/C-	B+/C-	B+	C+/C-	B+	B+	B+/C-
	4	Regional severance	-	-	-	-	C-	C-	C-	C-	B+/C-	C-	-	B+/C-	C-	C-	C-
	5	Existing social infrastructure & Services such as Traffic/Existing Public Facilities	B+	-	-	-	-	-	-	-	C-	B+/C-	B+	B+/C-	-	-	B+
	6	Social vulnerable groups such as the poverty and ethnic minority	C-	C-	C-	C-	C-	C-	C-	C-	C+/C-	C+/A-	C+/C-	C+/A-	C+/C-	C+/C-	C+/C-
	7	Inequality between beneficiaries and project-affected peoples	C-	C-	C-	C-	C-	C-	C-	C-	C-	B-	-	B-	C-	-	C-
	8	Cultural heritage	-	-	-	C-	C-	C-	C-	C-	C-	C-	-	C-	C-	C-	C-
	9	Conflict of interests	-	-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	B-	C-	C-
	10	Water use right and common land use right	-	C-	C-	B-	C-	C-	C-	C-	B-	B-	C-	C-	C-	C-	B-
	11	Sanitation	-	C+	B+	C-	C+	C+	C+	C+	C-	C-	C-	C-	C-	C+/C-	C-
Natural Environment	12	Disaster (natural risk) and epidemic as HIV	-	C+	B+	B+/C-	C-	C-	C-	C-	C-	B+/C-	C-	C-	C-	C-	B+/C-
	13	Topography and geology	-	-	-	B-	-	-	-	-	B-	B-	-	B-	-	-	B-
	14	Soil erosion	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	-	C-	C-	-	C-
	15	Ground water	-	-	-	C+/C-	-	-	-	-	C+/C-	C+/C-	-	C+/C-	C+/C-	C-	C+/C-
	16	Flow regime of lake and river	B-	B-	C-	B-	C-	C-	C-	C-	B-	B-	C-	B-	C-	B-	B-
	17	National Park or equivalent area in terms of its ecological importance	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	-	-	C-	C-	C-
	18	Coastal and sea area	-	-	-	-	C+/C-	C+/C-	C+/C-	C+/C-	-	C-	C-	-	-	C-	-
	19	Flora and fauna	C-	C-	C-	C-	C-	C-	C-	C-	B-	B-	C-	B-	C-	-	B-
	20	Climate	-	-	-	-	-	-	-	-	-	-	-	-	-	C-	-
	21	Landscape	C-	C-	C-	B-	C-	C-	C-	C-	B-	B-	-	B-	C-	-	B-
Pollution	22	Global warming	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23	Air pollution	-	-	-	C-	-	-	-	-	C-	C-	C-	C-	C-	C-	C-
	24	Water pollution	C+/C-	C+/C-	B+/C-	B-	C+/C-	C+/C-	C+/C-	C+/C-	B-	B-	C+/C-	B-	C+/C-	-	B-
	25	Soil pollution	-	-	-	C-	-	-	-	-	C-	C-	C+/C-	C-	C+/C-	-	C-
	26	Waste	-	-	-	B-	-	-	-	-	B-	B-	C-	B-	C-	-	B-
	27	Noise and vibration	C-	C-	C-	C-	C-	C-	C-	C-	C-	B-	C-	B-	C-	B+	C-
	28	Ground subsidence	-	C+	B+	-	B+	B+	B+	B+	-	-	-	-	C-	-	-
	29	Offensive odor	-	-	-	C-	-	-	-	-	C-	C-	C-	C-	C-	-	C-
	30	Bottom sediment	-	-	C-	B-	C-	C-	C-	C-	B-	B-	-	B-	C-	C-	B-
	31	Accident	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-	C-

Note: Evaluation categories are as follows;

A+/-: Significant positive/negative impact is expected.

B+/-: Some positive/negative impact is expected to some extent.

C+/-: Positive/negative impact is unknown in the scoping stage (Further study was required.).

-: No negative impact is expected. Therefore, the item under this category is not subject to the EIA/IEE

\* The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

### Annex-T I.3.4.1 (3/4) Summary of Environmental Scoping for Projects and Programs of IWRM Plan

	Sector	Municipal Water Supply, Sanitation and Sewerage					Flood and Sediment Disaster Management						Watershed Management						
		Project Code*/ Impact Items	MS-C- 01	MS-C- 02	MS-C- 03	MS-C- 04	MP-C- 01	FL-P- 01	FL-P- 02	FL-C- 01		FL-C- 02	FL-C- 03	FL-C- 04	WS-C - 01	WS-C - 02	WS-C - 03	WS-C - 04	
										Opt.1	Opt.2								
Social Environment	1	Involuntary resettlement	-	-	-	-	-	C-	C-	A-	-	-	-	-	-	-	-	-	
	2	Local Economy such as Employment & Livelihood, etc.	C+	C+	C+	C+	C+	B+	B+	B+	B+	-	B+	-	C+	B+	C+	C+	
	3	Land use & Utilization of Local Resources	-	-	-	-	-	B+	B+	B+	A-	-	-	-	C+	C+	C+	C+	
	4	Regional severance	-	-	-	-	-	C-	-	C-	C-	-	C+/C-	-	-	-	-	-	
	5	Existing social infrastructure & Services such as Traffic/Existing Public Facilities	-	-	-	-	C+	B+	-	-	B-	-	B+	-	-	-	-	C+	
	6	Social vulnerable groups such as the poverty and ethnic minority	-	-	-	-	-	C-	C-	C-	C-	C+	C+	-	C+	C+	C+	C+	
	7	Inequality between beneficiaries and project-affected peoples	-	-	-	-	-	C-	C-	B-	C-	-	C+/C-	-	C-	C-	-	C-	
	8	Cultural heritage	C-	C-	C-	C-	-	-	-	-	-	-	C-	-	-	-	C-	-	
	9	Conflict of interests	-	-	-	-	-	-	-	C-	B-	-	C-	-	C-	C-	C-	C-	
	10	Water use right and common land use right	-	-	-	-	-	-	-	-	-	-	C-	C+	C-	C-	C-	C-	
	11	Sanitation	B+	B+	B+	B+	B+	-	-	-	-	-	-	-	-	-	-	-	
Natural Environment	12	Disaster (natural risk) and epidemic as HIV	C+	C+	C+	C+	B+	B+	B+	B+	B+/B-	B+	C+	-	-	-	-	-	
	13	Topography and geology	-	-	-	-	-	C-	C-	C-	C-	-	-	-	-	-	-	-	
	14	Soil erosion	-	-	-	-	-	C-	C-	C-	C+/C-	-	C+	-	C+	C+	C+	C+	
	15	Ground water	C+/C-	C+/C-	C+/C-	C+/C-	-	C-	C-	C-	C-	-	-	-	-	-	-	-	
	16	Flow regime of lake and river	-	-	-	-	-	C-	C-	C+/C-	B-	-	C-	-	-	-	-	-	
	17	National Park or equivalent area in terms of its ecological importance	C+/C-	C+/C-	C+/C-	C+/C-	C+	C+/C-	C+/C-	C-	B-	-	C+/C-	C+	C+	B+	C+	C+	B+
	18	Coastal and sea area	C+/C-	C+/C-	C+/C-	C+/C-	-	C-	C-	C-	C-	-	-	C+	-	-	-	-	
	19	Flora and fauna	C+/C-	C+/C-	C+/C-	C+/C-	-	C+/C-	C+/C-	-	B-	-	C+/C-	C+	B+	B+	B+	B+	
	20	Climate	-	-	-	-	-	-	-	C-	-	-	-	-	-	-	-	-	
	21	Landscape	-	-	-	-	-	C-	C-	C-	C-	-	-	-	C+	C+	C+	C+	
Pollution	22	Global warming	-	-	-	-	-	-	-	C-	C-	-	-	C+	C+	C+	C+	C+	
	23	Air pollution	-	-	-	-	-	-	-	C-	C-	-	-	C+	-	-	-	-	
	24	Water pollution	C+/C-	C+/C-	C+/C-	C+/C-	C+	C-	C-	B-	B-	-	C-	C+	-	-	-	-	
	25	Soil pollution	C+/C-	C+/C-	C+/C-	C+/C-	C+	C-	C-	C-	-	-	C-	C+	-	-	-	-	
	26	Waste	C+/C-	C+/C-	C+/C-	C+/C-	C+	C-	C-	B-	C-	-	C-	C+	-	-	-	-	
	27	Noise and vibration	-	-	-	-	-	C-	C-	B-	C-	-	C-	-	-	-	-	-	
	28	Ground subsidence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29	Offensive odor	C+/C-	C+/C-	C+/C-	C+/C-	-	-	-	-	-	-	C-	-	-	-	-	-	
	30	Bottom sediment	-	-	-	-	-	C-	C-	C-	-	-	-	-	-	-	-	-	
	31	Accident	C-	C-	C-	C-	-	C-	C-	C-	C-	-	C-	-	-	-	-	-	

Note: Evaluation categories are as follows;

A+/-: Significant positive/negative impact is expected.

B+/-: Some positive/negative impact is expected to some extent.

C+/-: Positive/negative impact is unknown in the scoping stage (Further study was required.).

-: No negative impact is expected. Therefore, the item under this category is not subject to the EIA/IEE

\* The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

### Annex-T I.3.4.1 (4/4) Summary of Environmental Scoping for Projects and Programs of IWRM Plan

	Sector	Water-related Environment Management					Inter-sector for Water Resources Management							
		Project Code%/ Impact Items	WQ-P-01	WQ-C-01	WQ-C-02	WQ-C-03	WQ-C-04	IS-C- 01	IS-C- 02				IS-C- 03	IS-C- 04
									Opt.1	Opt.2	Opt.3	Opt.4		
Social Environment	1	Involuntary resettlement	-	-	-	-	C-	-	C-	A-	C-	A-	-	-
	2	Local Economy such as Employment & Livelihood, etc.	C+	-	C+	-	C+	C+	B+/C-	B+/C-	B+	B+/C-	C+	C+
	3	Land use & Utilization of Local Resources	C+	C+	C+	C+	C+	C+	C+/C-	B+/C-	B+	C+/C-	C+	C+
	4	Regional severance	-	-	-	-	-	-	B+/C-	C-	-	B+/C-	-	-
	5	Existing social infrastructure & Services such as Traffic/Existing Public Facilities	-	-	-	-	-	-	C-	B+/C-	B+	B+/C-	-	-
	6	Social vulnerable groups such as the poverty and ethnic minority	-	-	-	-	-	-	C+/C-	C+/A-	C+/C-	C+/A-	-	-
	7	Inequality between beneficiaries and project-affected peoples	-	-	-	-	-	-	C-	B-	-	B-	-	-
	8	Cultural heritage	-	-	-	-	C-	-	C-	C-	-	C-	-	-
	9	Conflict of interests	-	-	-	-	C-	-	C-	C-	C-	C-	-	B+
	10	Water use right and common land use right	-	-	-	-	C-	-	B-	B-	C-	C-	-	-
	11	Sanitation	C+	-	-	-	B+	-	C-	C-	C-	C-	-	-
Natural Environment	12	Disaster (natural risk) and epidemic as HIV	-	-	-	-	-	-	C-	B+/C-	C-	C-	-	-
	13	Topography and geology	-	-	-	-	C-	-	B-	B-	-	B-	-	-
	14	Soil erosion	-	-	-	-	C-	-	C-	C-	-	C-	-	-
	15	Ground water	-	-	-	-	C+	B+	C+/C-	C+/C-	-	C+/C-	C+	C+
	16	Flow regime of lake and river	-	-	-	-	-	-	B-	B-	C-	B-	-	-
	17	National Park or equivalent area in terms of its ecological importance	C+	C+	C+	C+	C+	-	C-	C-	-	-	-	-
	18	Coastal and sea area	-	C+	C+	C+	C+	-	-	C-	C-	-	-	-
	19	Flora and fauna	C+	C+	C+	C+	C+	-	B-	B-	C-	B-	-	-
	20	Climate	-	-	-	-	-	-	-	-	-	-	-	-
	21	Landscape	-	-	-	-	-	-	B-	B-	-	B-	-	-
Pollution	22	Global warming	C+	-	-	C+	-	-	-	-	-	-	-	-
	23	Air pollution	C+	-	-	C+	C+	-	C-	C-	C-	C-	-	-
	24	Water pollution	B+	B+	B+	C+	C+	C+	B-	B-	C+/C-	B-	B+	C+
	25	Soil pollution	B+	C+	C+	C+	C+	-	C-	C-	C+/C-	C-	-	-
	26	Waste	B+	-	-	C+	B+	-	B-	B-	C-	B-	-	-
	27	Noise and vibration	-	-	-	-	C-	-	C-	B-	C-	B-	-	-
	28	Ground subsidence	-	-	-	-	-	-	-	-	-	-	-	C+
	29	Offensive odor	C+/C-	-	-	C+	C+/C-	-	C-	C-	C-	C-	-	-
	30	Bottom sediment	-	-	-	-	-	-	B-	B-	-	B-	-	-
	31	Accident	C-	-	-	-	C-	-	C-	C-	C-	C-	-	-

Note: Evaluation categories are as follows;

A+/-: Significant positive/negative impact is expected.

B+/-: Some positive/negative impact is expected to some extent.

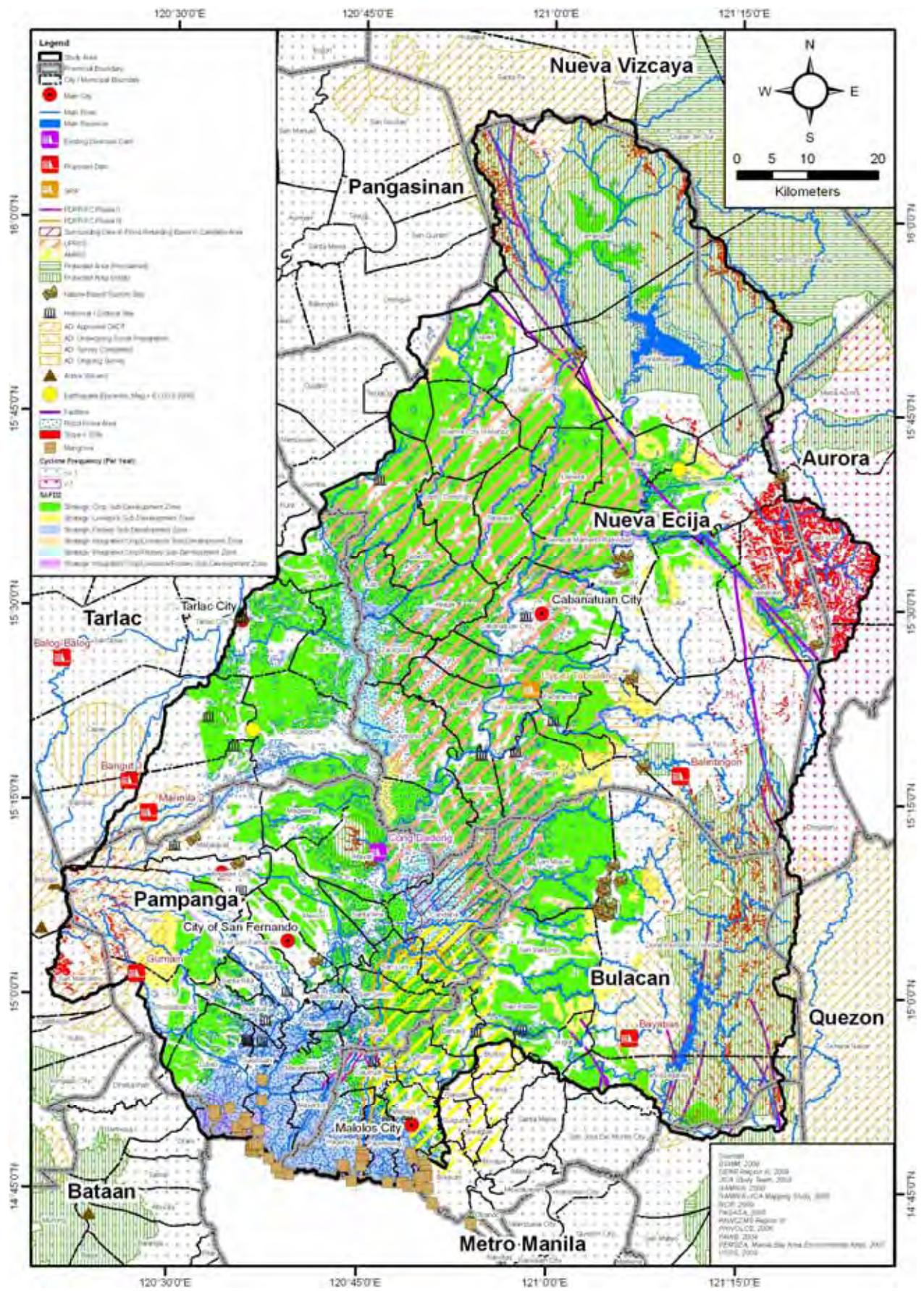
C+/-: Positive/negative impact is unknown in the scoping stage (Further study was required.).

-: No negative impact is expected. Therefore, the item under this category is not subject to the EIA/IEE

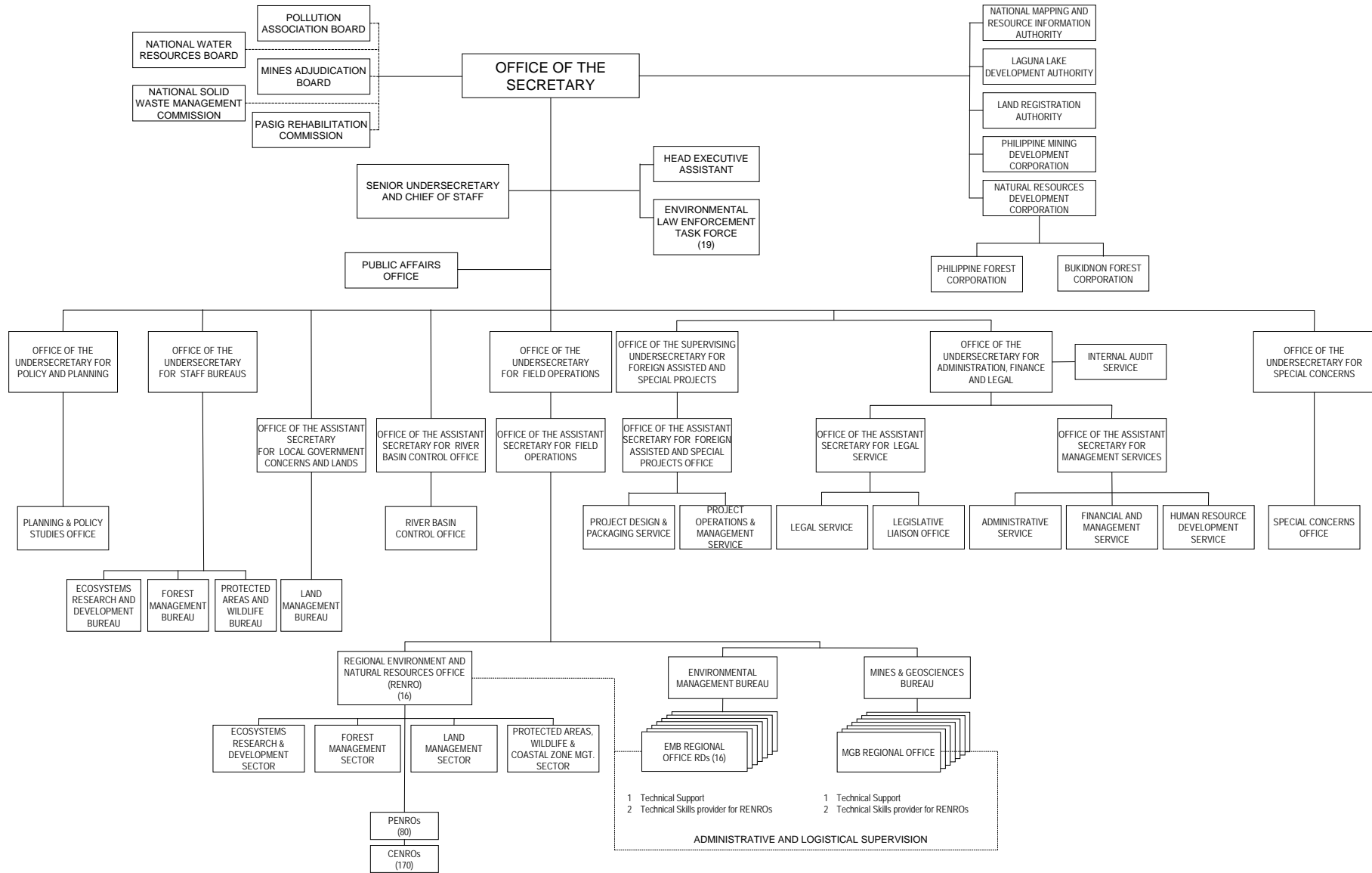
\* The project codes correspond to the project titles as shown in Annex-T I.3.1.1.

# *Annex-Figures*



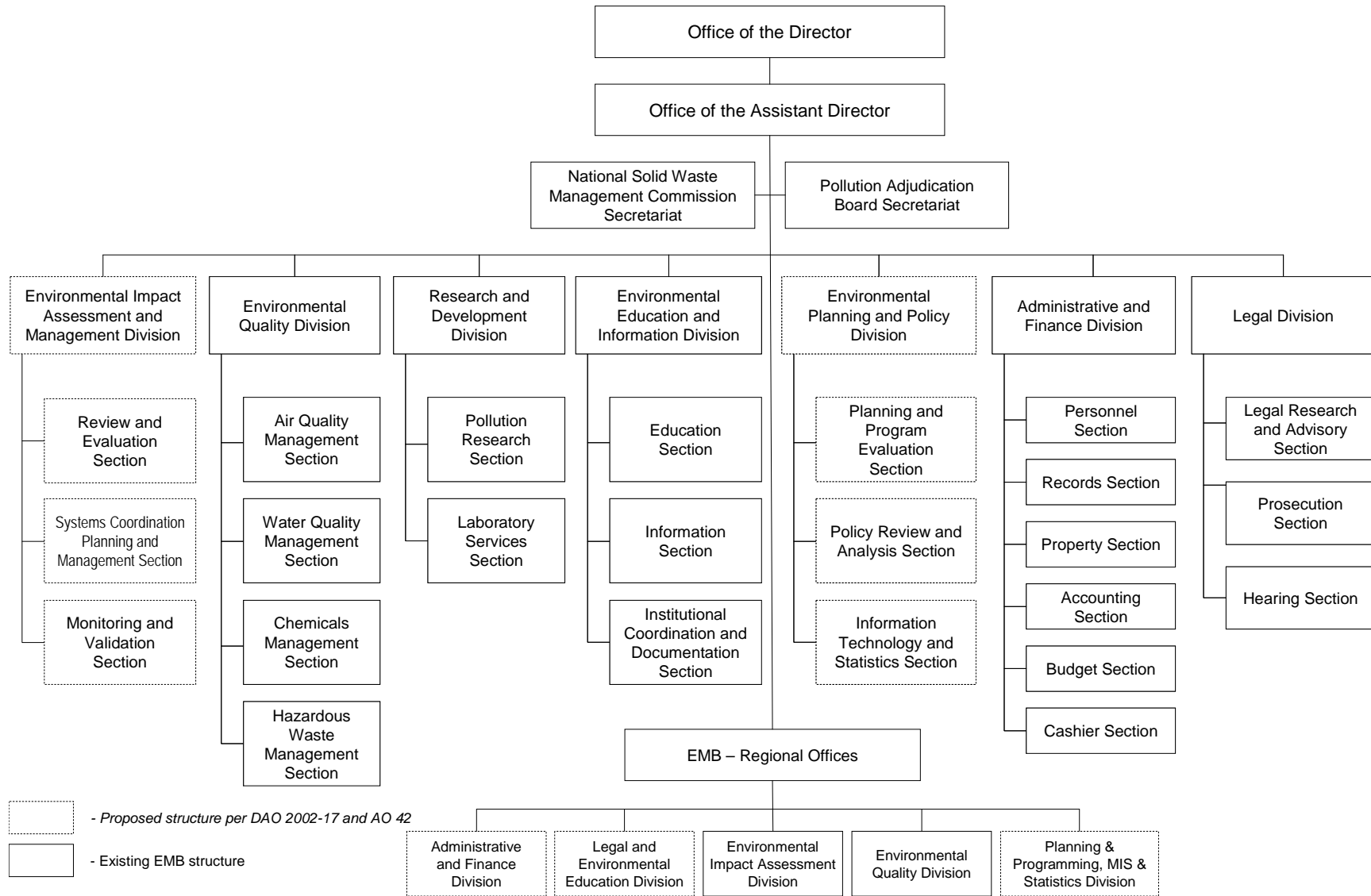


Annex-F I.2.2.1 Potential ECAs in Region III



Annex-F I.2.2.2 Organization chart of DENR





Annex-F I.2.2.3 Organization chart of EMB



***Sector J***

***Guideline for Formulation of IWRM Plan***



## Sector J. Guideline for Formulation of IWRM Plan

### Table of Contents

	<u>Pages</u>
<b>J.1 General.....</b>	<b>J-1</b>
J.1.1 Objectives of the Guideline .....	J-1
J.1.2 Basic Concept on the IWRM Plan .....	J-1
<b>J.2 Planning Procedures - Overview .....</b>	<b>J-2</b>
<b>J.3 Planning Procedures - Details .....</b>	<b>J-5</b>
J.3.1 Setting of Planning Framework .....	J-5
J.3.2 Selection of the Eligible Projects for IWRM of Pampanga River Basin .....	J-5
J.3.3 Preliminary Study on Alternative Approaches to the Specific Issues .....	J-6
J.3.4 Grouping of the Projects .....	J-6
J.3.5 Development Scenarios by and Phased Implementation Schedule for the Projects in Group-A .....	J-7
J.3.6 Evaluation and Prioritizing of the Inter-sector Projects in Group-B.....	J-8
J.3.7 Development Scenarios by and Phased Implementation Schedule for the Projects in Group-B .....	J-9
J.3.8 Formulation of IWRM Plan .....	J-10
J.3.9 Institutional Setup Plan for IWRM of Pampanga River Basin .....	J-11
J.3.10 The Stakeholders related to IWRM Plan for Pampanga River Basin .....	J-11
J.3.10.1 Hierarchy of Stakeholders and Preparation of Opportunities for Consensus Building and Hearing of Opinions.....	J-11
J.3.10.2 Timing and Topics of Meetings .....	J-12
J.3.11 Schedule for Planning Procedures .....	J-12

### List of Tables

#### List of Tables in Report

Table J. 3.2.1	Number of Projects relevant to IWRM for Pampanga River Basin .....	J-6
Table J. 3.5.1	Typical Development Scenarios by the Projects in Group-A.....	J-8
Table J. 3.6.1	Categories and Criteria for Evaluation of the Projects.....	J-9
Table J. 3.10.1	Hierarchies and Functions of Stakeholders .....	J-12

#### List of Annex Tables

Annex-T J.3.6.1	Scoring Criteria for Evaluation of the Project .....	JT-1
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**List of Figures**

**List of Figures in Report**

Figure J. 1.2.1	Process of IWRM.....	J-1
Figure J. 3.8.1	Image of Output of the IWRM Plan for Pampanga River Basin.....	J-11
Figure J. 3.11.1	Schedule for Planning Procedures .....	J-13

## Sector J. Guideline for Formulation of IWRM Plan

### J.1 General

#### J.1.1 Objectives of the Guideline

This Guideline aims at attaining the following objectives:

- (1) The Guideline shall furnish the definite procedures and methodologies for formulation of the IWRM Plan for Pampanga river basin.
- (2) The outputs of the Guideline shall be presented to and consented by the stakeholders in the course of the study. Thus, the Guideline shall be used as a tool for consensus building of the stakeholders on the proposed IWRM Plan.
- (3) The Guideline is especially prepared for Pampanga river basin. However, its substantial part of the outputs shall be useful as the reference to and/or standards for formulation of the IWRM Plan for other river basins.

#### J.1.2 Basic Concept on the IWRM Plan

The IWRM would be a flexible tool for optimizing of the sustainable development of the water resources as quoted from the “Catalyzing Change”, a handbook issued by Global Water Partnership. The IWRM is also assumed not to be a goal in itself, but it should be an approach to promote the coordinated development and management of water resources and maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystem.

The process of IWRM shall move forward like a spiral with several different stages starting from the initial primitive stage toward the mature stages as shown in Figure J.1.1.1. Each of the stages in the process of IWRM shall cover the sequence of the four (4) steps of: (a) assessment of existing conditions, (b) planning (i.e., formulation of the IWRM Plan), (c) implementation of the projects for IWRM and (d) monitoring on the results of the project implementation. Moreover, the accountability to and synergy with the stakeholders has to be assured through involvement of the multi-stakeholders at every steps of the IWRM.

The present stage for the IWRM in Pampanga river basin is the initial spiral stage, and of the above four (4) steps, the present study supports those of items (a) and (b). The follow-up activities after the present study are indispensable to completion of the initial spiral stage of the IWRM.

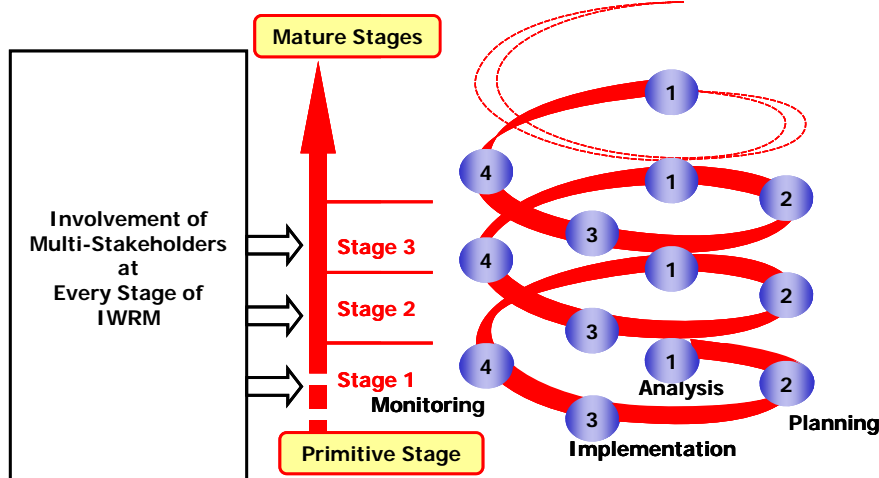


Figure J. 1.2.1 Process of IWRM

## **J.2 Planning Procedures - Overview**

As described above, this Guideline is to furnish the definite procedures and methodologies for formulation of the IWRM Plan for Pampanga river basin. The procedures together with methodologies for plan formulation are summarized as below:

### **Step 1: Assessment (Identification of the Problems and Issues on IWRM)**

Assessment on the principal problems and issues on the IWRM in Pampanga river basin shall be made as the basic approach to formulation of the IWRM Plan. The problems and issues are latent in the various aspects such as: (a) the water resources development, allocation and distribution for the irrigation, the municipal water and other various water demands, (b) the flood and sediment disaster management, (c) the watershed management and (d) other water-related environment managements. Moreover, some of the problems and issues are not limited into a single sector but they extend across several sectors causing the inter-sector conflicts.

### **Step 2: Setting of the Planning Framework**

The planning frameworks shall be set as the preconditions for formulation of the IWRM Plan. The principal items of the planning frameworks are such as:

- Target completion year of the entire plan,
- Socio-economic frames by the target year,
- Visions, objectives and sector goals of IWRM Plan for Pampanga river basin, and
- Ceilings for the Project Investment Cost.

The details on setting of the planning framework are as described in the following subsection J.3.1.

### **Step 3: Selection of the Potential Projects for IWRM of Pampanga River Basin**

Various government agencies and non-government entities currently implement and/or propose the projects, which could cope with the aforesaid issues and/or problems on IWRM and make a contribution to the visions, objectives and sector goals for the IWRM Plan. These on-going and proposed projects shall be identified as the components of the IWRM Plan. The details on selection of the projects for IWRM are as described in subsection J.3.2.

In addition, the conceptual projects, which are essentially required to solve the issues and/or problems but currently neither implemented nor proposed, shall also be further proposed as the components of the IWRM Plan.

### **Step 4: Preliminary Study on Alternative Approaches to the Specific Issues**

Some of the projects selected as the potential components of the IWRM Plan in the above Step3 may contain several alternative approaches to cope with their own specific issues. The optimum plan among the alternative approaches would be ideally determined before finalizing of the IWRM Plan.

However, the feasibility study shall be required to determine such optimum plan. On the other hand, the IWRM Plan would involve numerous projects to attain a variety of water-related development scenarios, and therefore, the feasibility study would be hardly carried out, in detail, for each of the individual projects. From this point of view, the IWRM Plan shall take the following fundamental rules:

- The feasibility study shall be included as a part of the project and undertaken before commencement of the physical project works.
- The outline of the project features together with the project investment cost required shall be provisionally assumed talking the conceptual alternative approaches into account, and
- The preliminary study on the project(s) may be carried out to estimate the most-likely optimum plan, when the project is judged to prominently influential to the entire IWRM Plan and at the same time, the basic information for the preliminary study are available.



The details on the preliminary study on the alternative approaches are as described in subsection J.3.3.

**Step 5: Grouping of the Projects**

The projects selected as the IWRM Plan in the above Step3 shall be divided into Group-A and Group-B in order to facilitate the programming of the under-mentioned project development scenarios and the project implementation schedule/the project investment program. The projects in Group-A have to be implemented in accordance with the basic social and natural requirements regardless to the amount of the project cost. All projects not included into Group A are classified into Group B. The typical projects classified in Group B are such as the regional economic development project and the projects for mitigation of the water related disaster, which shall be implemented by the special budget during the specific term(s). The details on grouping of the projects are as described in subsection J.3.4.

**Step 6: Setting of Development Scenarios by and Phased Implementation Schedule for the Projects in Group-A**

The target development scenario for the project in Group-A shall be set as the prerequisite for the phased project implementation schedule. That is, the development scenario shall be firstly delineated and, then, the phased implementation schedule shall be programmed in order to attain the development scenarios. The details on development scenarios by and phased implementation schedule for the projects in Group-A are as described in subsection J.3.5.

**Step 7: Evaluating and Prioritizing of the Projects in Group-B**

The projects classified into Group-B in the above Step5 shall be evaluated in order to prioritize them. The evaluation is made to the inter-sector projects, which extend over the various water-related sectors such as (a) the agriculture/irrigation and fishery development, (b) the municipal water supply, sewerage and sanitation, (c) the flood and sediment disaster management, (c) the watershed management and (d) water-related environment management. The details on evaluating and prioritizing of the projects in Group-B are as described in subsection J.3.6.

**Step 8: Development Schedules by and Phased Implementation Schedule for the Projects in Group-B**

The phased implementation schedules for the projects in Group-B shall be programmed in accordance with the priority orders of the projects as evaluated in the above Step7 and the ceilings of the project investment cost for each of the short-term, the mid-term and long-term. Then, the phased development scenarios shall be delineated as the resultants of the phased implementation schedule. However, when the development scenarios proposed by the priority orders of the projects are hardly accepted by the stakeholders, the priority orders shall be reexamined and a certain modification for the phased implementation schedule as well as development scenarios shall be made. The details on the development schedules by and the phased implementation schedule for the projects in Group-B are as described in subsection J.3.7.

**Step 9: Formulation of the IWRM Plan for Pampanga River Basin**

The implementation schedules, the investment programs and the development scenarios of the projects shall be finalized by integrating the outputs given in the above Step6 and Step8, and the following items shall be clarified:

- The phased programs in the short term (2011-2015), the mid-term (2016-2020) and the long term (2021-2025),
- The expected eligible financial source for the projects,
- The implementation bodies for the projects,
- The sectors, which the projects would belong, such as (a) agriculture/irrigation and fishery development, (b) municipal water supply, sanitation and sewerage, (c) flood and sediment disaster management, (d) watershed management, and (e) water-related environment management.

## Sector J: Guideline for Formulation of IWRM Plan

The details on formulate the IWRM Plan for Pampanga river basin are as described in subsection J.3.8.

### **Step 10: Formulation of Institutional Setup Plan**

The optimum institutional setup plan, which would be required to execute the aforesaid spiral processes of IWRM for assessment, formulation, implementation and monitoring of the projects, shall be also proposed.

## **J.3 Planning Procedures - Details**

### **J.3.1 Setting of Planning Framework**

As described above, the planning framework shall be set as the preconditions for formulation of the IWRM Plan. The principal items to be included in the planning framework are as enumerated below:

**(1) Target Year**

The target year is the completion year for all of the proposed projects in IWRM Plan. In this study, the target year is set at 2025, and the project implementation period is divided into the following three (3) terms: (a) Short-term for a period from 2011 to 2015, (b) Mid-term for a period from 2016 to 2020 and (c) Long-term for a period from 2021 to 2025.

**(2) Socio-economic Frame**

The socio-economic frame is to prescribe the trends of the socio-economic conditions such as the population growth and the growth of the GRDP in the study area. These socio-economic conditions by the above target year are indispensable to estimate the future municipal water demand, flood damage potentials and other basic information for formulation of the IWRM Plan.

**(3) Visions, Objectives and Sector Goals of IWRM Plan for Pampanga River Basin**

The IWRM Plan shall involve the various multi-water-sector-projects/ programs. Hence, the inter-sector visions are proposed as the principal targets common to all proposed projects for IWRM of Pampanga river basin. The objectives in the several categories are further assumed to embody the visions. Moreover, each of the water-related sectors in the IWRM Plan is provided with the concrete sector goals, which could enhance the objectives and/or visions.

The principal policies in the existing national and/or regional development programs such as MTPDP 2004-2010, and RPPF, 2005-2030 are referred in setting of the above visions, objectives and sector goals of the IWRM Plan for Pampanga river basin.

**(4) Ceilings for the Project Investment Cost**

When the implementation of the projects excessively concentrates upon any of the short-term, mid-term and/or long-term, the total project investment cost may exceed the affordable limit of the national and/or regional budgetary capacity. From this point of view, the approximate ceilings of the project investment cost are provisionally estimated for each of the short-term, mid-term and long-term with referring to the previous actual disbursement for the projects.

### **J.3.2 Selection of the Eligible Projects for IWRM of Pampanga River Basin**

There are a large number of the water related projects, which are currently being undertaken and/or proposed by various government agencies and private entities in the study area. Of these projects, those, which are judged to be effective to attain the aforesaid visions, objectives and sector goals, are selected as the components of the IWRM Plan. Moreover, the JICA Study Team in corroboration with the members of SC and TWG as well as other stakeholders further worked out the conceptual projects, which would be essentially required to cope with the water-related problems and issues such as the water shortage, the flood/sediment disasters and the deterioration of the water-related environment. It should be noted that the conceptual projects would require either further study such as feasibility study or determination of the basic project component, before their implementation. The number of eligible projects for IWRM of Pampanga river basin is as listed below:

**Table J. 3.2.1 Number of Projects relevant to IWRM for Pampanga River Basin**

Sector	On-going Projects	Proposed Projects	Conceptual Plans*	Total
Agriculture/Irrigation and Fishery	14	11	3	28
Municipal Water Supply, Sanitation and Sewerage	3	4	11	18
Flood and Sediment Disaster Management	4	2	4	10
Watershed Management	12	-	4	16
Water-related Environment Management	3	1	4	8
Inter-sector for Water Resources Management	-	-	4	4
Total	36	18	30	84

Note (\*): Proposed by JICA Study Team

Source: JICA Study Team

### J.3.3 Preliminary Study on Alternative Approaches to the Specific Issues

As described in Step 4 in the foregoing subsection J.2, the IWRM Plan deals with a large number of the projects and therefore, the comparative study on the alternative approaches for each of the projects shall be hardly carried out, in detail, at the stage of formulation of IWRM Plan. From the above points of view, the IWRM Plan shall take the three (3) principal rules as described in Step4 in subsection J.2.

In the formulation of the IWRM Plan for Pampanga river basin, it is preliminarily assumed that nine (9) projects among 84 projects would possible contains the alternative approaches, and the following two (2) of them were further examined as the objectives of the preliminary study.

- Project for Recovery of Reliability of Water Supply in Angat-Umiray System (Code: IS-C-02)
- Flood Mitigation for Pampanga Delta (Code: FL-C-01)

The above alternative approaches would be compared and the optimum approach shall be selected from the various points of view such as: (a) economic viability as expressed by EIRR and/or the project least cost, (b) the financial affordability against the project investment cost, (c) the technical viability (d) the environmental impacts including those to the natural environments (such as geographic conditions, the vegetation and the water quality) and the social environments (such as the house resettlements, lapse of the right of land ownership and loss of the opportunity) and (f) adaptability to the future possible climate changes. The optimum approach would consist of the several projects as its components, and these components would be merged into one project.

### J.3.4 Grouping of the Projects

As described in the aforesaid Step5 of the planning procedures in subsection 7.2, the potential projects for IWRM Plan of Pampanga river basin as selected in section 7.4 shall be classified into the Group-A and B according to their purposes and/or contents. The details for this classification are as described hereinafter:

#### (1) Group-A

The following projects shall be classified into Group-A

- The projects for basic human needs like the municipal water supply projects, which are indispensable to secure the life of the people,
- The projects, which are indispensable for preservation of the irreversible natural environments and/or resources, and.
- The projects for rehabilitation and/or maintenance of the existing water resources management facilities, which are indispensable for sustainment of the inherent design capacity of the facilities.

The projects of the above items (a) to (c) have to be implemented in accordance with the social, natural and/or physical fundamental requirement regardless to the amount of the project cost. For instance, the expansion of the safe municipal water supply system has to be unconditionally required to cope with the growth of the population as the basic human need.

Moreover, the target development scenarios for the projects in Group-A shall be set as the prerequisite for implementation of the project. That is, the development scenarios shall be firstly set, and then the implementation schedule of the projects shall be programmed to attain the development scenarios.

**(2) Group-B**

The following projects shall be classified into Group-B

- (a) The projects for economic development, which could enhance the growth of the regional economy and/or improvement of the livelihood in the region,
- (b) The projects for mitigation of flood and sediment disasters, which could contribute to the better public welfare and the growth of the regional economy, and
- (c) The ad hoc projects, which could support and/or strengthen the annual regular projects classified into Group-A

The commencement of the projects for the above items (a) to (c) could be optionally selected depending on the availability of budget for project implementation. The projects of the above items (a) and (c) would be implemented by the special budget during the specific term(s). The phased implementation schedule of the projects in Group-B shall be firstly determined based on the following two (2) factors into account:

- (a) The priority orders of the projects, which could be determined taking the results of inter-sector project evaluation, and
- (b) The ceilings of the project investment cost for each of the short-term, mid-term and long-term.

After the phased implementation schedule of the projects is determined, then the development scenarios shall be delineated as the resultants of the project implementation schedule. However, when the development scenarios delineated as the resultants of the project implementation schedule are deemed to be unjustifiable and/or they are hardly accepted by the stakeholders, the prioritizing of the projects shall be reexamined and a certain modification for the project implementation schedule as well as the development scenarios shall be made.

**J.3.5 Development Scenarios by and Phased Implementation Schedule for the Projects in Group-A**

As described above, the projects classified into Group-A have to be implemented in accordance with the development scenarios which shall be determined by the essential social, natural and physical needs regardless to the amount of the project cost. The typical development scenarios and their corresponding phased implementation schedules for Pampanga river basin are set for as shown in Table J.3.5.1.

**Table J. 3.5.1 Typical Development Scenarios by the Projects in Group-A**

Sector	Development Scenario
Agriculture/ Irrigation and Fishery Development	The on-going six (6) annual regular projects for rehabilitation of the existing irrigation facilities shall be sustained until 2025 so as to improve the agricultural productivities.
	The on-going four (4) annual regular projects for fishery development shall be sustained until 2025 so as to improve the fishery productivities.
Municipal Water Supply, Sanitation and Sewerage	The water supply capacity of the existing Angat-Umiray System shall be strengthened to promise the full supply level for municipal water demand in Metro Manila and irrigation water demand in AMRIS by 2020.
	The new bulk water supply system with the capacity of 2.7m <sup>3</sup> /s for Bulacan Province shall be developed to cope with the incremental population and preserve the safe water quality for drinking by 2015.
	The new bulk water supply system with the capacity of additional 3.8m <sup>3</sup> /s for Bulacan Province shall be developed to cope with the incremental population and preserve the safe water quality for drinking by 2025.
	The new bulk water supply system with the capacity of 0.8m <sup>3</sup> /s for Metro Clark (Pampanga and Tarlac Provinces) and 1.3m <sup>3</sup> /s for Pampanga Province shall be developed to cope with the incremental population and preserve the safe water quality for drinking by 2025.
	Safe drinking water access with Level 3,2,1 water supply system shall reach to 100% by 2025 The service area of Level 3 water supply system in the urban area shall cover 80% of the households in the study area by 2025. At the same time, the present coverage ratio of Level 3 water supply system in the rural area shall be maintained by 2025, notwithstanding the future increment of population.
	The whole households in the study areas shall be provided with the sanitary toilets by 2025.
Management of Flood and Sediment Disasters	The on-going annual regular program for rehabilitation and maintenance of river dyke and slope by DPWH shall be sustained by 2025 so as to preserve the inherent design capacities of the facilities.
	The annual regular program for rehabilitation and maintenance of drainage and flood cool facilities by LGUs shall be sustained by 2025.
	Public awareness on IWRM shall be improved through integration of the salient points of IWRM into school curricula.
Watershed Management	The on-going nine (9) regular programs for watershed management in Pampanga river basin shall be sustained by 2025, which could expand the new forest cover at the rate of 660 ha per annum.
Water-related Environment Management	The non-structural projects by DENR and LGUs, which are intended to protect water quality, shall be sustained by 2025 so as to reduce the pollution load from various sources.
	The structural programs for reduction of the risk for contamination in water body shall be sustained by 2025.

### J.3.6 Evaluation and Prioritizing of the Inter-sector Projects in Group-B

Evaluation of the projects, which are classified into Group-B, shall be made to prioritize the projects and to formulate the phased implementation program for them. The evaluation is made from the viewpoints of six (6) categories namely: (a) Viability of the Project, (b) Enhanced Livelihood, (c) Improved Quality of Life, (d) Decentralized Development, (e) Sustained Ecosystem and (f) Empowered People. Of these categories, the Item (a) of the “Viability of the Project” is the fundamental factor to judge the viabilities in implementing the project. On the other hand, other items of (b) to (f) are indexes to evaluate how the project could make a contribution to the aforesaid strategic objectives.

Each of the categories for evaluation would have further four (4) to five (5) criteria for evaluation as listed in Table J.3.6.1, and the total number of criteria for evaluation would reach 25 items. Such rather large number of criteria would be advantageous for the well-balanced evaluation of the wide range of the projects in various water-related sectors.

**Table J. 3.6.1 Categories and Criteria for Evaluation of the Projects**

Category	Criterion for Evaluation
1. Viability of the Project	1.1 Economic viability
	1.2 Technical viability
	1.3 Financial affordability
	1.4 Impacts to natural and social environments
	1.5 Adaptability to the climate change
2. Enhanced Livelihood	2.1 Creation of new job opportunities in the Region
	2.2 Increase of the income level in the Region
	2.3 Improvement of livelihood for the vulnerable group*
	2.4 Reduction of the income gaps in the urban areas and the rural areas
3. Improved Quality of Life	3.1 Increase of the access to the safe drinking water
	3.2 Increase of the per-capita municipal water supply volume
	3.3 Improvement of the sanitary and health conditions
	3.4 Mitigation of the flood risks and hazard
4. Decentralized Development	4.1 Development of the regional economic development centers
	4.2 Increase of the regional productivity in the agriculture, fishery, forestry, industry and service sectors
	4.3 Creation of a favorable circumstances for private investment in the Region
	4.4 Enhancement of social equity in the Region
5. Sustained Ecosystem	5.1 Enhancement of the sustainable monitoring on the ecosystem
	5.2 Protection of the ecologically vulnerable areas
	5.3 Promotion of vegetation in the watersheds
	5.4 Reduction of the potential pollution loads
6. Empowered People	6.1 Promotion of stakeholder participation in project planning and execution
	6.2 Improvement/transfer of knowledge and skills
	6.3 Promotion of community-based activities
	6.4 Empowerment of the vulnerable group*

Note: \*: The vulnerable group includes the poor, the indigenous peoples, the women-headed households, the out-of-school youths, the handicapped and the elderly

Each of the above criteria for evaluation would have three (3) ranks of scores. The projects, which may be expected to attain the high performance in the criterion, would take the score of 3, while those, which would attain the lower performance, would take scores of 2 or 1. The detailed criteria for scoring are as shown in Annex-T J.3.6.1.

- (1) Score 3: Achievement of the criterion for evaluation has been already verified and/or it has been programmed as one of the primary purposes of the project.
- (2) Score 2: The project is judged to make a certain indirect contribution to the criterion for evaluation, although achievement of the criterion is not the primary purpose of the project and/or it has been clearly verified yet.
- (3) Score 1: The project is judged to hardly satisfy the criterion and/or make any contribution to the criterion.

### **J.3.7 Development Scenarios by and Phased Implementation Schedule for the Projects in Group-B**

The IWRM Plan for Pampanga river basin would include 41 projects classified into Group-B. Of these projects, 12 ongoing projects are to be implemented in accordance with their existing schedules, which had already been fixed by the project proponents. On the other hand, other 29 proposed and/or conceptual projects are to be implemented taking the following prerequisites into account:

- The projects shall be implemented in order of the scores made in the aforesaid inter-sector project evaluation.

## Sector J: Guideline for Formulation of IWRM Plan

- The investment cost of the projects shall be accumulated in accordance with the above priority order of the projects. However, the accumulated investment cost over the sum of the investment cost for the ongoing infra-development projects<sup>1</sup> shall not exceed the ceiling costs (i.e., 31.6 billion pesos for the short-term, 33.7 billion pesos for the mid-term and long-term).
- When the accumulated investment cost exceeds the ceiling of either the short-term or the mid-term, the project implementation shall shift to the next term (i.e., from the short-term to the mid-term or from the mid-term to the long-term) and the accumulation of the investment cost shall be reset and restart.
- Judging from the scope of the projects, several projects would need the implementation period of more than 5 years extending over each of the short-term, the mid-term or the long-term. When the project has the implementation period of more than 5 years, its costs for the first and second 5-year term are estimated taking the disbursement schedule prepared by the project proponent and/or the scopes of the projects into account.

### J.3.8 Formulation of IWRM Plan

The following items (1) to (5) shall be the components of the IWRM Plan and formulated with referring to the results of examinations described in the foregoing subsections J.3.5 to J.3.7 (refer to Figure J.3.8.1):

#### (1) Project List

The on-going, proposed and conceptual projects, which could be effective to attain the visions, objectives and sector goals of the IWRM Plan by 2025, shall be proposed and put into the Project List. The necessary information in the Project List shall include the title of the project, the implementing body of the project, the necessary project investment cost and the project's classification of the aforesaid Group-A and Group-B.

#### (2) Project Implementation Program

The implementation schedule for each of the above projects shall be proposed as the phased programs for the short-term (2011-2015), the mid-term (2016-2020) and the long-term (2021-2025). Some of the projects would be completed within a shingle term, while some would extend across more than two (2) of the terms.

#### (3) Project Investment Program

The project investment schedule shall be proposed as the phased program for investment of the project cost in each of the short-term (2011-2015), the mid-term (2016-2020) and the long-term (2021-2025). The budgetary source for investment and/or the method for procurement of the budget shall be also proposed as a part of the program taking the ownership of the project, the budgetary capacity of the project implementing body and the possibility of the external financial assistance into account.

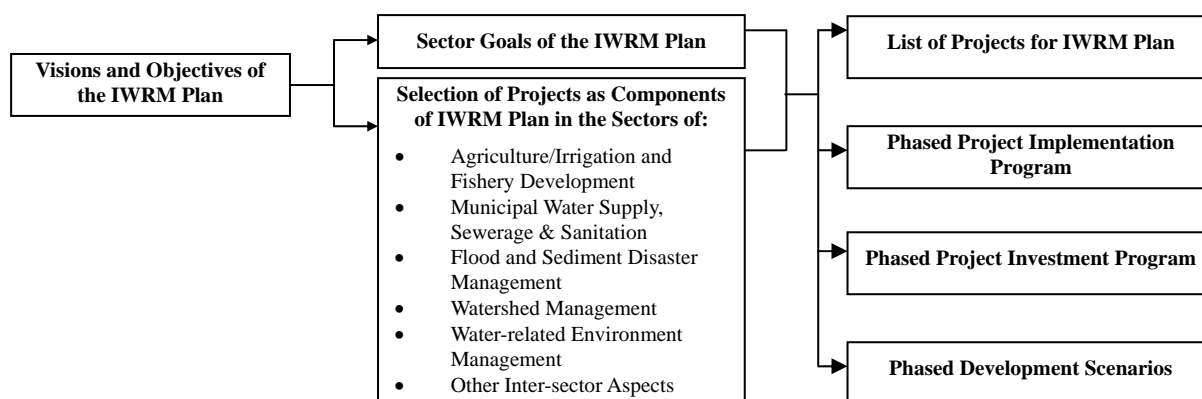
#### (4) Development Scenarios

The phased development scenarios for each of the short-term, the mid-term and the long-term shall be proposed in accordance with the above phased implementation schedule of the projects. The development scenarios shall be also proposed by each of the sectors of IWRM such as (a) agriculture/irrigation and fishery development, (b) municipal water supply, sanitation and sewerage, (c) flood and sediment disaster management, (d) watershed management and (e) water-related environment management.

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<sup>1</sup> The ongoing infra-development projects include 12 projects in Group-B and 11 projects, which are being undertaken by NIA, DA and DPWH as the yearly regular program for maintenance and rehabilitation of the existing water related infrastructures and classified into Group-A.





**Figure J. 3.8.1 Image of Output of the IWRM Plan for Pampanga River Basin**

### **J.3.9 Institutional Setup Plan for IWRM of Pampanga River Basin**

Institutional and organizational strengthening will be sought out from two (2) aspects:

- (1) To manage and/or to coordinate key issues in water resources in the river basin: such as reasonable allocation and regulation of water rights, upstream and downstream issues in flood control, watershed management, water quality management, sustainable groundwater management, etc., and
- (2) To establish River Basin Organization (RBO) for Pampanga river basin as the implementing body for the proposed IWRM Plan in terms of equitable and sustainable development, environmental conservation, and operation and maintenance of the river facilities and the monitoring system in the river basin.

The former would be related to the improvement of the Water Code and capacity strengthening of NWRB as an apex body for water right and water resources management. The latter would be related to capacity strengthening of sector agencies such as DENR (watershed, forest management, water quality management), DPWH (flood control and water-related natural disasters), NIA (irrigation water management) and LGUs (watershed, forest management, water quality management, flood control and water-related natural disasters, communal irrigation, groundwater management). The purpose, function, role and responsibility of the stakeholders as well as the financial sustainability and the regional policy on would be clarified to validate the RBO.

### **J.3.10 The Stakeholders related to IWRM Plan for Pampanga River Basin**

#### **J.3.10.1 Hierarchy of Stakeholders and Preparation of Opportunities for Consensus Building and Hearing of Opinions**

The participation of and consensus building with the stakeholders is essentially required to IWRM. It is, however, virtually difficult to make consensus with all of the stakeholders, since the number of the potential stakeholders in Pampanga river basin would be more than 20 million people including those related organizations and residents living in Pampanga river basin, Metropolitan Manila and the region from which water is transmitted. Accordingly, the priority stakeholders shall be selected and divided into three groups with different degree of participation for the planning process as shown in Table J.3.10.1.

**Table J. 3.10.1 Hierarchies and Functions of Stakeholders**

Hierarchy/Expected Members	Function
1. Core stakeholders <ul style="list-style-type: none"> <li>• Steering Committee members</li> <li>• Technical Working Group members</li> </ul>	<ul style="list-style-type: none"> <li>• To make the final decisions on consensus</li> <li>• To bring forward the problems and needs for IWRM</li> <li>• To propose the draft plan on IWRM</li> </ul>
2. Stakeholders (representatives at entire basin level) <ul style="list-style-type: none"> <li>• Related governmental organizations</li> <li>• Related organizations (water users association, fisherman's association, water supply company, power supply company etc.)</li> <li>• Representatives of local level stakeholders</li> <li>• Representatives of association of indigenous people, woman's association, and religious association, etc.</li> <li>• Representatives of LGUs in Metro Manila</li> <li>• Representatives of LGUs related to water transmission to reservoirs in the basin</li> <li>• NGO and Academies</li> <li>• Others, if necessary</li> </ul>	<ul style="list-style-type: none"> <li>• To bring forward the problems and needs for IWRM</li> <li>• To propose the draft plan on IWRM</li> </ul>
3 Other stakeholders <ul style="list-style-type: none"> <li>• Other stakeholders who are not included in other stakeholders of the above items 1 to 2</li> </ul>	<ul style="list-style-type: none"> <li>• To be disclosure the information through Web-site etc.</li> </ul>

Three (3) kinds of meeting, which consists of the Steering Committee Meeting, the Technical Working Group Meeting and the Stakeholder Meeting, are held for hearing of opinions and consensus building on the proposed IWRM Plan for Pampanga river basin. Decision making on consensus in the present study is basically under responsibility of the core stakeholders which consists of the members of the steering committee and technical working group. On the other hand, the Stakeholder Meeting aims at hearing of their opinions. The members for the Steering Committee and Technical Working Group had been determined at the early stage of the study.

### J.3.10.2 Timing and Topics of Meetings

The Steering Committee and Stakeholder Meetings are held as one set at each juncture in the course of the study. The Technical Working Meetings had been also originally scheduled at each juncture in the course of the study, but rescheduled, on the way of the study, to be held once a month as far as the activities of the JICA Study Team continues in Philippines.

The main activities in the Steering Committee and Technical Working Group Meeting include discussion on pending issues in the previous meetings, decision making and confirmation of agenda for succeeding stakeholder meeting. On the other hand, in the Stakeholder Meeting, explanation of the results of the study and hearing of the opinion from the stakeholder are carried out according to the agenda approved by the Steering Committee and Technical Working Group. The options brought forward by the stakeholders are to be incorporated into the work in the next step, and the results of the work are discussed in the next meeting for Steering Committee and Technical Working Group Meetings.

### J.3.11 Schedule for Planning Procedures

As described in subsection J.1.2, the process of IWRM should move forward like a spiral with several different stages, and each of the stages covers the four sequences of: (a) Assessment of existing conditions, (b) Planning (i.e., formulation of the IWRM Plan), (c) Implementation of the projects for IWRM and (d) Monitoring on the results of the project implementation.

The present stage for the IWRM in Pampanga river basin is the initial spiral stage, and of the above four sequences at this stage, the Item (a) for Assessment of existing conditions and item (b) for Planning are being undertaken for a 2-year period of from February 2009 to January 2011 as shown in Figure J.3.11.1.

Sector J: Guideline for Formulation of IWRM Plan

Objectives of Assessment and Plan Formulation and Meetings		2009												2010												2011		
		2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Assessment and Plan Formulation	Step1	██████████																										
	Step2				██████████																							
	Step3						██████████																					
	Step4												██████████															
	Step5																				██████████							
	Step6																									██████████		
	Step7																				██████████							
Meeting	Steering Committee (SC) Meeting																											
	Technical Working Group (TWG) Meeting (Including Joint SC and TWG Meetings)																											
	Stakeholder Meeting																											
Reporting		IC/R						P/R1				IT/R				P/R2									DF/R	F/R		

Figure J. 3.11.1 Schedule for Planning Procedures



# *Annex-Tables*



**Annex-T J.3.6.1 (1/3) Scoring Criteria for Evaluation of the Project**

Point of Evaluation		Scoring		
		3	2	1
<b>Viability of the Project</b>	<b>Economic viability</b>	The EIRR of the Project is above 15%.	The Project is in either of the following cases: <ul style="list-style-type: none"> <li>• The EIRR of the Project is in a range of 9 to 15%,</li> <li>• Any economic evaluation of the project has not been made but Project is likely to be economically viable</li> </ul>	The Project is in either of the following cases: <ul style="list-style-type: none"> <li>• The EIRR of the Project is below 9%,</li> <li>• Any economic evaluation for the Project has not been made yet and the project is not likely to be economically viable.</li> </ul>
	<b>Technical viability</b>	Technical viability of the Project has been confirmed through relevant studies and/or through previous implementation.	Technical viability of the Project has not been confirmed but no particular technical difficulty in executing the project is foreseeable.	There remain uncertainties in the technical viability of the Project.
	<b>Financial affordability</b>	The necessary budgetary arrangement has been made.	The necessary budget arrangement has not been made but any difficulties in arranging the budget are not foreseeable.	Difficulties in budgetary arrangement are foreseeable.
	<b>Impacts on natural and social environment</b>	The project is not likely to cause any significant adverse impact to the natural and social environment.	The Project is in either of the following cases: <ul style="list-style-type: none"> <li>• The potential adverse impacts on natural and social environment could be mitigated</li> <li>• The ecological and social benefits far outweigh the likely adverse impacts</li> </ul>	The potential adverse impacts on the natural and social environment are likely to be serious and beyond mitigation
	<b>Adaptation to climate change</b>	The Project would possess the direct mechanism adaptable to the climate change.	The Project would possess the indirect mechanism adaptable to the climate change.	The Project would hardly possess any mechanism adaptable to the climate change.
<b>Enhanced Livelihood</b>	<b>Creation of new job opportunities in the Region</b>	The Project would directly contribute to creation of the new job opportunities in the Region.	The Project would make an indirect contribution to creation of the job opportunities in the region.	The Project would hardly make any contribution to creation of the job opportunities in the region.
	<b>Increase of the income levels in the region</b>	The Project would directly contribute to increase of the income levels in the Region.	The Project would make an indirect contribution to increase of the income levels in the region.	The Project would hardly make any contribution to increase of income levels in the region.
	<b>Improvement of livelihood for the poor, the indigenous peoples, the women-headed households, the out-of-school youths, the handicapped, the elderly and other vulnerable groups.</b>	The Project would directly contribute to improvement of livelihood for the poor, the women-headed households, the out-of-school youths, the handicapped, the elderly and other vulnerable groups.	The Project would make an indirect contribution to improvement of livelihood for the poor, the women-headed households, the out-of-school youths, the handicapped, the elderly and other vulnerable groups.	The Project would hardly make any contribution to improvement of livelihood for the poor, the women-headed households, the out-of-school youths, the handicapped, the elderly and other vulnerable groups.
	<b>Reduction of the income gaps between the urban areas and the rural areas</b>	The Project would directly contribute to a reduction in income gaps between the urban and rural areas	The Project would make an indirect contribution to reduction in income gaps between the urban and rural areas.	The Project would hardly make any contribution to the reduction in income gaps between the urban and rural areas.

**Annex-T J.3.6.1 (2/3) Scoring Criteria for Evaluation of the Project**

Point of Evaluation		Scoring		
		3	2	1
<b>Improved Quality Life</b>	<b>Increase of access to safe drinking water</b>	The Project would directly contribute to increase of access to safe drinking water.	The Project would make an indirect contribution to increase of access to safe drinking water.	The Project would hardly make any contribution to increase of access to safe drinking water.
	<b>Increase of the municipal water supply volume</b>	The Project would directly contribute to increase of the municipal water supply volume	The Project would make an indirect contribution to increase of the municipal water supply volume.	The Project would hardly make any contribution to increase of the municipal water supply volume.
	<b>Improvement of sanitary and health conditions</b>	The Project would directly contribute to improvement of the sanitary conditions and/or reduction of water-related diseases.	The Project would make an indirect contribution to the improvement of sanitary conditions and/or reduction of water-related diseases.	The Project would hardly make any contribution to the improvement of sanitary conditions and/or reduction of water-related diseases..
	<b>Mitigation of flood risks and hazards</b>	The Project would directly reduce risks to life and damage to property/assets due to chronic flooding.	The Project would make an indirect contribution to the reduction of risks to life and damage to property/assets due to chronic flooding.	The Project would hardly make any contribution to the reduction of risks to life and damage to property/assets due to chronic flooding.
<b>Decentralized Development</b>	<b>Development of regional economic centers</b>	The Project is indispensable to the development of regional economic centers. (Typical examples of the Project are such as the bulk water supply project and the urban flood control/drainage improvement project.)	The Project is not necessarily indispensable to but could support the development of the regional economic centers	The Project would hardly make any contribution to development of the regional centers.
	<b>Increase of productivity in the Region's agriculture, industrial and service sectors.</b>	The Project would directly contribute to the increase of productivity in the Region's agriculture, industrial and service sectors.	The Project would make an indirect contribution to the increase of productivity in the Region's agriculture, industrial and service sectors.	The Project would hardly make any contribution to the increase of productivity in the Region's agriculture, industrial and service sectors.
	<b>Creation of a favorable climate for enterprise and private investment in the Region</b>	The Project would directly contribute to the creation of a favorable climate for enterprise development and private investments in the Region.	The Project would make an indirect contribution to the creation of a favorable climate for enterprise development and private investments in the Region.	The Project would hardly make any contribution to the creation of a favorable climate for enterprise development and private investments in the Region.
	<b>Enhancement of social equity in the Region</b>	The Project would directly contribute to the equitable distribution of access to the following: <ul style="list-style-type: none"> <li>• economic opportunities</li> <li>• economic goods and services</li> <li>• social services</li> </ul>	The Project would make an indirect contribution to the equitable distribution of access to the following: <ul style="list-style-type: none"> <li>• economic opportunities</li> <li>• economic goods and services</li> <li>• social services</li> </ul>	The Project would hardly make any contribution to the equitable distribution of access to the following: <ul style="list-style-type: none"> <li>• economic opportunities</li> <li>• economic goods and services</li> <li>• social services.</li> </ul>



Annex-T J.3.6.1 (3/3) Scoring Criteria for Evaluation of the Project

Point of Evaluation		Scoring		
		3	2	1
Sustained Ecosystem	<b>Enhancement of the sustainable monitoring on the ecosystem</b>	The Project would directly contribute to enhancement of the sustaining monitoring of vital ecosystems.	The Project would make an indirect contribution to enhancement of the sustaining monitoring of vital ecosystems.	The Project would hardly make any contribution to enhancement of the sustaining monitoring of vital ecosystems.
	<b>Protection of the ecologically vulnerable areas</b>	The Project would directly contribute to the protection of ecologically vulnerable areas.	The Project would make an indirect contribution to the protection of ecologically vulnerable areas.	The Project would hardly make any contribution to the protection of ecologically vulnerable areas .
	<b>Promotion of vegetation in the watersheds</b>	The Project would directly contribute to the increase of vegetation cover of the watersheds.	The Project would make an indirect contribution the increase of vegetation cover in the watersheds.	The Project would hardly make any contribution to the increase of vegetation cover in the watersheds.
	<b>Reduction of potential pollution loads</b>	The Project would directly contribute to the reduction of potential pollution loads.	The Project would make an indirect contribution to the reduction of potential pollution loads.	The Project would hardly make any contribution to the reduction of potential pollution loads.
Empowered People	<b>Promotion of stakeholder participation in project planning and execution</b>	The Project is inherently designed to promote stakeholder participation throughout the project cycle.	Some of the Project activities would support and encourage stakeholder participation.	The nature of the Project precludes any opportunity for meaningful stakeholder participation.
	<b>Improvement/transfer of knowledge and skills, beliefs and attitudes through participatory approaches in water-related projects</b>	The Project is designed to facilitate the transfer of skills and knowledge as well as promote changes in beliefs, values and attitudes related to water resource use, protection and management.	Some of the Project activities would support and encourage the transfer of skills and knowledge as well as promote changes in beliefs, values and attitudes related to water resource use, protection and management.	The nature of the Project precludes any opportunity to transfer of skills and knowledge as well as promote changes in beliefs, values and attitudes related to water resource use, protection and management.
	<b>Promotion of community-based activities</b>	The Project is inherently designed to promote community-based activities.	The Project would make a certain indirect support to or partly encourage community-based activities.	The nature of the Project precludes any possibility for community-based undertakings.
	<b>Empowerment of the indigenous peoples, the women-headed HH, handicapped, the out-of-school youths, the elderly and other vulnerable stakeholders</b>	The empowerment of such vulnerable stakeholders is inherent in the Project design.	The empowerment of such vulnerable stakeholders may be incidental but is not latent in the Project design.	The nature of the Project precludes any meaningful opportunity to empower such vulnerable stakeholders.



***Sector K***

***Formulation of IWRM Plan***



## Sector K. Formulation of IWRM Plan

### Table of Contents

	<u>Pages</u>
<b>K.1 Setting of Planning Framework .....</b>	<b>K-1</b>
K.1.1 Target Year .....	K-1
K.1.2 Socioeconomic Framework .....	K-1
K.1.2.1 Projected Population in the Study Area .....	K-1
K.1.2.2 Projected Gross Regional Domestic Product (GRDP) .....	K-1
K.1.2.3 Price Level of Project Cost .....	K-2
K.1.3 Visions, Objectives and Sector Goals of IWRM for the Study Area .....	K-2
K.1.3.1 Purpose for Setting of Visions, Objectives and Sector Goal .....	K-2
K.1.3.2 National and Regional Development Policies .....	K-2
K.1.3.3 Visions, Objectives and Sector Goals adopted for the Study .....	K-5
K.1.4 Grouping of the Projects .....	K-7
K.1.5 Ceiling of Investment Cost for Projects in Group B .....	K-8
K.1.6 Estimation Basis for the Ceiling of Investment Cost .....	K-8
<b>K.2 Project Implementation Schedule .....</b>	<b>K-10</b>
K.2.1 Implementation Schedule for Group-A Projects .....	K-10
K.2.2 Implementation Schedule for Group-B Projects .....	K-10
K.2.3 Number of Projects to be Implemented and Project Investment Cost for Each of 5-year Term .....	K-11
<b>K.3 Project Investment Plan .....</b>	<b>K-13</b>
K.3.1 General .....	K-13
K.3.2 Project Investment Plan for Agriculture, Irrigation and Fishery Development ..	K-14
K.3.3 Project Investment Plan for Development of Municipal Water Supply, Sanitation and Sewerage .....	K-14
K.3.4 Project Investment Plan for Management of Flood and Sediment Disasters .....	K-17
K.3.5 Project Investment Plan for Watershed Management .....	K-18
K.3.6 Project Investment Plan for Water-related Environment Management .....	K-18
K.3.7 Project Investment Plan for Inter-Sector Water Resources Development, Allocation and Distribution .....	K-19
<b>K.4 Development Scenarios .....</b>	<b>K-20</b>
K.4.1 Development Scenarios for Group-A Projects .....	K-20
K.4.1.1 Development Scenarios in Sector of Agriculture/Irrigation and Fishery Development .....	K-20
K.4.1.2 Development Scenarios in Sector of Municipal Water Supply, Sanitation and Sewerage .....	K-20
K.4.1.3 Development Scenarios in Management of Flood and Sediment Disasters .....	K-22
K.4.1.4 Development Scenarios in Watershed Management .....	K-23
K.4.1.5 Development Scenarios in Water-related Environment Management .....	K-23
K.4.2 Development Scenarios for Group-B Projects .....	K-24
K.4.2.1 Development Scenarios in the Sector of Agriculture, Irrigation and Fishery Development .....	K-24
K.4.2.2 Development Scenarios for Municipal Water Supply, Sanitation and Sewerage .....	K-25

K.4.2.3	Development Scenarios for Management of Flood and Sediment Disasters .....	K-25
K.4.2.4	Development Scenarios for Watershed Management.....	K-26
K.4.2.5	Development Scenarios for Water-related Environment Management ...	K-26
K.4.2.6	Development Scenarios for Inter-Sector Water Resources Development, Allocation and Distribution .....	K-27

## List of Tables

### List of Tables in Report

Table K. 1.2.1	Projected Population Growth Rates for the Study Area.....	K-1
Table K. 1.2.2	Annual Average Growth Rate of Gross Value Added in Region III from 1995 to 2007 .....	K-1
Table K. 1.2.3	Average Annual Increase Rate of Wholesale Price Index against Previous Year.....	K-2
Table K. 1.3.1	Objectives Delineated in MTPDP 2004-2010.....	K-2
Table K. 1.3.2	Sustainable Outcomes and Strategic Themes in the IWRM Plan Framework.....	K-5
Table K. 1.3.3	Vision Statement .....	K-5
Table K. 1.3.4	Goals in Each of the Sectors of Water Development and Management.....	K-7
Table K. 1.4.1	Results on Grouping of the Projects.....	K-7
Table K. 1.5.1	Ceilings of Investment Cost for Projects in Group B.....	K-8
Table K. 1.6.1	Summary of National Government Budget.....	K-8
Table K. 1.6.2	National Budget Allocated to the Projects for Water-Related Infrastructure Development.....	K-8
Table K. 2.3.1	Number of Projects to be implemented in Each of Short, Medium and Long-term .....	K-11
Table K. 3.1.1	Project Cost to be disbursed in Each of Short, Mid and Long-term .....	K-13
Table K. 3.1.2	Project Investment Cost divided according to Classifications and Status of the Projects (Project Implementation Period: 2011 – 2025).....	K-13
Table K. 3.1.3	Project Investment Cost divided according to Classifications and Implementing Bodies of the Projects (Project Implementation Period: 2011 – 2025).....	K-14
Table K. 3.2.1	Project Investment Cost for Agriculture, Irrigation and Fishery Development.....	K-14
Table K. 3.3.1	Project Investment Cost for Development of Municipal Water Supply, Sanitation and Sewerage.....	K-15
Table K. 3.3.2	Conversion of Project Investment Cost to Unit Cost .....	K-15
Table K. 3.4.1	Project Investment Cost for Management of Flood and Sediment Disasters .....	K-17
Table K. 3.4.2	Projects by DPWH for Management of Flood and Sediment Disasters.....	K-18
Table K. 3.5.1	Project Investment Cost for Watershed management.....	K-18
Table K. 3.6.1	Project Investment Cost for Water-related Environment Management.....	K-19
Table K. 3.7.1	Project Investment Cost for Inter-Sector Water Resources Development, Allocation and Distribution .....	K-19

### List of Annex Tables

Annex-T K.1.4.1	Grouping of Projects (Group-A Projects) .....	KT-1
Annex-T K 2.2.1	Principal Objectives and Contents of Major Discussions in TWG Meetings, Stakeholder Meeting and Joint SC and TWG Meeting in September and October 2010.....	KT-3
Annex-T K.2.1.2	Development Scenarios and Relevant Projects (Group-A).....	KT-6
Annex-T K.2.1.3	Implementation Schedule for Group-A Projects .....	KT-8
Annex-T K.2.2.4	Results of Evaluation (Scoring) of Group-B Projects by Study Team.....	KT-9
Annex-T K.2.2.5	Results of Evaluation (Scoring) of Group-B Projects by TWG Members .....	KT-10
Annex-T K.2.2.6	Group-B Projects to be Implemented in Short, Medium and Long Term .....	KT-11
Annex-T K.2.2.7	Implementation Schedule for Group-B Projects .....	KT-12
Annex-T K.2.2.8	Development Scenarios and Relevant Projects (Group-B).....	KT-13





## Sector K. Formulation of IWRM Plan

### K.1 Setting of Planning Framework

#### K.1.1 Target Year

The target year of the IWRM Plan under this planning stage had been set at 2025 as agreed in the “Minutes of Meeting on Implementation Agreement for the Study.” On the premise of the target year 2025, the project implementation period is divided into the following three 5-year terms. The phased implementation schedule as well as the phased investment program for the IWRM Plan is formulated on the premise of the said three terms.

- (1) Short-Term for the period from 2011 to 2015;
- (2) Medium-Term for the period from 2016 to 2020; and
- (3) Long-Term for the period from 2021 to 2025.

#### K.1.2 Socioeconomic Framework

##### K.1.2.1 Projected Population in the Study Area

Since about 99% of the whole extent of the study area belongs to the four provinces of Bulacan, Nueva Ecija, Pampanga and Tarlac, the population projection for the study area is made based on the Census for the said provinces. The specific population growth rates for the provinces are assumed based on the projection by the National Statistic Coordination Board (NSCB), as listed below:

**Table K. 1.2.1 Projected Population Growth Rates for the Study Area**

Province	2006-2010	2011-2015	2016-2020	2021-2025
Bulacan	2.70%	2.41%	2.18%	1.94%
Nueva Ecija	1.62%	1.50%	1.31%	1.10%
Pampanga	1.81%	1.62%	1.42%	1.23%
Tarlac	1.70%	1.55%	1.35%	1.16%
<b>The Study Area</b>	<b>2.06%</b>	<b>1.86%</b>	<b>1.66%</b>	<b>1.46%</b>

Source: NSCB

##### K.1.2.2 Projected Gross Regional Domestic Product (GRDP)

The projected growth of GRDP is estimated from the past annual average growth rate of Gross Value Added (GVA) in the industrial sectors recorded for Region III. Region III had an increase in GVA from 1995 to 2007, as listed below.

**Table K. 1.2.2 Annual Average Growth Rate of Gross Value Added in Region III from 1995 to 2007**

(1) Sector	Gross Value Added (in million pesos)			Annual Ave. Growth Rate of GVA (1995-2007)	Annual Ave. Growth Rate of GVA (2003-2007)
	In 1995	In 2003	In 2007		
Agriculture, Fishery & Forest	38,532	64,012	93,539	7.7%	8.2%
Industry	59,398	127,901	175,857	9.5%	9.0%
Service	62,009	155,377	231,959	11.6%	10.2%
Total	159,939	347,426	501,356	10.0%	9.4%

Source: NSCB

### K.1.2.3 Price Level of Project Cost

The project cost discussed in this project formulation is converted to the price level as of 2009 using the “Wholesale Price Index (WPI) for Construction Material” shown below.

**Table K. 1.2.3 Average Annual Increase Rate of Wholesale Price Index against Previous Year**

Year in Interval	1960–1969	1970–1979	1980–1989	1990–1999	2000–2008	1960–2009
WPI - Construction Materials	5.58%	5.65%	5.68%	5.52%	7.39%	5.97%

### K.1.3 Visions, Objectives and Sector Goals of IWRM for the Study Area

#### K.1.3.1 Purpose for Setting of Visions, Objectives and Sector Goal

The IWRM Plan would involve multi-water-sector projects such as those in the sectors of: (i) agriculture/irrigation and fishery development; (ii) municipal water supply, sanitation and sewerage; (iii) management of flood and sediment disasters; (iv) watershed management, (v) water-related environmental management; and (vi) water resources development, allocation and distribution. Taking these multi-sector projects into account, the visions for the IWRM Plan are proposed as the principal targets common to all proposed projects for the IWRM of Pampanga river basin. The objectives in the several categories are further assumed to embody the visions. Moreover, each of the water-related sectors in the IWRM Plan is provided with concrete sector goals, which could enhance the objectives and/or visions.

#### K.1.3.2 National and Regional Development Policies

The visions, objectives and sector goals shall be in line with the national and regional development policies. The policies on the nationwide and/or region-wide socioeconomic development and political improvement in the Philippines have been delineated through the “Medium-Term Philippine Development Plan (MTPDP) 2004-2010”<sup>1)</sup> and the “Regional Physical Framework Plan (RPF) 2005-2030, Central Luzon”<sup>2)</sup>. The IWRM Plan Framework in the Philippines<sup>3)</sup> had been also formulated through the leadership of NWRB in 2006 as the nationwide roadmap to enhance the adequate supply of clean water at a reasonable price, while at the same time effectively safeguarding biodiversity and healthy environment. The details of these national and regional development policies are as described hereinafter.

##### (1) Medium-Term Philippine Development Plan 2004-2010

The Philippines recorded the national average poverty incidence of 34% in 2000, which worsened from 33% in 1997. In the light of such extremely high and aggravating poverty incidence, the MTPDP 2004-2010 addressed “Poverty Alleviation” as the priority task of the government. The MTPDP further emphasizes the necessity to accelerate the country’s economic development, particularly through decentralized development for the small and medium enterprises (SMEs) and agribusiness, which could lead to the reduction of unemployment and rural poverty. Taking these conditions into account, the MTPDP set ten (10) objectives to contribute toward poverty alleviation and national economic development,

**Table K. 1.3.1 Objectives Delineated in MTPDP 2004-2010**

Category	Objectives
Livelihood	(1) Increase of job opportunities and income
Education	(2) Increase of enrollment rate of schools
Fiscal Status	(3) Creation of fiscal status balanced with right revenues and expenditures
Decentralized Development	(4) Spread of transport and digital infrastructure network over the country
	(5) Sustainable supply of power and water over the country
	(6) Spread of new centers of government, business and community in Luzon, Visayas and Mindanao
	(7) Development of Subic-Clark corridor as the competitive international service and logistics center in Southeast Asia Region
National Harmony	(8) Execution of elections of high integrity
	(9) Peace in Mindanao and to all insurgencies
	(10) Closure of divisive issues generated by the EDSA Revolution

Of the above objectives, those under the categories of livelihood and decentralized development in particular are closely related to the water management for the study area, and they are further elaborated as below.

**(a) The Objectives under the Category of Livelihood**

The MTPDP stated that poverty in the Philippines is basically the problem in rural areas, because a majority of the poor are the small and/or landless farmers, the farm workers, the fisher-folks and the indigenous people, and most of them are engaged in agriculture. Moreover, they tend to reside in the environmentally vulnerable areas and be handicapped by the less public service such as power/water supply.

From the above points of view, the MTPDP highlighted agriculture and agro-forestry development as the principal driving force for job creation, which could lead to poverty alleviation as well as economic development in rural areas, in particular.

The MTPDP worked out the nationwide vision to create two million jobs in the agricultural sector, which should have been achieved through development of two million hectares of new agricultural land. At the same time, the MTPDP stressed the necessity for increase of agricultural productivity at competitive prices, which could lead to the incremental income of farmers. Hence, the strengthening of irrigation water supply and/or expansion of agro-forestry as a part of watershed management would be highlighted to increase job opportunities in the agricultural sector and the income of farmers.

**(b) The Objectives under the Category of Decentralized Development**

The MTPDP addressed the necessity for spreading the new urban centers in Luzon, Visayas and Mindanao to decongest the overconcentration of economic activities in Metro Manila and to spur economic growth in the Philippines. The Subic-Clark corridor, which is partially located in the study area, in particular, is highlighted as the potential competitive international service and logistics center in Southeast Asia. Angeles, San Fernando and other major cities located in the study area would also be the strong candidates as the new government, business and community centers, because of the existing infrastructures and the easy access to Metro Manila through the North Luzon Expressway. The development of new bulk water supply systems, sewerage systems, flood mitigation systems and other water development/management programs would be the critical factors to create such new urban centers.

**(2) Regional Physical Framework Plan (RFPF) 2005-2030, Central Luzon**

The RFPF 2005-2030 set forth the following four (4) primary targets of regional development:

- Increase of agricultural productivity, which could lead to the increase of farmer's income in particular;
- Reduction of business cost through upgrading of the existing road infrastructure and strengthening of the linkages between the existing economic zones and their host municipalities;
- Reduction of the risk on natural calamities such as floods, landslides and earthquakes/tsunamis; and
- Increase of growth potential through agrarian reform, increase of enrollment rate of schools and improvement of residents' physical condition.

All of the above targets are likely to be oriented to the achievement of socioeconomic development, which could lead to improvement of living conditions and livelihood of residents finally contributing to poverty alleviation and economic development in the region. To achieve the visions, the RFPF set the following policies, strategies and/or action plans in each of the water-related sectors.

**(a) Agriculture/Irrigation and Fishery**

- The primary agriculture and aquaculture lands shall be preserved without being converted to other uses.
- The government shall continue to support agriculture and aquaculture development, especially in the construction of irrigation and drainage facilities.
- Science and technologies shall be harnessed to increase agriculture and aquaculture productivity with competitive costs for production.
- Priority shall be given to the development of new irrigation systems in order to expand the agricultural production areas. Existing irrigation systems shall be also rehabilitated and improved to increase their efficiencies.

**(b) Municipal Water Supply, Sanitation and Sewerage**

- The region's groundwater and surface water resources shall be properly developed and managed to satisfy the demand and reduced cost for municipal water supply.
- Existing municipal water supply and sanitation facilities shall be rehabilitated, improved and properly maintained. New facilities shall be also developed to increase their efficiency and service coverage.

**(c) Management of Floods and Sediment Disasters**

- Extensive and efficient flood control systems shall be provided to protect the settlement and production areas, in particular.
- Utmost effort shall be made to retain floodwater in the upper and middle reaches by suitable reservoir or flood retarding pond/swamp. This would ensure better control over floods and at the same time, create possible water resources development for multi-purpose project functions like power generation, irrigation and recreational facilities.
- Expansion of settlements in areas prone to disasters shall be restrained.

**(d) Watershed Management**

- The region shall focus on reforestation in open areas.
- Building of settlements and/or livestock production shall be discouraged in the upland areas with steep ground slopes of more than 18% and 30%, respectively. Production activities in NIPAS areas shall be also strictly prohibited.
- Massive reforestation of degraded mangrove ecosystems shall be pursued.

**(3) Integrated Water Resources Management (IWRM) Plan Framework in the Philippines**

The ever-increasing water demand is becoming a critical factor to the socioeconomic development and global competitiveness in the Philippines. Moreover, there is a critical linkage between better water management in various sectors and the country's socioeconomic development. From these points of view, the MTPDP underscored a need to adopt the IWRM approach as a more integrated and holistic management of water resources in the Philippines. This approach involves the coordinated development and management of water, land and related resources within the hydrological boundaries, to optimize economic and social welfare without compromising the sustainability of vital ecosystems.

The IWRM Plan Framework delineated four (4) Sustainable Outcomes, which are the medium to long-term goals for the water resources management in the Philippines. To achieve the Sustainable Outcomes, nine (9) Strategic Themes, which are either sector or inter-sector imperatives, are further set forth in the IWRM Plan Framework. The contents of the sustainable outcomes and strategic themes are as shown below.

**Table K. 1.3.2 Sustainable Outcomes and Strategic Themes in the IWRM Plan Framework**

Sustainable Outcomes	Strategic Themes
Effective Protection and Regulation for Water Security and Ecosystem Health	<ul style="list-style-type: none"> <li>To ensure the rational, efficient and ecologically sustainable allocation of water.</li> <li>To enhance the effectiveness in groundwater management and aquifer protection.</li> <li>To achieve the clean and healthy water.</li> <li>To mitigate the risks of climate change events and water-related disasters.</li> </ul>
Sustainable Water Resources and Responsive Services for Present and Future Needs	<ul style="list-style-type: none"> <li>To promote water conservation/stewardship and improve the water use efficiency.</li> <li>To expand the access and ensure availability of affordable and responsive water supply and sanitation services.</li> </ul>
Improved Effectiveness, Accountability, and Synergy among Water-Related Institutions and Stakeholders	<ul style="list-style-type: none"> <li>To promote the participatory water governance and supportive enabling environment.</li> <li>To strengthen the knowledge management and the building capacity for IWRM.</li> </ul>
Adaptive and Proactive Response to Emerging/Future Challenges	<ul style="list-style-type: none"> <li>To explore the new pathways to water resource management - water sensitive design and water rights trading.</li> </ul>

**K.1.3.3 Visions, Objectives and Sector Goals adopted for the Study**

With reference to the above nationwide and/or region-wide development plan and IWRM Plan Framework, the following visions, objectives and sector goals are adopted for the IWRM Plan of the study area.

**(1) Visions**

**“Poverty Alleviation”** and **“Economic Development”** are raised as the priority tasks in the MTPDP. All of the socioeconomic and infrastructure development programs proposed in the RPFDP for Central Luzon are also directed to the said two principal tasks. With reference to the MTPDP and the RPFDP, “Poverty Alleviation” and “Economic Development” are adopted as the principal visions of the IWRM plan for Pampanga river basin.

It is herein noted that “Poverty Alleviation” is oriented to not only the betterment of livelihood/increase of income for poverty thresholds but also securing the basic human needs such as safe drinking water and safe living conditions against flood and other water-related disasters. At the same time, the approaches to “Poverty Alleviation” shall not be made to sacrifice the vital ecosystem. Likewise, “Economic Development” shall be oriented to not only development of the regional economy but also preserving and/or recovery of the ecosystem in Pampanga river basin.

The related vision statement proposed by a member of TWG is as shown in Table K1.3.3.

**Table K. 1.3.3 Vision Statement**

*The Pampanga river basin (PRB) shall become the most economically advanced river basin in the country that shall attain the lowest incidence of poverty, fully restored watershed and ecosystems, properly utilized and managed water resources, adequately provided modern infrastructure facilities, and an empowered citizens in partnership with transparent, accountable, and development-oriented leaders.*

The average ratio of poverty thresholds in the study area as of 2006 is about 20%, which is lower than the national average of about 33%. Nevertheless, particular attention shall be given to the ratio of poverty thresholds in Nueva Ecija Province in the study area. The ratio in this province is about 38%, which exceeds the national average. A majority of the employees in the province are engaged in the agriculture/forestry sector and one of the crucial issues on poverty alleviation for the province should be addressed to increment the income of employees in the sector.

It is further noted that manufacturing, agriculture/forestry and trade are the three (3) major industries in Region III, which produce the Gross Value Added of more than 50% in the region.

Accordingly, these three industrial sectors shall take the principal role for the “Economic Development” in the study area, so that enhancement of the bulk water supply system for manufacturing and the irrigation system for agriculture would be the important water-related works to ensure the economic development in the study area. Enhancement of the irrigation system in particular would be the crucial issue, since Region III is the largest irrigated paddy-producing district in the country taking the share of about 22% of the national total.

**(2) Objectives**

To achieve the said principal visions, the following five (5) items are further proposed as the objectives of the IWRM plan for Pampanga river basin with reference to the MTPDP, RFPF and IWRM Plan Framework in Philippines:

**(a) Objective 1: Enhanced Livelihood**

Objective 1 is oriented to the enhancement of the minimum requirement for livelihood, which shall contribute to poverty alleviation. The importance of this objective is emphasized in the MTPDP for the Philippines as well as the RFPF for Central Luzon. To achieve this objective, both the MTPDP and RFPF emphasized the necessity to increase job opportunities in the agricultural sector, and agricultural productivity with competitive production costs.

**(b) Objective 2: Improved Quality of Life**

Objective 2 is oriented to the improvement of the quality of life, which shall be one of the essential factors for poverty alleviation similar to the above Objective 1. Both the MTPDP and RFPF highlighted the importance of the following two water management systems for improvement of the quality of life, namely; (i) the substantial municipal water supply system, which could promise access to safe drinking water; and (ii) substantial mitigation system against flood, sediment disasters and other water-related damages.

**(c) Objective 3: Decentralized Development**

Objective 3 is the main driving force for the decentralized socioeconomic development of the existing urban centers in the study area such as Clark Field, Angeles City and San Fernando City, and the agricultural development in the rural areas. Both the MTPDP and RFPF highlighted two principal water-related issues to give a strong incentive of such decentralized development, namely; (i) availability of adequate municipal water supply for the urban centers and adequate irrigation water supply for the principal irrigation areas in the study area; and (ii) minimization of damage by floods, sediment disasters and other water-related disasters in the study area.

**(d) Objective 4: Sustained Ecosystem**

The above Objectives 1, 2 and 3 would contain active interventions to reform the existing natural environment, which could result in spoiling the rich biodiversity and the healthy ecosystem. To avoid such adverse effects to the ecosystem, Objective 4 is to be launched. The major approaches to attain this objective would include reforestation of mangroves and other degraded ecosystems and inducement of sanitary facilities and efforts to improve the quality of surface water.

**(e) Objective 5: Empowered People**

As described above, water resource development and management shall involve various sectors such as those for water allocation/distribution, mitigation of water-related disasters and conservation of ecosystems. To achieve a well-balanced water resources development and management, it is indispensable to involve all of the stakeholders in the IWRM Plan and pursue capacity building for them at all stages and key processes. From this point of view, this objective is proposed as a part of the MTPDP and the IWRM-RFP and applied in the study.

**(3) Goals of Each of Water related Sectors**

To achieve the aforesaid five (5) objectives, the goals for each of the water-related sectors are assumed, with reference to the MTPDP, RPPF and the IWRM Plan Framework as listed below.

**Table K. 1.3.4 Goals in Each of the Sectors of Water Development and Management**

Sector	Goal
Agriculture and Hydropower	<ul style="list-style-type: none"> <li>• Rehabilitate and develop irrigation system</li> <li>• Enhance new agricultural technology on water management</li> <li>• Sustainable fishery under integrated water resource management</li> </ul>
Municipal Water Supply, Sanitation and Sewerage	<ul style="list-style-type: none"> <li>• Improve water supply quality</li> <li>• Ensure necessary water supply capacity</li> <li>• Reduce pollution load</li> </ul>
Flood and Sediment Disaster Mitigation	<ul style="list-style-type: none"> <li>• Mitigate chronic damage by flood and sediment disasters</li> </ul>
Watershed Management	<ul style="list-style-type: none"> <li>• Intensify management, protection and maintenance of vulnerable and ecologically sensitive area</li> <li>• Increase forest cover of critically denuded uplands, and mangrove areas and urban corridors</li> </ul>
Water-related Environment Management	<ul style="list-style-type: none"> <li>• Strengthen water quality monitoring, data management, regulatory and decision support system</li> <li>• Reduce pollution load from various sources in key areas of Pampanga river basin in order to render quality of waters fit for specified uses</li> </ul>

**K.1.4 Grouping of the Projects**

As described in Sectors C to H, 84 projects are selected as the eligible components of the IWRM for Pampanga river basin. These projects are classified into the Group-A and B in order to facilitate programming of the under-mentioned project implementation schedule and development scenarios. The detailed criteria for classification to Group-A and B are as described in the foregoing Section J.3.4 in Sector Report J.

As the results of classification, the projects are divided into Group-A and B as listed in Annex-T K.1.4.1 and summarized Table K.1.4.1. The Group-A includes 43 projects and the investment cost of about 97 billion pesos in total. The Sector of the “Municipal Water Supply, Sanitation and Sewerage” requires the largest cost of about 69 billion pesos in Group-A, which correspond to about 71% of the group total. On the other hand, the Group-B includes 41 projects requiring the investment cost of about 72 billion pesos in total. The Sector of “Agriculture/Irrigation and Fishery” takes 18 projects and the investment cost of 55 billion pesos in total (or about 76% of the total), which is the largest in Group-B. The second largest is in the Sector of Management of Flood and Sediment Disasters taking 7 projects and the project investment cost of about 12 billion pesos (about 17% of the total).

**Table K. 1.4.1 Results on Grouping of the Projects**

Group	Sector	Number of Projects	Project Cost (million pesos)
A	Agriculture/Irrigation and Fishery	10	12,388
	Municipal Water Supply, Sanitation and Sewerage	15	68,571
	Management of Flood and Sediment Disasters	3	3,687
	Watershed Management	9	623
	Water-related Environment Management	5	3,417
	Inter-Sector Water Resources Development, Allocation and Distribution	1	7,966
	Sub-total	43	96,652
B	Agriculture/Irrigation and Fishery	18	55,400
	Municipal Water Supply, Sanitation and Sewerage	3	1,155
	Management of Flood and Sediment Disasters	7	12,071
	Watershed Management	7	2,951
	Water-related Environment Management	3	248
	Inter-Sector Water Resources Development, Allocation and Distribution	3	607
	Sub-total	41	72,432
Total		84	169,084

### K.1.5 Ceiling of Investment Cost for Projects in Group B

The ceiling of project investment cost shall be one of the important factors to determine the implementation schedule for the projects in Group B. When the implementation of projects excessively concentrates upon any of the aforesaid short-term, medium-term and/or long-term, the total project investment cost may exceed the affordable limit of the national and/or regional budgetary capacity. From this point of view, the approximate ceilings of investment cost for the projects in Group B are provisionally estimated for each of the short-term, medium-term and long-term, as listed in Table K.1.5.1. The detailed estimation bases for these ceilings of investment cost are as described in Section K.1.6.

**Table K. 1.5.1 Ceilings of Investment Cost for Projects in Group B**

Term	Period	Ceiling Amount
Short-term	2011–2015	31.7 billion pesos
Mid-term	2016–2020	33.7 billion pesos
Long-term	2021–2025	33.7 billion pesos
Total	2011–2025	99.1 billion pesos

### K.1.6 Estimation Basis for the Ceiling of Investment Cost

The national budget of the Philippines had increased from 0.948 trillion pesos in 2005 to 1.426 trillion pesos in 2009, with the annual average incremental rate of about 11% as listed below.

**Table K. 1.6.1 Summary of National Government Budget**

(Unit: Billion Pesos)

Year	Allocated to Departments and Agencies	Allocated as Special Purpose Funds	Total
2005	442	506	948
2006	401	652	1,053
2007	458	669	1,126
2008	722	592	1,315
2009	710	716	1,426

Of the above national budget, 15 to 20 billion pesos (about 1.0 to 1.4% of the national budget) are allotted to infrastructure development of the water source/distribution for irrigation implemented by NIA and flood mitigation by DPWH, as listed in Table K.1.6.2.

**Table K. 1.6.2 National Budget Allocated to the Projects for Water-Related Infrastructure Development**

(Unit: Billion Pesos)

Year	Description	Water Use*	Flood Mitigation**	Total
2007	(1) Whole Nation	7.31	7.93	15.25
	(2) Study Area	1.52	0.27	1.79
	(3) Share {(2)/(1)}	20.80%	3.30%	11.70%
2008	(1) Whole Nation	8.04	6.73	13.67
	(2) Study Area	2.08	0.56	2.64
	(3) Share {(2)/(1)}	25.90%	8.30%	19.30%
2009	(1) Whole Nation	12.55	6.93	19.48
	(2) Study Area	0.36	1.54	1.9
	(3) Share {(2)/(1)}	2.90%	22.30%	9.80%

Note: \*: Budget allocated to projects of NIA under the “Agriculture and Fisheries Modernization Program” in “Special Purpose Funds”

\*\* : Budget allocated to projects of DPWH under the “Department Fund”

Source: Budget Expenditures/Sources by the Department of Budget and Management

In addition to the above national budget, the LGUs also have a certain budget for the implementation of water-related projects. Nevertheless, the annual total budgets of the provincial governments in the study area are in the range of about 1 to 2.4 billion pesos only and such amounts would make it virtually difficult to shoulder the necessary costs for the major water-related development projects.



Accordingly, the national budget could be regarded substantially as the sole eligible source for the implementation of major water-related projects. At the same time, the budget could be unevenly concentrated to a particular project, which would be implemented during a particular period, provided that the project implementation is judged to be strategically important for the nation. Moreover, the national budget has increased in the recent five (5) years with an annual incremental rate of about 11%, and this incremental tendency is expected to continue for the time being. From these viewpoints, the ceilings of investment cost for the projects are estimated on the following assumptions:

- The national budget for water-related infrastructure development projects would be able to continue to increase by 11% per year until the end of the short-term plan (i.e., 2015); and
- Taking into account the maximum percentage of the above national budget allocated to the study area in the previous years, about 20% of the national budget could be expended, as the ceiling, for project development in the study area.

Based on the above assumptions, the ceiling of investment by the target year 2025 is estimated at about 99 billion pesos, and those for short-term, medium-term and long-term plans are as listed in Table K.1.5.1.

## **K.2 Project Implementation Schedule**

### **K.2.1 Implementation Schedule for Group-A Projects**

As described in Section J.3.4 and J.3.5 in Sector Report J, the development scenarios relevant to the Group-A projects are firstly conceived taking the basic social and natural needs into account, and then the implementation schedule for Group-A projects are set up to catch up the development scenarios. The typical development scenarios are as enumerated below:

- *The development scenarios, which have to be timely implemented in accordance with the basic human needs:* The typical scenario is such as development of the bulk municipal water supply system, which has to be completed in the right term to meet the municipal water demand increased with the urban population growth.
- *The development scenarios, which shall be gradually attained throughout the short, medium and long-term:* The scenarios are oriented to the gradual improvement of the social and/or natural environments such as (a) increase of the access to the safe drinking water through the expansion of the pipe water supply system and the sanitary toilets, (b) expansion of the forest coverage through the yearly regular program of reforestation and (c) increase of the agricultural activities through the yearly regular maintenance and rehabilitation of the existing irrigation facilities.

The JICA Study Team proposed the development scenarios for the Group-A projects in due consideration of: (a) the problems/issues on IWRM in Pampanga river basin (refer to Chapter 6) and (b) the visions, objectives and sector goals of the IWRM (refer to Section K1.3). The proposed development scenarios were further reviewed and revised through the TWG meetings on September 29, 2010, the TWG workshop on October 07, 2010 and the stakeholder meeting on October 13, 2010 (refer to Annex-T K.2.1.1). As the results, the specific development scenarios for Pampanga river basin were finally determined and the implementation schedule for Group-A projects were further proposed in due consideration of the right time for completion of the projects to catch up the development scenarios. The proposed development scenarios and the relevant project implementation schedules are as shown in Annexes-T K.2.1.2 and 2.1.3. The details of the development scenarios are further described in the following Section K.4.1.

### **K.2.2 Implementation Schedule for Group-B Projects**

As described in the Section J.3.4, the Group-B projects are oriented to the following items:

- Development of the regional economy,
- Mitigation of the flood and sediment disasters and
- Support of the yearly regular projects classified into Group-A.

Target completion year of the Group-B project could be optional in general, and the priority order of the projects is assumed as the principal factor for programming of the implementation schedules for the Group-B projects. The detailed methodologies for setting of the priority order of the projects and the implementation schedule are as described in the foregoing Sections J.3.6 in Sector Report J and 7.9 in Main Report.

The priority order of the Group-B projects is determined based on the results of scoring for each of the project. The scorings for the Group-B projects were firstly made by the JICA Study Team and then the results of the scorings are reviewed and revised by 13 members of the TWG, who represent the following agencies: NIA, NPC, BSWM, PHILVOLCS, DENR-RBCO, DPWH-FCSEC, PAGASA, DILG-Region III, Provincial Gov. of Tarlac (PPDO), Provincial Government of Bulacan (PGENRO), NEDA-Region III, MWSS, DENR-PAWB and NWRB.

The specific procedures taken for the scorings of the projects are as below:

- (1) The scorings of the 29 proposed and conceptual projects<sup>1</sup> were firstly made by the JICA Study Team as shown in Annex-T K.2.2.4. The results of the scorings were presented to and discussed by the TWG members in the TWG Meeting on September 29, 2010.
- (2) The TWG-Workshop was held on October 7, 2010. Each of the TWG members reviewed the results of the above scorings by the JICA Study Team, and revised the results of scorings through the Workshop. The scorings for each of the projects revised by the TWG members are averaged into the geometric mean as shown in Annex-T K.2.2.5.
- (3) Some of the TWG members proposed to make the second-round scorings for the projects not referring to the results of scoring by the JICA Study Team. This second-round scoring aimed at attaining more objective and precise results of scorings. In accordance with the proposal, the second-round scoring was individually made by each of the TWG members in the days following to the Workshop. However, the second-round scorings were prepared by three (3) members only.
- (4) The limited number of second-round scorings was judged to hardly represent the collective conclusion of the whole TWG members on scoring. From this point of view, the priority order of the projects is finally determined according to the first-round scores made during the Workshop as stated in the above item (2).

In addition to the above priority order of the projects made by the scoring, the ceiling project investment cost for each of the short, medium and, long-term is another important factor to determine the implementation schedule for the Group-B projects. The details of the ceiling project investment cost are as described in Section K1.6, and the projects to be implemented in the short, medium and long-term are proposed taking the ceiling project investment cost into account as shown in Annexes-T K.2.2.6 and 2.2.7. The development scenarios to be attained by the proposed implementation schedule are assumed as shown in Annex-T K.2.2.8 and described in detail in the following Section K.4.2.

### K.2.3 Number of Projects to be Implemented and Project Investment Cost for Each of 5-year Term

In accordance with the aforesaid the implementation schedules for the Group-A and B projects, the number of the projects to be implemented in each of the short, medium and long-term is estimated as shown in Tables K.2.3.1.

**Table K. 2.3.1 Number of Projects to be implemented in Each of Short, Medium and Long-term**

Classification of Projects		Short-term	Mid-term	Long-term	Total
Project to be Implemented within the Term	Group A	41	36	36	113
	Group B	33	17	6	56
	<b>Total</b>	<b>74 (44%)</b>	<b>53 (31%)</b>	<b>42 (25%)</b>	<b>169 (100%)</b>
Projects to be commenced in the Term	Group A	41	0	2	43
	Group B	33	7	1	41
	<b>Total</b>	<b>74 (88%)</b>	<b>7 (8%)</b>	<b>3 (4%)</b>	<b>84 (100%)</b>
Project to be Completed within the Term	Group A	5	2	36	43
	Group B	23	12	6	41
	<b>Total</b>	<b>28 (33%)</b>	<b>14 (17%)</b>	<b>42 (50%)</b>	<b>84 (100%)</b>

A total of 84 projects are to be implemented throughout the short, medium and long term. Out of these projects, 74 projects are firstly commenced in the short-term, and 28 projects of them are completed within the same term as listed in Tables K.2.3.1. The remainders (i.e., 46 projects) continue to be

<sup>1</sup> The Group-B includes 12 ongoing projects out of 41 projects in total. These ongoing projects are to be implemented in accordance with their existing implementing schedules, which had already been programmed by the project proponents. On the other hand, other 29 proposed and/or conceptual projects are to be implemented in due consideration of the priority order of the projects into account as described above.

## Sector K: Formulation of IWRM Plan

implemented in the next medium-term. Likewise, 53 projects are implemented in the medium-term including 7 projects to be newly commenced and 14 projects to be completed within the term. The number of projects to be finally implemented in the long-term is 42, which include 3 projects to be newly commenced.

## K.3 Project Investment Plan

### K.3.1 General

It is clarified that a total of about 169 billion pesos would need to be invested for implementation of the whole projects for IWRM plan of Pampanga river basin (i.e., 84 projects). Of the total project investment cost, 61.5 billion pesos (36% of the total investment cost) is disbursed in the short-term and followed by 52.7 billion pesos (31%) in the medium-term and 55.0 billion pesos (33%) in the long-term as shown in Table K.3.1.1.

**Table K. 3.1.1 Project Cost to be disbursed in Each of Short, Mid and Long-term**

(Unit: million pesos)

Classification of Project	Short-term	Mid-term	Long-term	Total
Agriculture/Irrigation and Fishery Development	22,163	26,164	19,461	67,788
Municipal Water Supply, Sanitation and Sewerage Development	29,137	8,980	31,609	69,726
Management of Flood and Sediment Disasters	6,431	6,597	2,730	15,758
Watershed Management	1,721	1,588	265	3,574
Water-related Environment Management	1,501	1,371	793	3,666
Inter-Sector Water Resources Development, Allocation and Distribution	509	7,965	99	8,573
Total	61,462	52,665	54,957	169,085

Of the total project investment cost of about 169.1 billion pesos, the ongoing projects and the proposed projects would require the investment cost of 21.5 and 77.5 billion pesos, respectively as shown in Table K.3.1.2. The necessary budgetary sources of a total of 99.0 billion pesos for the ongoing and proposed projects have been arranged and/or they are being sought by the project proponents. On the other hand, there is nothing to be done with the project investment cost of about 70.1 billion pesos for the conceptual projects. The conceptual projects for Municipal Water Supply, Sanitation and Sewerage Development in particular require the large budgetary sources for their investment of 48.1 billion peso.

**Table K. 3.1.2 Project Investment Cost divided according to Classifications and Status of the Projects (Project Implementation Period: 2011 – 2025)**

(Unit: million pesos)

Classification of Project	Ongoing Project	Proposed Projects	Conceptual Projects	Total
Agriculture/Irrigation and Fishery Development	12,766	54,208	814	67,788
Municipal Water Supply, Sanitation and Sewerage Development	5,213	16,456	48,057	69,726
Management of Flood and Sediment Disasters	1,454	5,820	8,484	15,758
Watershed Management	1,662		1,912	3,574
Water-related Environment Management	356	1,036	2,273	3,665
Inter-Sector Water Resources Development, Allocation and Distribution			8,573	8,573
Total	21,452	77,520	70,113	169,085

As shown in Table K.3.1.3, the public investment by the national government agencies and/or the local government units would be the major financial sources for all projects other than those for municipal water supply, sanitation and sewerage development. The public investment could include the private investment induced by BOT and/or the foreign financial assistance.

In the sector for the municipal water supply, sanitation and sewerage development, the sewerage development could be implemented through the public investment by the LGUs, while the municipal water supply development has to be implemented, in principle, through the non-public investment by the public corporation/private firm.

Almost half of the investment cost (i.e., 34.2 billion pesos) is for the municipal water supply development by the public corporation and/or private firm. This investment cost is to be recovered through the collection fee for municipal water supply services. Details on this cost recovery are as described in the under-mentioned Section K.3.3.

**Table K. 3.1.3 Project Investment Cost divided according to Classifications and Implementing Bodies of the Projects (Project Implementation Period: 2011 - 2025)**

(Unit million pesos)

Classification of Project	Project Implementing Bodies				Total
	NGAs	LGUs	NGAs & LGUs	Public Corporation/Private Firm	
Agriculture/Irrigation and Fishery Development	53,514	-	14,274	-	67,788
Municipal Water Supply, Sanitation and Sewerage Development	-	35,521	-	34,205	69,726
Management of Flood and Sediment Disasters	11,242	3,008	1,508	-	15,758
Watershed Management	1,873	-	1,669	32	3,574
Water-related Environment Management	533	2,025	71	1,036	3,665
Inter-Sector Water Resources Development, Allocation and Distribution	-	-	8,573	-	8,573
<b>Total</b>	<b>67,162</b>	<b>40,554</b>	<b>26,095</b>	<b>35,273</b>	<b>169,085</b>

The project investment plan for each of the sectors is as described hereinafter:

### K.3.2 Project Investment Plan for Agriculture, Irrigation and Fishery Development

As shown in Table K.3.2.1, the total project cost in this sector, which is to be disbursed by 2025, is estimated at about 67.8 billion pesos. Of this total project cost, about 98% or 665.5 billion pesos is used for development and operation/maintenance of the national irrigation system being financed from the “National Government Fund for Agriculture and Fisheries Modernization Program”, which is allocated to NIA. In addition to the Fund, the “Irrigation Service Fee (ISF)” is to be used as part of the operation and maintenance for the existing irrigation facilities. However, the actual budget for Region III allotted from the ISF in the recent five (5) years from 2004 to 2008 is in a range of 51.3 to 64.2 million pesos only, which could hardly make a substantial contribution to the allotment to the necessary project cost.

Aside from the above budget of NIA, the following projects are to be financed from the national budget of the Department of Agriculture and/or local government budget:

- The projects for development of the small scale irrigation system (the project codes of AI-G-08, AIP-11 and AI-C-01): The investment cost for these projects is estimated at about 811 million pesos, which is to be financed from the budget of DA-BSWM and the LGUs.
- The projects for inland fishery development (the project codes of AF-G-01 to 04): The investment cost for these projects is estimated at 450 million pesos in total and to be financed from the budget of DA-BFAR.

**Table K. 3.2.1 Project Investment Cost for Agriculture, Irrigation and Fishery Development**

(Unit: million pesos)

Object*	Principal Entities for Financing	Short-term		Mid-term		Long-term		Total	
1	NIA	21,545	97.2%	25,714	98.3%	19,268	99.0%	66,527	98.1%
2	DA and LGUs,	469	2.1%	300	1.1%	43	0.2%	811	1.2%
3	DA	150	0.7%	150	0.6%	150	0.8%	450	0.7%
<b>Total</b>		<b>22,163</b>	<b>100.0%</b>	<b>26,164</b>	<b>100.0%</b>	<b>19,461</b>	<b>100.0%</b>	<b>67,788</b>	<b>100.0%</b>

Note:

\*: Object 1: Development and operation/maintenance for the large-scale irrigation systems and capacity development for agricultural development

Object 2: Development and operation/maintenance of small scale irrigation system

Object 3: Development of inland fishery

### K.3.3 Project Investment Plan for Development of Municipal Water Supply, Sanitation and Sewerage

The projects, which belong to this sector, would require the project investment cost of about 67.9 billion pesos in total as listed below:

**Table K. 3.3.1 Project Investment Cost for Development of Municipal Water Supply, Sanitation and Sewerage**

(Unit: million pesos)

Object*	Principal Entities for Financing	Short-term		Mid-term		Long-term		Total	
		Amount	%	Amount	%	Amount	%	Amount	%
1	WD	3,793	13.0%	3,610	40.2%	3,722	11.8%	11,127	16.0%
2	Public	0	0.0%	255	2.8%	255	0.8%	510	0.7%
3	Corporation/	13,111	45.0%	1,176	13.1%	23,661	74.9%	37,948	54.4%
4	Private Firm**	5,562	19.1%	0	0.0%	0	0.0%	5,562	8.0%
5	LGU	519	1.8%	304	3.4%	267	0.8%	1,090	1.6%
6		5,507	18.9%	3,635	40.5%	3,704	11.7%	12,846	18.4%
7		645	2.2%	0	0.0%	0	0.0%	645	0.9%
Total		22,163	29,137	100%	8,980	100%	31,609	100%	69,726

Note:

- \*: Object 1: Expansion of Level 3 and 2 municipal water supply system  
 Object 2: Construction/provision of septage treatment and disposal facilities  
 Object 3: Development of bulk water supply system  
 Object 4: Strengthening of Water Supply Capacity of Angat Umiray System  
 Object 5: Expansion of Level 1 municipal water supply system  
 Object 6: Construction/provision of sanitary toilets  
 Object 7: Development of Sewerage System

\*\* : MWSS and private firms such as Manila Water Company Inc. (MWCI) and Maynilad Water Service Incorporated (MWSI)

The project investment cost for the Object 4 and 7 shown in the above Table K.3.3.1 have been secured by the public water service corporations such as MWSS and Clark Water as well the local government of Cabanatuan City. Moreover, the project investment cost for the Objects 5 and 6 could be allotted by the budget of the LGUs. Thus, the available financial sources for the project investment of the Objectives-4 to 7 could be foreseeable. On the other hand, the budgeting process of the project investment cost for the Objects 1 to 3 has to be newly clarified.

The project investment for the Objects 1 to 3 is subject to the “full cost recovery” both for the initial construction cost and the annual O&M cost for the project facilities. That is, the WDs and/or the public water service corporations such as MWSS and CDC as the project implementing bodies, would secure the necessary initial construction cost of the facilities and recover the initial cost as well as the annual O&M cost of the facilities by collecting the fee for use of the facilities from the water users.

In order to clarify the availability of the above “full cost recovery”, the project investment costs for the above Objects 1 to 3 are converted to the unit costs per served water volume and compared with the current prevailing water rates. The results of the conversion are as listed in Table K.3.3.2 and the detailed clarification on the “full cost recovery” is as described in the under-mentioned items (1) to (3):

**Table K. 3.3.2 Conversion of Project Investment Cost to Unit Cost**

Object*	Initial Investment Cost (million pesos)	Annualized Cost (million pesos/year)			Annual Water Consumption (mil. m <sup>3</sup> /year)	Unit Cost (peso/m <sup>3</sup> )
		Annualized Initial Investment Cost**	Annual O&M Cost	Total		
1	11,130	1,137.5	1,030.8	2,168.4	103.1	21.0
2	510	104.8	355	459.8	110.5***	4.2
3	37,948	3,880.40	379.7	4,260.1	225.9	18.9

Note:

- \*: Object 1: Expansion of Level 3 and 2 municipal water supply system  
 Object 2: Construction/provision of septage treatment and disposal facilities  
 Object 3: Development of bulk water supply system
- \*\* : The initial investment cost is converted to the annualized cost based on the following assumptions.
- The project life is assumed at 50years for Object 1 and 3, while it is assumed at 7years for Object 2.
  - The time interval for replacement of the facilities is assumed at 25 years for Object 1 and 3, while it is assumed at 7years for Object 2.
  - The annual interest rate is assumed at 10%.
- \*\*\* : The figure is estimated on the premises of the volume of water consumption for Level 3 water supply system

**(1) Expansion of Level 3, 2, 1 Municipal Water supply System**

As described in the under-mentioned item (1) in Section K.4.1, the “expansion of Level 3, 2 and 1 municipal water supply system toward 2025” is raised as one of the development scenarios for improvement of water supply quality and securing of the necessary water supply volume.

Expansion of the Level 1 water supply system is to be financed by the LGUs and it is not subject to full cost recovery as described above. On the other hand, the necessary investment cost for expansion of Level 3 and 2 water supply system is to be secured and recovered by the WDs. That is, WDs would secure the initial investment cost by their own budget or loan from LWUA, and recover it by collecting of the water service fee from the water users.

Out of 76 WDs in total in the study area, 13 WDs are expected to secure the necessary initial investment cost by their own budgets judging from the classification of WDs by LWUA (refer to subsection D.6.3.1). On the other hand, the remaining 63 WDs would need to have the loan from LWUA to secure the initial investment cost.

As shown in Table K.3.3.2, the total initial investment cost is 11.1 billion pesos, and 6.1 billion pesos of it could be assumed as the necessary amount of the loan from LWUA to the above 63 WDs. This amount of 6.1 billion pesos is disbursed for 15-year period from 2011 to 2015, and therefore, the annual average disbursement is estimated at 0.41 billion pesos/year.

The future available annual loan by LWUA is estimated at about 4.8 billion pesos/year (refer to subsection D.6.3.1). Judging from the available loan amount by LWUA, the above annual average disbursement of 0.41 billion pesos/year is judged to be secured.

As shown in Table K.3.3.2, the unit cost for the initial investment and the O&M for expansion of Level 3 and 2 municipal water supply systems is estimated at about 21 pesos/m<sup>3</sup>. On the other hand, the water rate for service of Level 3 and 2 municipal water supply systems is in a range of 16 to 21 pesos/m<sup>3</sup>. Judging from the unit cost for project investment and the current water rate for service, the project investment could be fully recovered by the water rate without the large increment in the water rate.

**(2) Construction/Provision of Septage Treatment and Disposal Facilities**

As described in the under-mentioned item (2) in Section K.4.2, one of the development scenarios is oriented to construction/provision of the septage treatment and disposal facilities, which shall cover about 80% of the households in the urban area of the principal ten (10) cities/municipalities by 2025. In this study, it is proposed that this project is to be implemented by WDs, and its investment cost is to be fully recovered by the following manners:

- As shown in Table K.3.3.2, the necessary project investment cost is estimated at 4.2 pesos/m<sup>3</sup> assuming the water consumption volume of the Level 3 water supply system. In order to recover the said project investment cost, it is proposed that the investment cost of 4.2 pesos/m<sup>3</sup> shall be surcharged to the above water rate for the service of Level 3 and 2 water supply service.
- The above surcharge cost is called “Environmental Fee” as suggested by in “the business model for development of septage treatment and disposal facilities by WDs” project and, MWSS has already applied it since 2008.

**(3) Development of Bulk Water Supply System**

As described in the under-mentioned item (2) in Section K.4.1, development of the bulk water supply system is proposed for Bulacan Province, Pampanga Province and Metro Clark area in particular. The project investment cost for development of the bulk water supply system is to be recovered through the following manners:



- The public water service corporation such as MWSS as well as the relevant private firms would be the implementing body for development of the bulk water supply system. The initial investment cost for the development is estimated at 37.9 billion pesos in total as shown in Table K.3.3.2. The budgetary capacities of these implementing bodies would be able to secure the said necessary initial investment cost judging from their previous business showings.
- As shown in Table K.3.3.2, the sum of the initial investment cost and the annual O&M cost for development of the bulk water supply system could be equivalent to about 19pesos per unit m<sup>3</sup> of water consumption. In addition, the cost of about 21pesos/m<sup>3</sup> for expansion of Level 3 and 2 water supply system is required as a part of the bulk water supply service. Accordingly, the investment cost of about 40peso/m<sup>3</sup> in total is required for the service of the bulk water supply system.
- The service of the bulk water has been already introduced to Meycauayan WD and Obando WD in Bulacan Province. The present water rate for those service areas of the bulk water supply is around 42 pesos/m<sup>3</sup>, which is almost equal to the above necessary investment cost (i.e., 40pesos/m<sup>3</sup>).
- As compared with the necessary investment cost with the present water rate for the bulk water supply services, the investment cost could be fully recovered by the water rate. The water rate of the bulk water service is far higher than the water rate of municipal water service without the bulk water supply. The water users may accept such high water rates, which would be because of the safe and stable water supply promised by the bulk water supply system.

#### K.3.4 Project Investment Plan for Management of Flood and Sediment Disasters

The initial project investment cost in this sector is estimated at 15.8 billion pesos. Of this total initial investment cost, about 70% or 10.9 billion pesos is to be financed from the national government budget allocated to DPWH. The projects other than those by DPWH are: (a) operation, maintenance and improvement of the small scale flood control and drainage systems, which are to be financed by the LGUs and (b) development of the flood forecasting and warning systems, which is to be financed by the budget of LGUs and PAGASA.

**Table K. 3.4.1 Project Investment Cost for Management of Flood and Sediment Disasters**

(unit: million pesos)

Object*	Principal Entities for Financing	Short-term		Mid-term		Long-term		Total	
1	DPWH	5,121	79.6%	5,594	84.8%	227	8.3%	10,942	69.4%
2	LGUs	1,008	15.7%	1,000	15.2%	2,500	91.6%	4,508	28.6%
3	Others	302	4.7%	3	0.0%	3	0.1%	308	2.0%
	Total	6,431	100.0%	6,597	100.0%	2,730	100.0%	15,758	100.0%

Note:

\*: Object 1: Development and O&M of the large-scale flood control facilities, maintenance of the major river channels/river facilities and capacity building on management of flood and sediment disasters.

Object 2: Establishment of community-based flood forecasting warning and evacuation system and operation, maintenance and improvement of the small-scale flood control and drainage facilities, which are under jurisdiction of LGUs.

Object 3: Capacity development on the dam reservoir operation against flood, etc.

DPWH undertakes the following five (5) projects for management of flood and sediment disasters for Pasac river system and Pampanga river system. Of these projects, the project of FL-G-02 is currently in progress, and a substantial part for its necessary budget has been arranged already. Moreover, the budgetary arrangement for the ongoing two (2) projects for Pasac river system (i.e., the projects of FL-G-01 and FIL-G-02) have also been made, and the proposed projects for Pasac river system (i.e., L-P-01) is now being made on the premises of the foreign financial assistance. On the other hand, the project for Pampanga river system (i.e., FL-C-01) is left behind since the Phase 1 of the project had been suspended in 2002, and the budgetary arrangement of the project is being required.

**Table K. 3.4.2 Projects by DPWH for Management of Flood and Sediment Disasters**

Project Code	Name of Project	Investment Cost ( Mil. Php )
FL-G-03	Maintenance and Rehabilitation Works for River Dike and Slope	679
FL-G-01	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part I	470
FL-G-02	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part II	5
FL-P-01	Flood Control Measures in Mt. Pinatubo Devastated Area- Focus on Pasac Delta	4,320
FL-C-01	Flood Mitigation for Pampanga Delta	5,468
Total		10,942

The national government budget allotted to DPWH includes those for: (a) Programs (for the line operations), (b) Projects (for implementation of the locally funded and foreign assisted projects and (c) others (for interest payment, etc). The operation and maintenance of the flood control facilities and/or the river channels is basically financed from the budget for above Programs for the line operation. However, the national total budget financed from the Programs for O&M of the flood control facilities/river channels was limited to 2.9 billion pesos in 2009. This budget is likely to be quite inadequate and thereby, a part of the budget for the above Projects has to be used for O&M just like the case of the project of FL-G-03.

### K.3.5 Project Investment Plan for Watershed Management

The project investment cost of 3.6 billion pesos in total is to be disbursed during the 15-year period from 2011 to 2025 as shown in Table K.3.5.1. Of the total investment cost, about 91% or 3.3 billion pesos are financed from the national budget of DENR and used for reforestation, agro-forestry, and hillside works in the upland and preservation of the forest.

**Table K. 3.5.1 Project Investment Cost for Watershed management**

(unit: million pesos)

Object*	Principal Entities for Financing	Short-term		Mid-term		Long-term		Total	
		Amount	%	Amount	%	Amount	%	Amount	%
1	DENR	1,559	90.6%	1,509	95.0%	187	70.6%	3,255	91.1%
2	Others	162	9.4%	79	5.0%	78	29.4%	319	8.9%
Total		162	9.4%	79	5.0%	78	29.4%	319	8.9%

Note:

\*: Object 1: Reforestation, agro-forestry, hill-side works in the upland and preservation of the forest in the classified forest land.

Object 2: .Preservation of forest in the watershed of the dam reservoir and urban greening

Out of the said total investment cost of 3.6 billion pesos, about 46.5% or 1.7 billion pesos is disbursed to the ongoing projects and therefore, it could be secured provided that the present annual budgets allotted to the projects are sustained until 2025. The remaining budget of 1.9 billion pesos (53% of the total investment cost) is for the conceptual project, and need to be secured from the new financial sources, which may require the foreign financial assistance and/or the private investment through BOT.

### K.3.6 Project Investment Plan for Water-related Environment Management

The project investment cost of about 3.7 billion pesos in total is to be disbursed during the 15-year period from 2011 to 2025 as shown in Table K.3.6.1. Out of the total investment cost, about 53% or 2.0 billion pesos is for construction and operation of solid waste management facilities for Nueva Ecija, Bulacan and Pampanga Province, which is undertaken through the project of WQ-C-04. In order to attain the said solid waste management, Nueva Ecija Province has already arranged the necessary budget for construction of five (5) sanitary landfills and their support facilities. As for Bulacan and Pampanga Province, however, the definite budgetary arrangement for the solid waste management has not been made yet and it remains as the future task. In order to minimize the budget for solid waste management for the two provinces, the proposed project works for the provinces are limited to construction and O&M of the transfer stations assuming usage of the existing two (2) sanitary landfills located in Tarlac and Bulacan Province.

The Clean Development Mechanism Program (CDM) projects would require the second largest investment cost of about 1.0 billion pesos next to the above solid waste management. This investment cost would be shouldered by the private firms through BOT led by DENR. Other project works such as establishment of water quality monitoring system, capacity buildings and IEC relevant to the water-related environment management would be financed by the national government budget allotted to DENR, the budget of the LGUs and the private investments.

**Table K. 3.6.1 Project Investment Cost for Water-related Environment Management**

(unit: million pesos)

Object*	Principal Entities for Financing	Short-term		Mid-term		Long-term		Total	
1	LGUs	109	21.4%	99	1.2%	99	100.0%	307	3.6%
2	Private Firm	300	58.9%	0	0.0%	0	0.0%	300	3.5%
3	DENR and Others	100	19.6%	7,866	98.8%	0	0.0%	7,966	92.9%
	Total	509	100.0%	7,965	100.0%	99	100.0%	8,573	100.0%

Note:

\*: Object 1: Solid water management

Object 2: CDM programs

Object 3: Establishment of the water quality monitoring system and capacity building/IEC on the water-related environment management.

### K.3.7 Project Investment Plan for Inter-Sector Water Resources Development, Allocation and Distribution

The project investment cost of about 8.6 billion pesos in total is to be disbursed during the 15-year period from 2011 to 2025 as shown in Table K.3.7.1. Out of the total investment cost, about 93% or 8.0 billion pesos is for the project for recovery of reliability of water supply capacity of the existing Angat-Umiray System (Project of IS-C-02). The feasibility study for this project needs to be firstly undertaken by NWRB to clarify the necessary project components, which would include the new water resources development, and the organization setup for implementation of the project. Moreover, it would be necessary to clarify the possible financial sources and their shares for allotment. The possible financial sources would include the national government fund by NWRB, NIA, NPC, the LGU's fund by Bulacan Province, the corporation/private fund by MWSS and its relevant MWCI and MWSI, and other private fund collected through BOT.

**Table K. 3.7.1 Project Investment Cost for Inter-Sector Water Resources Development, Allocation and Distribution**

(unit: million pesos)

Object*	Principal Entities for Financing	Short-term		Mid-term		Long-term		Total	
1	NWRB, Others**	100	19.6%	7,866	98.8%	0	0.0%	7,966	92.9%
2	NWRB	109	21.4%	99	1.2%	99	100.0%	307	3.6%
3	NWRB	300	58.9%	0	0.0%	0	0.0%	300	3.5%
	Total	509	100.0%	7,965	100.0%	99	100.0%	8,573	100.0%

Note:

\*: Object 1: Recovery of reliability of water supply of Angat-Umiray System

Object 2: Establishment of monitoring system for usage of the surface water and groundwater

Object 3: Capacity building on water allocation and distribution

## **K.4 Development Scenarios**

### **K.4.1 Development Scenarios for Group-A Projects**

The target development scenarios for Group-A projects are proposed as described hereinafter.

#### **K.4.1.1 Development Scenarios in Sector of Agriculture/Irrigation and Fishery Development**

In order to enhance the sector goals of “rehabilitation and development of the irrigation system” and “sustainable fishery under integrated water resources management”, the following two (2) development scenarios are proposed:

##### **(1) Rehabilitation of Existing Irrigation Facilities**

The development scenario is oriented to improvement of the agricultural productivities by sustaining of the following seven (7) ongoing programs for rehabilitation and/or maintenance of the existing irrigation facilities throughout the short, medium and long-term:

- AI-G-03: Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project ,
- AI-G-04: Balikatan Sagip Patubig Program,
- AI-G-05: Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities,
- AI-G-06: Restoration/Rehabilitation of Existing NIA Assisted Irrigation System,
- AI-G-08: Rehabilitation of Small Water Impounding Projects/Diversion Dams and
- AI-G-09: Comprehensive Agrarian Reform Program, Irrigation Component .

##### **(2) Sustainable Fishery Production**

The development scenario is oriented to sustainable fishery productivities by continuity of the following four (4) ongoing projects, which are being undertaken by BFAR, DA or LGU, throughout the short, medium and long-term:

- AF-G-01: Aquaculture Fisheries Development Programs,
- AF-G-02: Comprehensive Regulatory Services,
- AF-G-03: Support Projects and Activities and
- AF-G-04: Fisheries Resources Management for Improved and Sustainable Harvest.

#### **K.4.1.2 Development Scenarios in Sector of Municipal Water Supply, Sanitation and Sewerage**

In order to achieve the sector goal of “improvement of water quality”, “ensuring of necessary water supply capacity”, and “reduce of pollution load”, the seven (7) development scenarios are proposed in the study. Moreover, in order to embody these development scenarios, implementation of 17 projects is proposed. The details of these development scenarios and the projects to embody the development scenarios are as described hereinafter:

##### **(1) Short-term Development of Bulk Water Supply System for Bulacan Province**

The groundwater in Bulacan Province is currently used as the principal source for municipal water supply in the Province. However, the supply capacity by the groundwater is judged to reach the critical level causing the land subsidence as well as the serious sanitary intrusion to the groundwater. Hence, a development scenario on the “MW-P-03: Bulacan Treated Water Supply Project”, which is most likely to use the surface water as the source, is proposed. This

bulk water supply system shall be completed by 2015 promising the water supply capacity of  $2.7\text{m}^3/\text{s}$ , which cover the municipal water demand of about one million residents.

## (2) Strengthening of Water Supply Capacity of Angat Umiray System

The Angat-Umiray System is the principal water supply source for the municipal water use in Metro Manila and the irrigation water use in AMRIS. However, the updated water demand for the municipal and irrigation use exceed far over the water supply capacity of Angat Umiray System. As the results, the serious water shortage occurs almost every two year.

Taking the potential water shortage into account, the development scenario is oriented to strengthening of the water supply capacity of Angat Umiray System. In order to attain the development scenario, the following three (3) projects are scheduled to urgently complete within the short-term.

- MW-G-01: Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2
- MW-P-01: Rehabilitation of Umiray-Macua Facilities and
- MW-P-02: Sumag River Diversion Project.

The above urgent reinforcement of the existing Angat-Umiray System would still hardly attain the full supply level of the System for its present relevant water demand. Hence, The Project of "IS-C-02: Project for Recovery of Reliability of Water Supply System in Angat-Umiray System" is scheduled in the short-term and medium-term. The Project could drastically boost up the reliability of the Angat Umiray System and promise the municipal water supply for Metro Manila with a design safety level of 10-year return period and the irrigation water supply for AMRIS with a design safety level of 5-year return period by 2020.

## (3) Expansion of Level 3,2,1 Municipal Water Supply

The following development scenarios on the step-wise expansion of the Level 3 , 2 and 1 municipal water supply system in the study area is proposed in order to improve the water supply quality and at the same time to ensure the necessary water supply capacity:

- The coverage of Level 3, 2, 1 water supply system with safe drinking water supply shall reach 100% by 2025.
- The coverage ratios of the Level 3 Water Supply System in the urban area shall increase 1% per annum by 2015, and the average ratio in the whole urban areas of the study area shall reach 80% by 2025. At the same time, the lowest coverage ratio of Level 3 System in the urban areas shall not be below  $46.5\%^2$  in 2025 so as to avoid the extremely uneven distribution of the System.
- The present average coverage ratio of Level 3 Water Supply System in the rural area shall be maintained until 2025, notwithstanding the future increment of population. The target coverage ratio of Level 3 in the rural area is 18% in average for the whole study area.

In order to attain the above development scenario, implementation of the following four (4) projects throughout the period from 2011 up to 2025 is proposed:

- MW-C-1: Additional Level 3,2, 1 Facilities towards 2025 in Bulacan
- MW-C-2: Additional Level 3,2, 1 Facilities towards 2025 in Pampanga
- MW-C-3: Additional Level 3,2, 1 Facilities towards 2025 in Nueva Ecija
- MW-C-4: Additional Level 3,2, 1 Facilities towards 2025 in Tarlac)

<sup>2</sup> The boundary of 46.5% for the lowest coverage ratio is derived from the future expected incremental rates of 17% for a period of 17 years (from 2008 to 2025) added to half of the present average coverage ratio as of 2008 (= 29.5%).

**(4) Construction/Provision of Sanitary Toilets**

In order to reduce the pollution load in the study area, which could make an indirect contribution to secure the safe drinking water from the source of the groundwater, the following development scenario is proposed:

- The rate of construction/provision of the sanitary toilets in all municipalities and cities shall increase at the rate of 10% per annum by 2015, and
- All households in the study area shall be provided with sanitary toilets by 2025<sup>3</sup>.

In order to attain the development scenario, implementation of the following four (4) projects is proposed:

- MS-C-1: Additional Sanitary Facilities towards 2025 in Bulacan,
- MS-C-2: Additional Sanitary Facilities towards 2025 in Pampanga,
- MS-C-3: Additional Sanitary Facilities towards 2025 in Nueva Ecija and
- MS-C-4: Additional Sanitary Facilities towards 2025 in Tarlac

**(5) Development of Bulk Water Supply System for Metro Clark**

In order to cope with the increment of the municipal water use in the Metro Clark, a development scenario is oriented to gradual expansion of the bulk water supply system with a full supply capacity of 0.8m<sup>3</sup>/s toward 2025. In order to attain the development scenario, “MW-P04; Metro Clark Bulk Surface Water Project” is proposed.

**(6) Long Term Development of Bulk Water Supply System for Bulacan and Pampanga Province**

In order to serve the incremental provincial population and cope with deterioration of the groundwater quality, proposed is the development scenario such that the bulk water supply system with the supply capacity of 5.5m<sup>3</sup>/s for Bulacan and 1.3m<sup>3</sup>/s for Pampanga Province shall be developed by 2025. The projects to embody the bulk water supply are as listed below:

- MW-C-05: Extended Bulacan Bulk Water Supply Project and
- MW-C-06: Pampanga Bulk Water Supply Project

**K.4.1.3 Development Scenarios in Management of Flood and Sediment Disasters**

In order to make a contribution to mitigation of the chronic flood damage and improvement of knowledge on the flood management, the following development scenarios are proposed:

**(1) Sustainment of Regular Program for Maintenance and Rehabilitation of River Dike and Slope**

Most of the existing river dikes, levees, river slope protection and other river structures in Pampanga and Pasac river basins are seriously deteriorated at present. In order to cope with such degradation of the river structures as well as river channels, a development scenario is oriented to sustainment of maintenance and rehabilitation of river dike and slope. The development scenario shall be embodied through the proposed project of “FL-G-03: Maintenance and Rehabilitation Works for River Dike and Slope”. The project had started in 2008 and it is proposed to continue the project as the yearly regular program toward 2025.

**(2) Sustainment of Regular Program for Maintenance and Rehabilitation of Drainage and Flood Control facilities**

In order to cope with deterioration of the urban drainage facilities under jurisdiction of the LGUs, the development scenario is proposed. In order to embody the development scenario,

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<sup>3</sup> The target year is set at 2025, because the main purpose of construction/provision of sanitary toilets is to secure the access to safe drinking water for all by 2025, which is stated in the Philippine Water Sector Roadmap.

the project of “FL-C-03: Maintenance, Rehabilitation and Improvement for Drainage and Flood Control facilities under jurisdiction of LGUs” shall be sustained as the yearly regular program toward 2025.

**(3) Improve of Public Awareness**

In order to improve the public awareness on the management of the flood and sediment disasters, proposed is the development scenario, which is oriented to inclusion of the salient points of the knowledge on the management of the flood and other principal issues of IWRM into the curricula of primary and secondary school. In order to attain the development scenario, the project of “FL-C-04; Integration of Salient Points of IWRM for Pampanga River Basin into School Curricula” shall be implemented throughout the short, medium and long-term.

**K.4.1.4 Development Scenarios in Watershed Management**

The following development scenario is proposed to attain the sector goals of: “intensifying of management, protection and maintenance of vulnerable and ecologically sensitive area” and “increase of forest cover of critically denuded uplands, mangrove areas and urban corridors”:

**(1) Sustainment of the On-going Regular Program for Watershed Management**

The development scenario is oriented to sustaining the following ongoing nine (9) regular programs for watershed management in Pampanga river basin until 2025. Through execution of the projects, it is expected that the present forest cover of 187,500ha would expand by about 10,000ha at the rate of 660ha per annum by 2025.

- WS-G-01: Forest Protection and Law Enforcement Program (FPLEP)
- WS-G-02: Community-based Forest Management Program
- WS-G-04: Coastal Resource Management Program (CRMP)
- WS-G-05: Protected Area Community-based Resource Management Program (CBFM-PACBRMA)
- WS-G-06: Private Forest Plantation Development Program (PFPPDP)
- WS-G-07: NIA-UPRIIS' Watershed Management Program
- WS-G-08: NPC's Watershed Management Program
- WS-G-09: Integrated Social Forestry (ISF) Projects

**K.4.1.5 Development Scenarios in Water-related Environment Management**

The following development scenarios are proposed to enhance the sector goals for reduction of the pollution load:

**(1) Dealing with Contamination of Surface, Ground and Coastal Water**

The pollution load from various sources shall be reduced by sustaining the following three (3) ongoing non-structural measures, which are the regular program by DENR and LGU.

- WQ-G-01: Ecological Solid Waste Management Program (ESWMP)
- WQ-G-02: Industrial Pollution Control Program (IPCP)
- WQ-G-03: Sagip-Ilog Project

**(2) Reduction of Risk for Contamination in Water Body**

By 2025, the following two (2) structural measures shall be implemented to reduce the risk of contamination from livestock, domestic and industrial wastes:

- WQ-P-01: Clean Development Mechanism Projects

## Sector K: Formulation of IWRM Plan

- WQ-C-04: Construction of Sanitary Landfills and Support Facilities in Nueva Ecija and Cluster Waste Transfer Stations in Bulacan and Pampanga

### **K.4.2 Development Scenarios for Group-B Projects**

The phased implementation schedule for 41 Group-B projects is proposed as described in the foregoing Section K.2.2. Hence, the development scenarios are conceived as the consequences of the proposed implementation schedule (refer to Annex-T K.2.2.5). The detailed development scenarios are as described hereinafter.

#### **K.4.2.1 Development Scenarios in the Sector of Agriculture, Irrigation and Fishery Development**

The following four (4) development scenarios are expected through implementation of a total of 18 projects in the short-term, the medium-term and the long-term. The development scenarios would enhance the sector goals of: (a) Improvement of the irrigation system, and (b) enhancement of new agricultural technologies on water management in particular:

##### **(1) Improvement of Irrigation Technologies**

As the consequence of implementation of the following three (3) projects, the innovative irrigation technologies shall be developed and the capacity building on usage of the technologies shall be made so as to increase the irrigation efficiency and save the irrigation water by 2015.

- AI-P-07: Appropriate Irrigation Technologies for Enhanced Agricultural Production
- AI-C-02: Introduction of Water Saving Irrigation Technology
- AI-C-03: Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs

##### **(2) Short-term Development of Infrastructures for Irrigation**

The agricultural productivity shall be increased through the following seven (7) irrigation development projects, which contribute to the beneficial area (newly developed) of 5,880ha, the beneficial area (rehabilitated) of 37,046 ha and beneficiaries of 56,640 farm-families in total, by 2015.

- AI-G-01: Balog-Balog Multipurpose Project Phase 1
- AI-G-02: Along-along Creek Irrigation Project (UPRIIS Div3)
- AI-G-10: Upper Tabuating SRIP
- AI-G-07: Participatory Irrigation Development Project, APL1-Infrastructure Development
- AI-P-10: Rehabilitation of AMRIS
- AI-P-03: Sector Loan on Rehabilitation of Irrigation Facilities
- AI-P-11: Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects, Small Diversion Dam Projects

##### **(3) Mid-term Development of Infrastructures for Irrigation**

The agricultural projects shall be increased through the following seven (7) irrigation development projects, which contribute to the beneficial area (newly developed) of 58,443ha, the beneficial area (rehabilitated) of 50,904ha and beneficiaries of 101,893 farm-families in total by 2020.

- AI-P-02: Balog-Balog Multipurpose Project Phase 2



- AI-P-04: Casecnan Multi-purpose Irrigation & Power Project Irrigation Component Phase 2
- AI-C-01: New Construction of Small Scale Irrigation Project under BSWM
- AI-P-08: Central Luzon Groundwater Irrigation Systems Reactivation Project
- AI-P-06: Irrigation Water Resources Augmentation Pump Establishment Project
- AI-P-05: Procurement of Pumps, Drilling Rigs & Related Equipment

**(4) Long-term Development of Infrastructures for Irrigation**

The agricultural projects shall be increased through the following two (2) projects, which contribute to beneficial area (newly developed) of 31,199ha and beneficiaries of 9,152 farm-families by 2025.

- AI-P-01: Balintongan Reservoir Multipurpose Project (BRMP)
- AI-P-09: Gumain Reservoir Project

**K.4.2.2 Development Scenarios for Municipal Water Supply, Sanitation and Sewerage**

The following two (2) development scenarios are expected as the consequence of implementation of three (3) projects. The development scenarios would enhance the sector goal of the “reduce the pollution load” in particular.

**(1) Development of Sewerage Systems**

The following two (2) on-going projects for development of the sewerage systems shall be completed by 2015. Upon completion of the projects, about 12 % of the population in Cabanatuan City and 100% in Clark would be served by the public sewerage system.

- MP-G-01: Cabanatuan Sewerage System
- MP-G-02: Expansion of Clark Sewerage System

**(2) Construction/Provision of Septage Treatment and Disposal Facilities**

The services of the septage treatment and disposal facilities shall be provided through the project of “MP-C-01: Septage Treatment and Disposal Facility” to about 80% of the urban area in the following ten cities/municipalities by 2025<sup>4</sup>: (1) Angeles, (2) San Fernando, (3) Guagua, (4) Mabalacat, (5) Baliuag, (6) Calumpit, (7) Hagonoy, (8) Malolos, (9) Cabanatuan, and (10) Tarlac.

**K.4.2.3 Development Scenarios for Management of Flood and Sediment Disasters**

The five (5) development scenarios in the sector are to be achieved through implementation of the seven (7) projects.

**(1) Flood Mitigation for Pasac River Basin (Eastern Pinatubo Area)**

The following on-going and proposed flood mitigation projects for Pasac river basin shall be completed by 2015. Upon completion of the projects, the chronic flood damage in the area of about 57,300 ha would be mitigated, and about 309,000 people would be benefitted.

- FL-G-01: Pinatubo Hazard Urgent Project (PHUMP) Phase III Part I
- FL-G-02: Pinatubo Hazard Urgent Project (PHUMP) Phase III Part II
- FL-P-01: Flood Control Measures in Mt. Pinatubo Devastated Area- Focus on Pasac Delta

<sup>4</sup> The target year has been set at 2025 referring the output from 4<sup>th</sup> stakeholder meetings, although the target water quality of Manila Bay by DENR is to be Class SB category by 2020.

**(2) Flood Mitigation for Pampanga Delta**

The chronic flood damage in Pampanga Delta shall be mitigated through implementation of the project of “FL-C-01: Flood Mitigation for Pampanga Delta” by 2020. Upon completion of the project, the potential flood inundation area of about 32,400 ha would be mitigated, and about 175,000 people would be benefitted

**(3) Capacity Building on the Appropriate Dam Reservoir Operation against Flood**

The capacity building on the appropriate reservoir operation against flood for Pantabangan Dam and Angat Dam shall be completed through the technical cooperation by JICA by 2015. This technical cooperation is currently being undertaken under the on-going project of “FL-G-04 Flood Forecasting and Warning System Capacity Building Project upon Dam Release in the Philippines”.

**(4) Establishment of Community-based Flood Forecasting and Warning System for Provinces of Pampanga, Tarlac and Nueva Ecija**

Bulacan Province had established the community-based flood forecasting and warning system in 2005. Succeeding to Bulacan Province, other three (3) provinces in the study area, Pampanga, Tarlac and Nueva Ecija shall be provided with the community-based flood forecasting and warning system by 2015

**(5) Flood Mitigation for Bacolor Municipality**

The Project of “FL-P-02: Bacolor Comprehensive Rehabilitation Master Plan” shall be implemented by 2025. Upon completion of the Project, the flood damage potential in the area of about 107,500 ha in Bacolor Municipality in Pampanga Province would be mitigated.

**K.4.2.4 Development Scenarios for Watershed Management**

The following development scenario shall be achieved to attain the sector goals of: “intensifying of management, protection and maintenance of vulnerable and ecologically sensitive area” and “increase of forest cover of critically denuded uplands, mangrove areas and urban corridors”:

**(1) Strengthening of the On-going Reforestation Efforts**

The following seven (7) special projects shall be implemented in order to strengthen the on-going reforestation efforts. Upon completion of the projects, the forest cover shall expand by 39,900ha.

- WS-G-03: Integrated Agro-Forestry Development Program (CBFM-CARP)
- WS-G-11: Forestlands Management Project (FMP)
- WS-G-12: Pampanga River Basin Rehabilitation Project (PRBRP)
- WS-C-01: Upland Development Program (UDP)
- WS-C-02: Protected Area Management Program (PAMP)
- WS-C-03: Urban Greening Program
- WS-C-04: Community-based Eco-tourism Program

**K.4.2.5 Development Scenarios for Water-related Environment Management**

The following development scenarios shall be achieved to attain the sector goals of “strengthening of the water quality monitoring” and “reduce of pollution loads”:

**(1) Improvement of Monitoring and Processing System for the Water Quality Data**

By 2015, DENR shall improve the monitoring and processing system for the water quality data through implementation of the project of “WQ-C-01 Capacity Development to Upgrade WQ Monitoring and Data Management Program”.

**(2) Capacity Development to Reduce Pollution Load**

By 2020, the capability of fishpond operators and non-compliant industries shall be improved through implementation of the following two (2) projects over the medium-term towards adopting cleaner production options in order to reduce their impacts on water quality.

- WQ-C-02: Capacity Development to Improve Water Quality and Aquaculture Fisheries Management
- WQ-C-03: Capacity Development Project to Improve Industry Adoption of Cleaner Production Options

**K.4.2.6 Development Scenarios for Inter-Sector Water Resources Development, Allocation and Distribution**

The following two (2) development scenarios shall be achieved in order to strengthen of monitoring system on the water resources and make capacity development on water allocation and distribution:

**(1) Enhancement of Monitoring of Groundwater and Surface Water**

By 2025, the monitoring of the groundwater and surface water shall be enhanced through implementation of the following two (2) projects in order to apprehend the actual status of the water resources in Pampanga river basin:

- IS-C-01: Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin
- IS-C-03: Enhancement of Monitoring System for Surface Water in Pampanga River

**(2) Capacity Development on Water Allocation and Distribution**

By 2015, the appropriate methodologies on the water allocation and distribution for municipal water use, irrigation, hydropower generation and other various water uses shall be introduced to NWRB and other relevant agencies through implementation of the project of “IS-C-04: Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution”.

**References**

- 1) NEDA: Medium-Term Philippine Development Plan 2004-2010, 2004.
- 2) NEDA Region III: Updated Central Luzon Regional Physical Framework Plan (RFPF) 2005-2030, 2006.
- 3) NWRB: IWRM Plan Framework in the Philippines, 2006.



# *Annex-Tables*



**Annex-T K.1.4.1 (1/2) Grouping of Projects (Group-A Projects)**

Project Group	Sector	Serial No.	Project		Implementing Agency	Initial Investment Cost	O&M cost
			Code	Name of Project		(Million Pesos)	(Mil.Pesos/year)
A	Agriculture/ Irrigation and Fishery	1	AI-G-03	Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project (REGIP)	NIA	398	None
		2	AI-G-04	Balikatan Sagip Patubig Program (BSPP)	NIA	46	None
		3	AI-G-05	Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities	NIA	1,579	None
		4	AI-G-06	Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (RRE-NIAIS)	NIA	8,767	None
		5	AI-G-08	Rehabilitation of Small Water Impounding Projects / Diversion Dams	DA-BSWM	128	None
		6	AI-G-09	Comprehensive Agrarian Reform Program, Irrigation Component	NIA	1,020	None
		7	AF-G-01	Aquaculture Fisheries Development Programs	DA-BFAR	450	None
		8	AF-G-02	Comprehensive Regulatory Services	DA-BFAR		
		9	AF-G-03	Support Projects and Activities	DA-BFAR		
		10	AF-G-04	Fisheries Resources Management for Improved and Sustainable Harvest	DA-BFAR		
Sub-total						12,388	0.0
A	Municipal Water Supply, Sanitation and Sewerage	11	MW-G-01	Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2	MWSS	4,568 *	30.5
		12	MW-P-01	Rehabilitation of Umiray-Macua Facilities	MWSS	454	2.3
		13	MW-P-02	Sumag River Diversion Project	MWSS	540	2.7
		14	MW-P-03	Bulacan Treated Bulk Water Supply Project	MWSS/LGU	11,935	119.3
		15	MW-P-04	Metro Clark Bulk Surface Water Project	CDC	3,527	35.3
		16	MW-C-01	Additional Level 3,2, 1 Facilities towards 2025 in Bulacan	LWUA/WDs/LGUs /Private WSPs	3,839	324.2
		17	MW-C-02	Additional Level 3,2, 1 Facilities towards 2025 in Pampanga	LWUA/WDs/LGUs /Private WSPs	4,914	416.6
		18	MW-C-03	Additional Level 3,2, 1 Facilities towards 2025 in Nueva Ecija	LWUA/WDs/LGUs /Private WSPs	2,903	249.3
		19	MW-C-04	Additional Level 3,2, 1 Facilities towards 2025 in Tarlac	LWUA/WDs/LGUs /Private WSPs	559	46.2
		20	MW-C-05	Extended Bulacan Bulk Water Supply Project	LGU	16,754	167.7
		21	MW-C-06	Pampanga Bulk Water Supply Project	LGU	5,732	57.4
		22	MS-C-01	Additional Sanitary Facilities towards 2025 in Bulacan	LGUs	3,676	18.4
		23	MS-C-02	Additional Sanitary Facilities towards 2025 in Pampanga	LGUs	4,725	23.6
		24	MS-C-03	Additional Sanitary Facilities towards 2025 in Nueva Ecija	LGUs	3,477	17.4
25	MS-C-04	Additional Sanitary Facilities towards 2025 in Tarlac	LGUs	968	4.8		
Sub-total						68,571	1,515.6
A	Management of Flood and Sediment Disasters	26	FL-G-03	Maintenance and Rehabilitation Works for River Dike and Slope	DPWH	679	None
		27	FL-C-03	Maintenance, Rehabilitation and Improvement for Drainage and Flood Control Facilities under Jurisdiction of LGUs	LGUs	3,000	None
		28	FL-C-04	Integration of Salient Points of IWRM for Pampanga River Basin into School Curricula	DE-Region III	8	None
Sub-total						3,687	0.0
A	Watershed Management	29	WS-G-01	Forest Protection and Law Enforcement Program (FPLEP)	DENR/PENRO/CENRO	39	None
		30	WS-G-02	Community-based Forest Management Program	DENR/RCBFMO	71	None
		31	WS-G-04	Coastal Resource Management Program (CRMP)	DENR/PAWCZMS	37	None
		32	WS-G-05	Protected Area Community-based Resource Management Program (CBFM-PACBRMA)	DENR/PAWCZMS	13	None
		33	WS-G-06	Private Forest Plantation Development Program (PFDP)	DENR-FRDD	93	None
		34	WS-G-07	NIA-UPRIIS' Watershed Management Program	NIA-UPRIIS	180	None
		35	WS-G-08	NPC's Watershed Management Program	NPC	107	None
		36	WS-G-09	Integrated Social Forestry (ISF) Projects	LGUs/DENR/RCBFMO	51	None
		37	WS-G-10	Private-sector Watershed Management Initiatives	Private Firm/NGOs	32	None
		Sub-total					
A	Water-related Environment Management	38	WQ-G-01	Ecological Solid Waste Management Program (ESWMP)	DENR-EMB III	192	None
		39	WQ-G-02	Industrial Pollution Control Program (IPCP)	DENR-EMB III	153	None
		40	WQ-G-03	Sagip-Ilog Project	DENR-EMB/LGUs/Pvt. Sector	11	None
		41	WQ-P-01	Clean Development Mechanism	Private Industries	1,036	63.0
		42	WQ-C-04	Construction of Sanitary Landfills and Support Facilities in Nueva Ecija and Cluster Waste Transfer Stations in Bulacan and Pampanga	LGUs	2,025	349.0
Sub-total						3,417	412.0
A	Others	43	IS-C-02	Project for Recovery of Reliability of Water Supply in Angat-Umiray System	NWRB/NIA/MWSS/NPC/LGU	7,966	39.8
		Sub-total					
<b>Total for Group A Projects</b>						<b>96,652</b>	<b>1,967.4</b>

Note: \*: The project cost is not total cost, but only for 2011-2025.

KT-1

**Annex-T K.1.4.1 (2/2) Grouping of Projects (Group-B Projects)**

Project Group	Sector	Serial No.	Project		Implementing Agency	Initial Investment Cost (Million Pesos)	O&M cost (Mil.Pesos/year)
			Code	Name of Project			
B	Agriculture/ Irrigation and Fishery	1	AI-G-01	Balog-Balog Multipurpose Project Phase 1	NIA	236 *	11.8
		2	AI-G-02	Along-along Creek Irrigation Project (UPRIIS Div3)	NIA	25 *	1.3
		3	AI-G-07	Participatory Irrigation Development Project, APLI-Infrastructure Development	NIA	41 *	0.3
		4	AI-G-10	Upper Tabuating SRIP	NIA	76 *	1.3
		5	AI-P-01	Balintingan Reservoir Multipurpose Project (BRMP)	NIA/G. Trino	13,591	68.0
		6	AI-P-02	Balog-Balog Multipurpose Project Phase 2	NIA	16,095	80.5
		7	AI-P-03	Sector Loan on Rehabilitation of Irrigation Facilities	NIA	222	1.1
		8	AI-P-04	Casecnan Multi-purpose Irrigation & Power Project Irrigation Component Phase 2	NIA	7,000	35.0
		9	AI-P-05	Procurement of Pumps, Drilling Rigs & Related Equipment	NIA	206	1.0
		10	AI-P-06	Irrigation Water Resources Augmentation Pump Establishment Project	NIA	130	0.7
		11	AI-P-07	Appropriate Irrigation Technologies for Enhanced Agricultural Production	NIA	654	3.3
		12	AI-P-08	Central Luzon Groundwater Irrigation Systems Reactivation Project	NIA	1,429	7.1
		13	AI-P-09	Gumain Reservoir Project	NIA	13,729	68.6
		14	AI-P-10	Rehabilitation of AMRIS	NIA	983	4.9
		15	AI-P-11	Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects, Small Diversion Dam Projects	DA Region III/LGUs	169	0.8
		16	AI-C-01	New Construction of Small Scale Irrigation Project under BSWM	BSWM/LGUs	514	2.6
		17	AI-C-02	Introduction of Water Saving Irrigation Technology	NIA	150	None
		18	AI-C-03	Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	NIA	150	7.5
Sub-total						55,400	295.8
B	Municipal Water Supply, Sanitation and Sewerage	19	MP-G-01	Cabanatuan Sewerage System	LGU	189	1.9
		20	MP-G-02	Expansion of Clark Sewerage System	Clark Water	456	4.6
		21	MP-C-01	Septage Treatment and Disposal Facility	MCWMC/LGUs/WDs/Private	510	355.0
Sub-total						1,155	361.5
B	Management of Flood and Sediment Disasters	22	FL-G-01	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part I	DPWH	470 *	23.5
		23	FL-G-02	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part II	DPWH	5 *	0.3
		24	FL-G-04	Flood Forecasting and Warning System Capacity Building Project upon Dam Release in the Philippines	PAGASA	300	None
		25	FL-P-01	Flood Control Measures in Mt. Pinatubo Devastated Area- Focus on Pasac Delta	DPWH	4,320	21.6
		26	FL-P-02	Bacolor Comprehensive Rehabilitation Master Plan	LGU	1,500	7.5
		27	FL-C-01	Flood Mitigation for Pampanga Delta	DPWH	5,468	27.3
		28	FL-C-02	Community Based Flood Early Warning System for Provinces of Pampanga, Tarlac and N. Ecija	LGUs	8	0.4
Sub-total						12,071	80.6
B	Watershed Management	29	WS-G-03	Integrated Agro-Forestry Development Program (CBFM-CARP)	DENR/RCBFMO/DAR	31	None
		30	WS-G-11	Forestlands Management Project (FMP)	DENR-FASPO	996	None
		31	WS-G-12	Pampanga River Basin Rehabilitation Project (PRBRP)	DENR-FRCD	12 *	None
		32	WS-C-01	Upland Development Program	DA/DENR/LGUs	980	None
		33	WS-C-02	Protected Area Management Program (PAMP)	DENR/PAWCZMS	404	None
		34	WS-C-03	Urban Greening Program	DENR/LGUs/Pvt. Sector	264	None
		35	WS-C-04	Community-based Eco-tourism Program	DOT/DENR/LGUs	264	None
Sub-total						2,951	0.0
B	Water-related Environment Management	36	WQ-C-01	Capacity Development to Upgrade WQ Monitoring and Data Management Program	DENR-EMB	140	None
		37	WQ-C-02	Capacity Development to Improve Water Quality and Aquaculture Fisheries Management	DA-BFAR	48	None
		38	WQ-C-03	Capacity Development Project to Improve Industry Adoption of Cleaner Production Options	DTI/DENR/Private Industries	60	None
Sub-total						248	0.0
B	Others	39	IS-C-01	Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin	NWRB/Others	297	3.7
		40	IS-C-03	Enhancement of Monitoring System for Surface Water in Pampanga River Basin	NWRB/Others	10	2.0
		41	IS-C-04	Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution	NWRB/Others	300	None
Sub-total						607	5.7
<b>Total for Group B Projects</b>						<b>72,432</b>	<b>743.5</b>
<b>Grand Total</b>						<b>169,084</b>	<b>2,710.9</b>

Note: \*: The project cost is not total cost, but only for 2011-2025.



Annex-T K 2.2.1 (1/3) Principal Objectives and Contents of Major Discussions in TWG Meetings, Stakeholder Meeting and Joint SC and TWG Meeting in September and October 2010

**TWG Meeting on Sep. 29, 2010**

**Objectives:**

1. To discuss the proposed prioritization order of the projects and development scenario for IWRM of Pampanga River Basin
2. To discuss the proposed IWRM institutional setup.
3. To discuss the interim results of preliminary Initial Environmental Evaluation (IEE) done for the projects

**Contents of Major Discussions:**

1. The TWG members shall have another meeting for their own validation on the prioritization of the different projects that were identified.

The TWG Workshop for the validation of the prioritization of project components of the IWRM Plan is scheduled on October 7, 2010 at Sulo Hotel from 9 – 4 pm.

2. The monitoring of water quality and the watershed environment shall not be integrated into one TWG in the organizational structure of the RBC since water quality is with EMB and there is a possibility for either of the sectors to be neglected.

The proposal of the Study Team was a separate TWG for each. However, it was decided to integrate them under one TWG through FDG since the two sectors are coordinated and both are under the organization of DENR.

3. The Study Team proposed that DILG shall head the TWG for water supply, sanitation and sewerage in the proposed organization setup of RBC. However, the TWG shall be headed by the LWUA or water districts (WDs) while the sanitation and sewerage to be under the DENR-EMB.

The original idea of the Study Team was for the DOH to chair the TWG for monitoring sanitation and sewerage, while it was modified to DILG in accordance with suggestion by FDG.

**TWG Meeting on Oct. 07, 2010**

**Objectives:**

1. To validate and/or improve the evaluation criteria for prioritization of projects as components of the IWRM Plan; and
2. To validate and/or improve the results of prioritization of projects made by the Study Team through Delphi technique

**Improvement of Results of Project Evaluations and Prioritization of Projects:**

1. The results of project evaluations and prioritization of projects made by the Study Team were revised by 13 TWG Members who represent from NIA, NPC, BSWM, PHILVOLCS, DENR-RBCO, DPWH-FCSEC, PAGASA, DILG-Region III, Tarlac Province, Bulacan Province, NEDA-Region III, MWSS, DENR-PAWB and NWRB.

**Contents of Major Discussions:**

1. The cost of P75M for the project “FL-C-02: Community Based Flood Early Warning System for Provinces of Pampanga, Tarlac and N.E” is deemed to be too costly in comparison with the cost of the similar project completed in Bulacan. Moreover, the Project shall be implemented earlier than its target implementation in 2016 proposed by the Study Team.
2. The benefits by the above Project could be gained for a longer period of time if it can be implemented earlier. Moreover, it is recommended to give the project more functionality by not limiting its use to flood alone but to utilize the data that can be monitored for research development, infrastructure, etc.
3. It was informed that the Provincial Disaster Coordinating Council (PDCC) of Nueva Ecija is now considering the proposal for the community-based flood early warning system which will be discussed with the Governor.
4. After the discussion, the participants replicated the evaluation done by Mr. Otogawa by project sets. Using the Scoring Matrix, the participants revised the scores of the projects for each set, as they see fit. Revised scores were placed in the blank above the scoring made by Mr. Otogawa. The new scores were incorporated and the total scores were collated by the encoders for each project set. The scores for Project Sets 1, 2 and 3 were collated and integrated by the Chief Encoder using geometric mean to arrive at the final scores.

Annex-T K 2.2.1 (2/3) Principal Objectives and Contents of Major Discussions in TWG Meetings, Stakeholder Meeting and Joint SC and TWG Meeting in September and October 2010

**Stakeholder Meeting on Oct. 13, 2010**

**Objectives:**

1. To present the methodologies for the formulation of the development scenarios, implementation program and investment program of the water-related projects proposed as components of the IWRM Plan for Pampanga River Basin by the JICA Study Team;
2. To discuss the approach and framework for the proposed institutional set-up plan for IWRM for Pampanga River Basin;
3. To present the web-page developed for the Pampanga River Basin Study; and
4. To review and validate the development scenarios, implementation program and investment program targeted for the short-term, mid-term and long-term.

**Contents of Major Discussions:**

1. The Study Team shall come up with a review of the Medium Term Development Plan (MTDP) of each province within the river basin. The particular consideration shall be given to the following three projects: (1) Cabo Holistic Development Project; (2) Tabuating River Irrigation System and (3) Sierra Madre Watershed Development Program.
  - \* The Study Team made an attempt to review the MTDP, but it was virtually difficult to take overview of the MTDPs for the whole provinces in the study area. Due to the difficulty, the whole of the MTDP was not incorporated and it was reflected only in the “FL-C-03: the Maintenance, Rehabilitation and Improvement for Drainage and Flood Control Facilities under Jurisdiction of LGUs”. It is further noted that of the above three projects to be given the particular consideration, the “Tabuating River Irrigation System “has been included as a part of the proposed IWRM Plan (refer to AI-G-10: Upper Tabuating SRIP”), but other two projects were not incorporated due to the invalid old information on them.
2. In accordance with comments given in the meeting, the following revisions were made for the Project of “MW-P-04: Metro Clark Bulk Water Supply Project”.
  - The name of Project was renamed from “Development of Water Supply System for Clark Special Economic Zone (2020 ~ 2025)
  - The project implementation period is revised from 2020-2025 to 2011-2025.
  - The objective area is expanded from the Clark New Frontier Area to the whole Metro Clark, which covers a part of Tarlac and Pampanga Province.
  - The classification of the Project is revised from the Group-B Project to Group-A Project.
3. In accordance with the comments given in the meeting, the target completion year of the Project of “MP-C-01: Construction/ Provision of Septage Treatment and Disposal Facilities” was revised from 2020 to 2025.
4. In accordance with the comments, the development scenario on “Level 3 Water Supply System” was modified to the development scenario on “Level 3, 2,1 Water Supply System”.
5. In accordance with the comments in the meeting, the following two projects were added as the components of the IWRM Plan for Pampanga River Basin.
  - FL-C-03 Maintenance, Rehabilitation and Improvement for Drainage and Flood Control Facilities under Jurisdiction of LGUs
  - FL-C-04 Integration of Salient Points of IWRM for Pampanga River Basin into School Curricula
6. In accordance with the comments in the meeting, the following two projects were transferred from Group-B to Group-A:
  - WQ-P-01: Clean Development Mechanism Projects
  - WQ-C-04: Construction of Sanitary Landfills and Support facilities in Nueva Ecija and Cluster Water Transfer Stations in Bulacan

Annex-T K 2.2.1 (3/3) Principal Objectives and Contents of Major Discussions in TWG Meetings, Stakeholder Meeting and Joint SC and TWG Meeting in September and October 2010

**Joint SC and TWG Meeting on**

**Objectives:**

1. To present the revised prioritization order of the projects and development scenarios as well as the revised institutional setup plan for IWRM of the Pampanga River Basin.

**Contents of Major Discussions:**

1. There shall be a footnote that states that the proposed grouping of the projects into Group A & B is not fixed but the projects can be transferred from one grouping to the other depending on the future situation and necessity for the project
2. The Chairperson for the TWG on Water Supply, Sanitation and Sewerage in the organization setup for RBC should be DILG and DOH instead of DILG and LWUA.
3. E.O. to be drafted should include a provision that will direct National Government Agencies to initially allocate contributions to the operation of the RBC from their respective offices and eventual allocation of specific funds from the national government for its operation.
4. The long-term option of legislative action to institutionalize creation of RBOs/RBCs in the country should be included.
5. Issues/conflicts on arbitration and monitoring of water rights shall be resolved first at the RBC level and only unresolved issues shall be elevated to NWRB. In this regard, the arbitration shall be subject to the guidelines or agreement that will be developed between RBC and NWRB.

**Annex-T K.2.2.2 (1/2) Development Scenarios and Relevant Projects (Group-A)**

Sector	Development Scenario	Term of Implementation	Project		Implementing Agency	Cost (million pesos)			
			Code	Name of Project		Short-term	Mid-term	Long-term	Total
Agriculture/Irrigation and Fisheries	<b>(1) Rehabilitation of Existing Irrigation Facilities</b>  The agricultural productivities shall be improved through rehabilitation of the existing irrigation facilities.	Whole Terms	AI-G-03	Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project (REGIP)	NIA	216	91	91	398
			AI-G-04	Balikatan Sagip Patubig Program (BSPP)	NIA	46	0	0	46
			AI-G-05	Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities	NIA	1,027	276	276	1,579
			AI-G-06	Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (RRE-NIAIS)	NIA	3,437	2,665	2,665	8,767
			AI-G-08	Rehabilitation of Small Water Impounding Projects / Diversion Dams	DA-BSWM	43	43	43	128
			AI-G-09	Comprehensive Agrarian Reform Program, Irrigation Component	NIA	340	340	340	1,020
	<b>(2) Sustainable Fishery Production</b>  The fishery productivities shall be sustained through the on-going regular projects.	Whole Terms	AF-G-01	Aquaculture Fisheries Development Programs	DA-BFAR	150	150	150	450
			AF-G-02	Comprehensive Regulatory Services	DA-BFAR				
			AF-G-03	Support Projects and Activities	DA-BFAR				
			AF-G-04	Fisheries Resources Management for Improved and Sustainable Harvest	DA-BFAR				
<b>Total</b>						<b>5,259</b>	<b>3,565</b>	<b>3,565</b>	<b>12,388</b>
Municipal Water Supply, Sanitation and Sewerage	<b>(1) Short-term Development of Bulk Water Supply System for Bulacan Province</b>  MWSS shall provide the bulk municipal water supply system to Bulacan Province in order to retrieve the deterioration of the groundwater currently used as the source for municipal water use in the Province by 2015. The water supply system shall have the supply capacity of 2.7m <sup>3</sup> /s, which could cover the municipal water demand of about one million.	Short-term	MW-P-03	Bulacan Treated Bulk Water Supply Project	MWSS/LGU	11,935	0	0	11,935
	<b>(2) Strengthening of Water Supply Capacity of Angat Umiray System</b>  (a) The more sustainable water supply by Angat-Umiray system shall be enhanced through implementation of MW-G-01, MW-P-01 and MW-P-02 by 2015 so as to mitigate the chronic shortage for the municipal water use in Metro Manila and the irrigation water use in AMRIS.  (b) The reliability of water supply in Angat Umiray System shall be fully recovered through implementation of IS-C-02 by 2020.	Short-term and Mid-term	MW-G-01	Angat Water Utilization and Aquaduct Improvement Project (AWUAIIP) Phase 2	MWSS	4,568	0	0	4,568
			MW-P-01	Rehabilitation of Umiray-Macua Facilities	MWSS	454	0	0	454
			MW-P-02	Sumag River Diversion Project	MWSS	540	0	0	540
	<b>(3) Expansion of Level 3, 2, 1 Municipal Supply System</b>  (a) The coverage of Level 3, 2, 1 water supply system with safe drinking water supply shall reach 100% by 2025.  (b) The coverage ratios of the Level 3 Water Supply System in the urban area shall increase 1% per annum by 2015, and their average ratio shall reach 80% by 2025. At the same time, the lowest coverage ratio in the urban area shall not be below 46.5% in 2025.  (c) The present average coverage ratio of Level 3 Water Supply System in the rural area shall be maintained until 2025, notwithstanding the future increment of population. The target coverage ratio to be maintained is 18% in average for the whole study area.	Whole Terms	MW-C-01	Additional Level 3, 2, 1 Facilities towards 2025 in Bulacan	LWUA/WDs/LGU/Private WSPs	1,404	1,200	1,235	3,839
			MW-C-02	Additional Level 3, 2, 1 Facilities towards 2025 in Pampanga	LWUA/WDs/LGU/Private WSPs	1,714	1,588	1,612	4,914
			MW-C-03	Additional Level 3, 2, 1 Facilities towards 2025 in Nueva Ecija	LWUA/WDs/LGU/Private WSPs	973	957	973	2,903
			MW-C-04	Additional Level 3, 2, 1 Facilities towards 2025 in Tarlac	LWUA/WDs/LGU/Private WSPs	221	169	169	559
	<b>(4) Construction/Provision of Sanitary Toilet</b>  The rate of construction/provision of the sanitary toilets in all municipalities and cities shall increase at the rate of 10% per annum by 2015, and the whole households in the study area shall be provided with the sanitary toilet by 2025.	Whole Terms	MSC-01	Additional Sanitary Facilities towards 2025 in Bulacan	LGUs	1,774	948	954	3,676
			MSC-02	Additional Sanitary Facilities towards 2025 in Pampanga	LGUs	1,969	1,356	1,400	4,725
			MSC-03	Additional Sanitary Facilities towards 2025 in Nueva Ecija	LGUs	1,394	1,037	1,046	3,477
			MSC-04	Additional Sanitary Facilities towards 2025 in Tarlac	LGUs	370	294	304	968
	<b>(5) Development of Bulk Water Supply System for Metro Clark</b>  The bulk water supply system (supply capacity of 0.8m <sup>3</sup> /s) shall be gradually expanded to the entire Metro Clark by 2025.	Whole Terms	MW-P-04	Metro Clark Bulk Surface Water Project	CDC	1,176	1,176	1,175	3,527
	<b>(6) Long-term Development of Bulk Water Supply System for Bulacan and Pampanga Province</b>  The bulk water supply system with the supply capacity of additional 3.8m <sup>3</sup> /s for Bulacan and 1.3m <sup>3</sup> /s for Pampanga Province shall be developed by 2025 in order to serve the incremental provincial population and cope with deterioration of the groundwater quality.	Long-term	MW-C-05	Extended Bulacan Bulk Water Supply Project	LGU	0	0	16,754	16,754
			MW-C-06	Pampanga Bulk Water Supply Project	LGU	0	0	5,732	5,732
<b>Total</b>						<b>28,592</b>	<b>16,591</b>	<b>31,354</b>	<b>76,537</b>

KT-6

**Annex-T K.2.2.2 (2/2) Development Scenarios and Relevant Projects (Group-A)**

Sector	Development Scenario	Term of Implementation	Project Code	Name of Project	Implementing Agency	Cost (million pesos)			
						Short-term	Mid-term	Long-term	Total
Management of Flood and Sediment Disasters	<b>(1) Sustainment of Regular Program for Maintenance and Rehabilitation of River Dike and Slope</b>  Until 2025, the following regular program for maintenance and rehabilitation of the deteriorated river dike and slope of Pampanga, Angat and Pasac river systems of 54km in length, which are under jurisdiction of DPWH, shall be sustained to maintain the original river flow capacities and morphology	Whole Terms	FL-G-03	Maintenance and Rehabilitation Works for River Dike and Slope	DPWH	226	226	227	679
	<b>(2) Sustainment of Regular Program for Maintenance and Rehabilitation of Drainage and Flood Control Facilities for LGUs</b>  Until 2025, the following regular program for maintenance and rehabilitation of the drainage and flood control facilities, which are under jurisdiction of the Provincial Governments of Pampanga, Bulacan, Nueva Ecija and Tarlac, shall be sustained to maintain the original design capacity of the facilities.	Whole Terms	FL-C-03	Maintenance, Rehabilitation and Improvement for Drainage and Flood Control Facilities under Jurisdiction of LGUs	LGUs	1,000	1,000	1,000	3,000
<b>(3) Improvement of Public Awareness on IWRM</b>  Toward 2025, public awareness on IWRM shall be improved through the annual regular program on the salient points of IWRM into school curricula for primary and secondary school in the aspect of IWRM for Pampanga river basin.	Whole Terms	FL-C-04	Integration of Salient Points of IWRM for Pampanga River Basin into School Curricula	DE-Region III	2	3	3	8	
<b>Total</b>						<b>1,228</b>	<b>1,229</b>	<b>1,230</b>	<b>3,687</b>
Watershed Management	<b>(1) Sustainment of the On-going Regular Program for Watershed Management</b>  The major on-going nine (9) regular programs for watershed management in Pampanga river basin shall be sustained by 2025, which could lead to the following outcomes:  (a) The 285,300has. of tenured and untenured forestlands shall be protected against illegal harvesting, encroachment, forest fires, illegal land use and conversion.  (b) The present forest cover of 187,500has shall be expanded through timber forest establishment and agro-forestry by about 10,000has. at the rate of 660has. per annum. Forest expansion will cover an additional 2.63% of the total classified and unclassified forestlands (377,500has.) in Pampanga river basin by 2025.  (c) The present agro-forestry cover shall expand by about 29,700has. at the rate of 200has. per annum as the basic strategy to provide additional income source to upland dwellers, particularly the indigenous peoples.  (d) Conservation of natural ecosystems and their critical habitats will be sustained in order to protect biodiversity. The area to be conserved includes: (i) natural forests within the 79,800has. of protected areas of Mt. Arayat NP, Pantabangan-Carranglan WFR and Angat WFR, and (ii) old and re-established mangrove forests within 77,400has. of coastal areas of Pampanga and Bulacan.	Whole Terms	WS-G-01	Forest Protection and Law Enforcement Program (FPLEP)	DENR/PENRO/CE NRO	13	13	13	39
			WS-G-02	Community-based Forest Management Program	DENR/RCBFMO	24	24	23	71
			WS-G-04	Coastal Resource Management Program (CRMP)	DENR/PAWCZMS	12	12	13	37
			WS-G-05	Protected Area Community-based Resource Management Program (CBFM-PACBRMA)	DENR/PAWCZMS	4	4	5	13
			WS-G-06	Private Forest Plantation Development Program (PFPDP)	DENR-FRCD	36	29	28	93
			WS-G-07	NIA-UPRIIS' Watershed Management Program	NIA-UPRIIS	100	40	40	180
			WS-G-08	NPC's Watershed Management Program	NPC	51	28	28	107
			WS-G-09	Integrated Social Forestry (ISF) Projects	LGUs/DENR/RCBFMO	17	17	17	51
			WS-G-10	Private-sector Watershed Management Initiatives	Private Firm/NGOs	11	11	10	32
<b>Total</b>						<b>268</b>	<b>178</b>	<b>177</b>	<b>623</b>
Water-related Environment Management	<b>(1) Dealing with Contamination of Surface, Ground and Coastal Water</b>  The pollution load from various sources shall be reduced by sustaining the ongoing non-structural measures under three (3) ongoing regular DENR and LGU programs that are intended to protect water quality.	Whole Terms	WQ-G-01	Ecological Solid Waste Management Program (ESWMP)	DENR-EMB III	64	64	64	192
			WQ-G-02	Industrial Pollution Control Program (IPCP)	DENR-EMB III	51	51	51	153
			WQ-G-03	Sagip-Ilog Project	DENR-EMB/LGU/Pvt. Sector	5	3	3	11
	<b>(2) Reduction of Risk for Contamination in Water Body</b>  By 2025, the structural measures will be implemented to reduce the risk of contamination from livestock, domestic and industrial wastes. These include: (a) waste-to-energy CDM projects for livestock farms in Bulacan and the sanitary landfill in Tarlac and Bulacan; and (b) sanitary landfills in N. Ecija and waste transfer stations in Pampanga and Bulacan.	Whole Terms	WQ-P-01	Clean Development Mechanism Projects	Private Industries	518	518	0	1,036
			WQ-C-04	Construction of Sanitary Landfills and Support Facilities in Nueva Ecija and Cluster Waste Transfer Stations in Bulacan	LGUs	675	675	675	2,025
<b>Total</b>						<b>1,313</b>	<b>1,311</b>	<b>793</b>	<b>3,417</b>
<b>Grand Total</b>						<b>36,660</b>	<b>22,874</b>	<b>37,119</b>	<b>96,652</b>

### Annex-T K.2.2.3 Implementation Schedule for Group-A Projects

Sector	Code	Name of Project	Implementing Agency	Short-term	Mid-term	Long-term
Agriculture/ Irrigation and Fisheries	AI-G-03	Repair, Rehabilitation of Existing Groundwater Irrigation Systems, Establishment of Groundwater Pump Project (REGIP)	NIA			
	AI-G-04	Balikatan Sagip Patubig Program (BSPP)	NIA			
	AI-G-05	Repair, Rehabilitation, Restoration & Preventive Maintenance of Existing National & Communal Irrigation Facilities	NIA			
	AI-G-06	Restoration/Rehabilitation of Existing NIA Assisted Irrigation System (RRE-NIAIS)	NIA			
	AI-G-08	Rehabilitation of Small Water Impounding Projects / Diversion Dams	DA-BSWM			
	AI-G-09	Comprehensive Agrarian Reform Program, Irrigation Component	NIA			
	AF-G-01	Aquaculture Fisheries Development Programs	DA-BFAR			
	AF-G-02	Comprehensive Regulatory Services	DA-BFAR			
	AF-G-03	Support Projects and Activities	DA-BFAR			
	AF-G-04	Fisheries Resources Management for Improved and Sustainable Harvest	DA-BFAR			
Municipal Water Supply, Sanitation and Sewerage	MW-P-03	Bulacan Treated Bulk Water Supply Project	MWSS/LGU			
	MW-G-01	Angat Water Utilization and Aquaduct Improvement Project (AWUAIP) Phase 2	MWSS			
	MW-P-01	Rehabilitation of Umiray-Macua Facilities	MWSS			
	MW-P-02	Sumag River Diversion Project	MWSS			
	IS-C-02	Project for Recovery of Reliability of Water Supply in Angat-Umiray System	NWRB/NIA/MWSS/NPC/LGU			
	MW-C-01	Additional Level 3,2, 1 Facilities towards 2025 in Bulacan	LWUA/WDs/LGUs/Private WSPs			
	MW-C-02	Additional Level 3,2, 1 Facilities towards 2025 in Pampanga	LWUA/WDs/LGUs/Private WSPs			
	MW-C-03	Additional Level 3,2, 1 Facilities towards 2025 in Nueva Ecija	LWUA/WDs/LGUs/Private WSPs			
	MW-C-04	Additional Level 3,2, 1 Facilities towards 2025 in Tarlac	LWUA/WDs/LGUs/Private WSPs			
	MS-C-01	Additional Sanitary Facilities towards 2025 in Bulacan	LGUs			
	MS-C-02	Additional Sanitary Facilities towards 2025 in Pampanga	LGUs			
	MS-C-03	Additional Sanitary Facilities towards 2025 in Nueva Ecija	LGUs			
	MS-C-04	Additional Sanitary Facilities towards 2025 in Tarlac	LGUs			
	MW-P-04	Metro Clark Bulk Surface Water Project	CDC			
MW-C-05	Extended Bulacan Bulk Water Supply Project	LGU				
MW-C-06	Pampanga Bulk Water Supply Project	LGU				
Management of Flood and Sediment Disasters	FL-G-03	Maintenance and Rehabilitation Works for River Dike and Slope	DPWH			
	FL-C-03	Maintenance, Rehabilitation and Improvement for Drainage and Flood Control Facilities under Jurisdiction of LGUs	LGUs			
	FL-C-04	Integration of Salient Points of IWRM for Pampanga River Basin into School Curricula	DE-Region III			
Watershed Management	WS-G-01	Forest Protection and Law Enforcement Program (FPLEP)	DENR/PENRO/CENRO			
	WS-G-02	Community-based Forest Management Program	DENR/RCBFMO			
	WS-G-04	Coastal Resource Management Program (CRMP)	DENR/PAWCZMS			
	WS-G-05	Protected Area Community-based Resource Management Program (CBFM-PACBRMA)	DENR/PAWCZMS			
	WS-G-06	Private Forest Plantation Development Program (PFDP)	DENR-FRCD			
	WS-G-07	NIA-UPRIIS' Watershed Management Program	NIA-UPRIIS			
	WS-G-08	NPC's Watershed Management Program	NPC			
	WS-G-09	Integrated Social Forestry (ISF) Projects	LGUs/DENR/RCBFMO			
	WS-G-10	Private-sector Watershed Management Initiatives	Private Firm/NGOs			
	Water-related Environment Management	WQ-G-01	Ecological Solid Waste Management Program (ESWMP)	DENR-EMB III		
WQ-G-02		Industrial Pollution Control Program (IPCP)	DENR-EMB III			
WQ-G-03		Sagip-Ilog Project	DENR-EMB/LGU/Pvt. Sector			
WQ-P-01		Clean Development Mechanism Projects	Private Industries			
	WQ-C-04	Construction of Sanitary Landfills & Support Facilities in Nueva Ecija and Cluster Waste Transfer Stations in Bulacan & Pampanga	LGUs			

Annex-T K.2.2.4 Results of Evaluation (Scoring) of Group-B Projects by Study Team

KT-9

Sector	Project Code	Viability of the Project					Enhanced Livelihood					Improved Quality of Life					Decentralized Development					Sustained Ecosystem					Empowered People					Grand Total	Rank	
		1	2	3	4	T	1	2	3	4	T	1	2	3	4	T	1	2	3	4	T	1	2	3	4	T	1	2	3	4	T			
Agriculture / Irrigation and Fishery	AI-P-01	3.0	3.0	2.0	2.0	1.0	11.0	3.0	3.0	2.0	3.0	11.0	1.0	1.0	1.0	2.0	5.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	3.0	2.0	9.0	49.0	15
	AI-P-02	3.0	3.0	3.0	2.0	1.0	12.0	3.0	3.0	2.0	3.0	11.0	1.0	1.0	1.0	2.0	5.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	3.0	2.0	9.0	50.0	12
	AI-P-03	3.0	3.0	3.0	3.0	2.0	14.0	2.0	3.0	2.0	3.0	10.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	4.0	10.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	2.0	8.0	50.0	12
	AI-P-04	3.0	3.0	2.0	3.0	1.0	12.0	3.0	3.0	2.0	3.0	11.0	1.0	1.0	1.0	1.0	4.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	3.0	2.0	9.0	49.0	15
	AI-P-05	2.0	2.0	2.0	3.0	1.0	10.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	1.0	2.0	2.0	1.0	6.0	40.0	28
	AI-P-06	2.0	3.0	2.0	2.0	2.0	11.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	1.0	3.0	1.0	1.0	6.0	1.0	1.0	1.0	1.0	4.0	1.0	2.0	2.0	2.0	7.0	40.0	28
	AI-P-07	2.0	2.0	3.0	3.0	2.0	12.0	2.0	3.0	3.0	3.0	11.0	2.0	2.0	1.0	2.0	7.0	1.0	2.0	2.0	2.0	7.0	1.0	1.0	2.0	1.0	5.0	3.0	3.0	3.0	3.0	12.0	54.0	4
	AI-P-08	2.0	2.0	2.0	2.0	2.0	10.0	2.0	3.0	2.0	3.0	10.0	1.0	1.0	1.0	1.0	4.0	1.0	3.0	1.0	2.0	7.0	1.0	1.0	2.0	1.0	5.0	2.0	2.0	2.0	2.0	8.0	44.0	24
	AI-P-09	2.0	2.0	2.0	2.0	1.0	9.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	1.0	1.0	2.0	1.0	5.0	38.0	30
	AI-P-10	2.0	2.0	3.0	2.0	1.0	10.0	3.0	3.0	2.0	3.0	11.0	3.0	3.0	2.0	1.0	9.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	2.0	1.0	5.0	2.0	2.0	2.0	3.0	9.0	53.0	7
	AI-P-11	2.0	2.0	2.0	2.0	3.0	11.0	3.0	3.0	2.0	3.0	11.0	1.0	1.0	1.0	1.0	4.0	1.0	3.0	2.0	3.0	9.0	1.0	1.0	2.0	1.0	5.0	3.0	2.0	3.0	2.0	10.0	50.0	12
	AI-C-01	2.0	2.0	1.0	2.0	3.0	10.0	3.0	3.0	2.0	3.0	11.0	1.0	1.0	1.0	1.0	4.0	1.0	3.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	3.0	2.0	9.0	46.0	20
	AI-C-02	2.0	2.0	2.0	2.0	3.0	11.0	3.0	3.0	3.0	3.0	12.0	2.0	1.0	1.0	1.0	5.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	2.0	1.0	5.0	3.0	3.0	3.0	3.0	12.0	54.0	4
AI-C-03	2.0	2.0	2.0	2.0	2.0	10.0	2.0	3.0	3.0	3.0	11.0	1.0	2.0	2.0	1.0	6.0	1.0	2.0	2.0	2.0	7.0	2.0	2.0	2.0	2.0	8.0	3.0	3.0	3.0	3.0	12.0	54.0	4	
Municipal Water Supply, Sanitation and Sewerage	MW-P-04	2.0	2.0	2.0	2.0	1.0	9.0	2.0	2.0	1.0	1.0	6.0	2.0	3.0	2.0	1.0	8.0	2.0	2.0	2.0	1.0	7.0	1.0	1.0	1.0	1.0	4.0	1.0	1.0	1.0	1.0	4.0	38.0	30
	MP-C-01	2.0	2.0	2.0	2.0	1.0	9.0	1.0	1.0	1.0	1.0	4.0	3.0	1.0	3.0	1.0	8.0	2.0	1.0	2.0	2.0	7.0	1.0	3.0	2.0	3.0	9.0	2.0	2.0	2.0	1.0	7.0	44.0	24
Management of Flood and Sediment Disasters	FL-P-01	3.0	3.0	3.0	2.0	1.0	12.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	3.0	3.0	8.0	3.0	3.0	3.0	2.0	11.0	1.0	2.0	1.0	2.0	6.0	3.0	2.0	3.0	2.0	10.0	56.0	2
	FL-P-02	1.0	1.0	1.0	2.0	1.0	6.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	2.0	3.0	7.0	2.0	2.0	2.0	1.0	7.0	1.0	1.0	1.0	1.0	4.0	2.0	1.0	2.0	1.0	6.0	38.0	30
	FL-C-01	2.0	2.0	2.0	2.0	2.0	10.0	2.0	3.0	3.0	2.0	10.0	1.0	2.0	2.0	3.0	8.0	3.0	3.0	3.0	2.0	11.0	2.0	1.0	1.0	1.0	5.0	3.0	3.0	3.0	2.0	11.0	55.0	3
	FL-C-02	2.0	2.0	1.0	3.0	3.0	11.0	2.0	2.0	2.0	3.0	9.0	1.0	1.0	2.0	3.0	7.0	2.0	1.0	2.0	1.0	6.0	1.0	1.0	1.0	1.0	4.0	3.0	3.0	3.0	2.0	11.0	48.0	17
Watershed Management	WS-C-01	2.0	2.0	2.0	3.0	3.0	12.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	3.0	6.0	1.0	2.0	2.0	3.0	8.0	1.0	3.0	3.0	2.0	9.0	3.0	2.0	3.0	2.0	10.0	53.0	7
	WS-C-02	2.0	2.0	2.0	3.0	3.0	12.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	3.0	6.0	1.0	2.0	2.0	3.0	8.0	1.0	3.0	3.0	2.0	9.0	3.0	2.0	3.0	2.0	10.0	53.0	7
	WS-C-03	2.0	3.0	2.0	3.0	1.0	11.0	1.0	1.0	1.0	1.0	4.0	1.0	1.0	2.0	2.0	6.0	1.0	1.0	2.0	1.0	5.0	2.0	3.0	3.0	2.0	10.0	3.0	2.0	3.0	2.0	10.0	46.0	20
	WS-C-04	2.0	2.0	2.0	3.0	1.0	10.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	2.0	1.0	5.0	2.0	2.0	1.0	2.0	7.0	2.0	2.0	2.0	2.0	8.0	2.0	1.0	2.0	2.0	7.0	45.0	23
Water-related Environment Management	WQ-P-01	2.0	2.0	2.0	3.0	3.0	12.0	1.0	3.0	1.0	1.0	6.0	1.0	1.0	2.0	1.0	5.0	2.0	1.0	2.0	1.0	6.0	1.0	2.0	3.0	2.0	8.0	2.0	2.0	3.0	3.0	10.0	47.0	19
	WQ-C-01	2.0	3.0	2.0	3.0	1.0	11.0	1.0	1.0	1.0	1.0	4.0	3.0	2.0	3.0	1.0	9.0	2.0	1.0	2.0	1.0	6.0	3.0	2.0	2.0	2.0	9.0	2.0	2.0	2.0	1.0	7.0	46.0	20
	WQ-C-02	2.0	2.0	2.0	3.0	1.0	10.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	2.0	1.0	5.0	1.0	3.0	2.0	2.0	8.0	3.0	3.0	1.0	2.0	9.0	2.0	2.0	2.0	2.0	8.0	48.0	17
	WQ-C-03	2.0	2.0	2.0	2.0	2.0	10.0	1.0	1.0	1.0	1.0	4.0	2.0	1.0	3.0	1.0	7.0	1.0	1.0	2.0	1.0	5.0	3.0	2.0	1.0	3.0	9.0	2.0	2.0	2.0	2.0	8.0	43.0	27
	WQ-C-04	2.0	2.0	2.0	2.0	1.0	9.0	1.0	1.0	1.0	1.0	4.0	3.0	1.0	3.0	1.0	8.0	2.0	1.0	2.0	1.0	6.0	1.0	3.0	2.0	3.0	9.0	2.0	2.0	2.0	2.0	8.0	44.0	24
Others	IS-C-01	2.0	3.0	2.0	3.0	2.0	12.0	1.0	1.0	1.0	1.0	4.0	3.0	3.0	3.0	1.0	10.0	1.0	2.0	2.0	1.0	6.0	3.0	3.0	1.0	2.0	9.0	3.0	3.0	2.0	2.0	10.0	51.0	10
	IS-C-03	2.0	3.0	2.0	3.0	2.0	12.0	1.0	1.0	1.0	1.0	4.0	3.0	3.0	3.0	1.0	10.0	1.0	2.0	2.0	1.0	6.0	3.0	2.0	1.0	2.0	8.0	3.0	3.0	3.0	2.0	11.0	51.0	10
	IS-C-04	2.0	2.0	2.0	3.0	2.0	11.0	2.0	3.0	2.0	2.0	9.0	3.0	3.0	3.0	1.0	10.0	2.0	3.0	3.0	3.0	11.0	2.0	2.0	2.0	1.0	7.0	3.0	3.0	3.0	3.0	12.0	60.0	1

Annex-T K.2.2.5 Results of Evaluation (Scoring) of Group-B Projects by TWG Members

Sector	Project Code	Viability of the Project					Enhanced Livelihood					Improved Quality of Life					Decentralized Development					Sustained Ecosystem					Empowered People					Grand Total	Rank	
		1	2	3	4	5	T	1	2	3	4	T	1	2	3	4	T	1	2	3	4	T	1	2	3	4	T	1	2	3	4			T
Agriculture / Irrigation and Fishery	AI-P-01	2.9	2.7	1.9	1.8	1.1	10.4	2.9	2.9	2.0	2.8	10.7	1.0	1.0	1.0	1.9	4.9	2.0	3.0	2.0	2.0	9.0	1.0	1.0	1.0	1.0	4.0	2.0	1.9	2.8	1.9	8.6	47.6	18
	AI-P-02	3.0	3.0	3.0	2.0	1.0	12.0	3.0	3.0	2.0	2.8	10.8	1.0	1.0	1.0	2.0	5.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	3.0	2.0	9.0	49.8	13
	AI-P-03	3.0	2.9	3.0	2.9	2.0	13.8	2.0	2.9	2.1	2.8	9.8	1.0	1.0	1.0	1.1	4.1	1.9	2.1	1.9	2.7	8.6	1.0	1.0	1.0	1.0	4.0	1.9	1.9	1.9	1.9	7.6	47.8	17
	AI-P-04	3.0	3.0	2.0	3.0	1.1	12.1	2.9	2.9	2.0	2.8	10.7	1.0	1.0	1.0	1.0	4.0	2.0	3.0	2.0	2.0	9.0	1.0	1.0	1.1	1.0	4.1	2.0	2.0	3.0	2.0	9.0	48.8	14
	AI-P-05	2.0	2.0	2.0	3.0	1.0	10.0	1.9	1.9	2.0	1.9	7.7	1.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	1.0	2.0	2.0	1.0	6.0	39.7	29
	AI-P-06	2.0	3.0	2.0	2.0	2.0	11.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	1.0	3.0	1.0	1.0	6.0	1.0	1.0	1.0	1.0	4.0	1.0	2.0	2.0	2.0	7.0	40.0	28
	AI-P-07	2.0	2.0	3.0	3.0	2.0	12.0	2.0	3.0	3.0	3.0	11.0	2.0	2.0	1.0	2.0	7.0	1.0	2.0	2.0	2.0	7.0	1.0	1.0	2.0	1.0	5.0	3.0	3.0	3.0	3.0	12.0	54.0	4
	AI-P-08	2.0	2.0	2.0	2.0	2.0	10.0	2.0	3.0	2.0	3.0	10.0	1.0	1.0	1.0	1.0	4.0	1.0	3.0	1.0	2.0	7.0	1.0	1.0	2.0	1.0	5.0	2.0	2.0	2.0	2.0	8.0	44.0	24
	AI-P-09	2.0	2.0	2.0	2.0	1.0	9.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	1.0	4.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.1	1.0	4.1	1.0	1.0	2.0	1.0	5.0	38.1	30
	AI-P-10	2.1	2.0	2.9	2.1	1.1	10.1	2.9	3.0	1.9	2.9	10.7	2.9	2.9	1.9	1.1	8.8	1.9	3.0	1.9	1.9	8.7	1.0	1.0	2.1	1.0	5.1	1.9	1.9	1.9	2.8	8.5	51.9	8
	AI-P-11	2.1	2.1	1.9	2.1	2.9	11.1	3.0	3.0	2.1	3.0	11.1	1.1	1.1	1.1	1.1	4.2	1.1	3.0	2.0	2.9	8.9	1.1	1.1	2.1	1.1	5.2	2.9	2.0	3.0	2.1	9.9	50.4	12
AI-C-01	2.0	1.9	1.0	2.1	2.9	9.8	3.0	3.0	2.1	3.0	11.1	1.1	1.1	1.1	1.1	4.2	1.1	3.0	2.0	2.0	8.0	1.1	1.1	1.1	1.1	4.3	2.0	2.0	2.8	1.9	8.6	46.0	21	
AI-C-02	2.1	2.1	2.1	2.0	2.8	11.0	2.7	2.8	2.8	2.8	11.1	1.8	1.0	1.0	1.0	4.8	1.8	2.7	1.8	2.0	8.3	1.0	1.0	1.8	1.0	4.8	2.6	2.7	2.7	2.7	10.7	50.7	10	
AI-C-03	2.0	2.0	2.0	2.0	2.0	10.0	2.0	3.0	2.9	2.9	10.8	1.0	2.0	2.0	1.0	6.0	1.0	2.0	2.0	2.0	7.0	2.0	2.0	2.0	2.0	8.0	3.0	3.0	3.0	3.0	12.0	53.8	5	
Municipal Water Supply, Sanitation and Sewerage	MW-P-04	1.9	1.9	1.9	1.9	1.0	8.6	1.9	2.0	1.0	1.0	5.9	2.1	2.9	1.9	1.0	7.9	2.0	2.0	2.1	1.1	7.1	1.0	1.1	1.0	1.1	4.1	1.0	1.0	1.0	1.0	4.0	37.6	32
	MP-C-01	2.0	2.0	2.0	1.9	1.0	8.9	1.0	1.0	1.0	1.0	4.0	2.5	1.1	2.9	1.0	7.5	1.9	1.0	1.9	2.0	6.8	1.0	2.9	1.9	2.9	8.7	2.0	2.0	2.0	1.0	7.0	42.9	27
Management of Flood and Sediment Disasters	FL-P-01	3.0	3.0	3.0	2.0	1.1	12.1	1.9	2.9	2.0	1.9	8.7	1.0	1.0	2.9	3.0	7.9	2.9	2.9	2.9	2.0	10.7	1.0	2.0	1.0	2.0	6.0	3.0	2.0	3.0	2.0	10.0	55.4	2
	FL-P-02	1.0	1.0	1.0	2.0	1.1	6.1	1.9	2.0	2.0	2.0	7.9	1.0	1.0	2.0	3.0	7.0	2.0	2.0	2.0	1.0	7.0	1.0	1.0	1.0	1.0	4.0	2.0	1.0	2.0	1.0	6.0	38.0	31
	FL-C-01	2.0	2.0	2.0	2.0	2.0	10.0	1.9	3.0	3.0	2.0	9.9	1.0	2.0	2.0	3.0	8.0	2.8	2.8	3.0	2.0	10.5	2.0	1.0	1.0	1.0	5.0	3.0	3.0	3.0	2.0	11.0	54.5	3
	FL-C-02	2.0	2.0	1.0	3.0	3.0	11.0	1.9	2.0	2.0	3.0	8.9	1.0	1.0	2.0	3.0	7.0	2.0	1.0	2.0	1.0	6.0	1.1	1.1	1.1	1.1	4.2	3.0	3.0	3.0	2.0	11.0	48.1	15
Watershed Management	WS-C-01	1.9	1.9	2.0	3.0	3.0	11.8	2.0	2.0	2.0	2.0	8.0	1.0	1.0	1.0	2.9	5.9	1.0	2.0	2.0	3.0	8.0	1.1	3.0	3.0	2.0	9.1	3.0	2.1	3.0	2.1	10.1	52.9	7
	WS-C-02	2.0	2.0	2.0	3.0	3.0	12.0	2.0	2.0	2.0	1.9	7.9	1.1	1.1	1.0	3.0	6.2	1.0	2.0	2.0	3.0	8.0	1.1	3.0	3.0	2.0	9.1	3.0	2.0	2.9	2.0	9.9	53.1	6
	WS-C-03	2.0	3.0	2.0	3.0	1.0	11.0	1.0	1.0	1.0	1.0	4.0	1.0	1.0	2.0	2.0	6.0	1.0	1.0	2.0	1.0	5.0	2.0	3.0	3.0	2.0	10.0	3.0	2.0	3.0	2.0	10.0	46.0	20
	WS-C-04	2.0	2.0	2.0	3.0	1.0	10.0	2.0	2.0	2.0	2.0	8.0	1.0	1.0	2.0	1.0	5.0	2.0	2.0	1.0	2.0	7.0	2.0	2.0	2.0	2.0	8.0	2.0	1.1	2.0	2.0	7.1	45.1	23
Water-related Environment Management	WQ-P-01	1.9	2.0	2.0	3.0	3.0	11.9	1.0	2.9	1.1	1.0	6.0	1.0	1.0	2.0	1.0	5.0	2.0	1.0	2.0	1.1	6.1	1.0	2.0	3.0	2.0	8.0	2.0	2.0	3.0	3.0	10.0	46.9	19
	WQ-C-01	2.0	2.9	2.0	3.0	1.0	10.9	1.0	1.0	1.0	1.0	4.0	3.0	1.9	3.0	1.0	8.9	2.0	1.0	2.0	1.0	6.0	2.9	2.0	2.0	2.0	8.9	2.0	2.0	2.0	1.0	7.0	45.7	22
	WQ-C-02	2.0	2.0	2.0	3.0	1.0	10.0	1.9	2.0	2.0	2.0	7.9	1.0	1.0	2.0	1.0	5.0	1.0	3.0	2.0	2.0	8.0	3.0	3.0	1.0	1.9	8.9	2.0	2.0	2.0	2.0	8.0	47.8	16
	WQ-C-03	2.0	2.0	2.0	2.1	2.0	10.1	1.0	1.0	1.0	1.0	4.0	2.0	1.0	3.0	1.0	7.0	1.0	1.0	2.0	1.0	5.0	3.0	2.0	1.0	3.0	9.0	2.0	2.0	2.1	2.0	8.1	43.1	26
	WQ-C-04	2.0	2.0	2.0	2.1	1.1	9.1	1.1	1.0	1.1	1.0	4.1	2.6	1.0	3.0	1.0	7.6	2.0	1.1	2.0	1.1	6.1	1.0	2.9	2.0	3.0	8.9	2.0	2.0	2.0	2.0	8.0	43.8	25
Others	IS-C-01	2.0	3.0	2.0	3.0	2.0	12.0	1.0	1.0	1.0	1.0	4.0	2.9	2.9	3.0	1.0	9.8	1.0	2.0	2.0	1.0	6.0	3.0	3.0	1.0	2.1	9.1	2.8	2.8	1.9	2.0	9.6	50.5	11
	IS-C-03	2.0	3.0	2.0	3.0	2.0	12.0	1.0	1.0	1.0	1.0	4.0	2.9	2.9	3.0	1.1	9.9	1.0	2.0	2.0	1.0	6.0	3.0	2.1	1.0	2.0	8.1	2.9	2.9	3.0	2.0	10.8	50.8	9
	IS-C-04	2.0	2.0	2.0	3.0	2.0	11.0	1.9	2.8	2.1	2.0	8.8	2.8	2.8	2.8	1.0	9.5	2.0	2.9	2.9	2.9	10.7	2.0	2.0	2.0	1.0	7.0	2.9	2.9	2.9	2.8	11.6	58.6	1



### Annex-T K.2.2.6 Group-B Projects to be Implemented in Short, Medium and Long Term

Priority Order	Project Code	Implementing Agency	Initial Investment Cost (Million Pesos)				Implementation Period (years)				Score
			Short-term	Mid-term	Long-term	Total	Short-term	Mid-term	Long-term	Total	
Group-A Project for Maintenance and Rehabilitation of Existing Facilities			5,485	3,791	3,792	13,067					
On-going Group-B Projects			2,339	498	0	2,837					
IS-C-04	Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution	NWRB/Others	300			300	Less than 5				58.6
FL-P-01	Flood Control Measures in Mt. Pinatubo Devastated Area- Focus on Pasac Delta	DPWH	4,320			4,320	Less than 5				55.4
FL-C-01	Flood Mitigation for Pampanga Delta	DPWH	100	5,368		5,468	5	5		10	54.5
AI-P-07	Appropriate Irrigation Technologies for Enhanced Agricultural Production	NIA	654			654	Less than 5				54.0
AI-C-03	Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	NIA	150			150	Less than 5				53.8
WS-C-02	Protected Area Management Program (PAMP)	DENR/PAWCZMS	202	202		404	5	5		10	53.1
WS-C-01	Upland Development Program	DA/DENR/LGUs	490	490		980	5	5		10	52.9
AI-P-10	Rehabilitation of AMRIS	NIA	983			983	Less than 5				51.9
IS-C-03	Enhancement of Monitoring System for Surface Water in Pampanga River Basin	NWRB/Others	10			10	Less than 5				50.8
AI-C-02	Introduction of Water Saving Irrigation Technology	NIA	150			150	Less than 5				50.7
IS-C-01	Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin	NWRB/Others	99	99	99	297	5	5	5	15	50.5
AI-P-11	Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects, Small Diversion Dam Projects	DA Region III/LGUs	169			169	Less than 5				50.4
AI-P-02	Balog-Balog Multipurpose Project Phase 2	NIA	8,942	7,153		16,095	5	4		9	49.8
AI-P-04	Casernan Multi-purpose Irrigation & Power Project Irrigation Component Phase 2	NIA	5,000	2,000		7,000	5	2		7	48.8
FL-C-02	Community Based Flood Early Warning System for Provinces of Pampanga, Tarlac and N. Ecija	LGUs	8			8	Less than 5				48.1
WQ-C-02	Capacity Development to Improve Water Quality and Aquaculture Fisheries Management	DA-BFAR	48			48	Less than 5				47.8
AI-P-03	Sector Loan on Rehabilitation of Irrigation Facilities	NIA	222			222	Less than 5				47.8
WS-C-03	Urban Greening Program	LGUs	88	88	88	264	5	5	5	15	46.0
AI-C-01	New Construction of Small Scale Irrigation Project under BSWM	BSWM/LGUs	257	257		514	5	5		10	46.0
WQ-C-01	Capacity Development to Upgrade WQ Monitoring and Data Management Program	DENR-EMB	140			140	Less than 5				45.7
WS-C-04	Community-based Eco-tourism Program	DOT/DENR/LGUs	132	132		264	5	5		10	45.1
AI-P-01	Balintingan Reservoir Multipurpose Project (BRMP)	NIA/G. Trino		9,708	3,883	13,591		5	2	7	44.6
AI-P-08	Central Luzon Groundwater Irrigation Systems Reactivation Project	NIA		1,429		1,429		Less than 5			44.0
WQ-C-03	Capacity Development Project to Improve Industry Adoption of Cleaner Production Options	DTI/DENR/Private Industries		60		60		Less than 5			43.1
MP-C-01	Septage Treatment and Disposal Facility	MCWMC/LGUs/WDs/Private		255	255	510		5	5	10	42.9
AI-P-06	Irrigation Water Resources Augmentation Pump Establishment Project	NIA		130		130		Less than 5			40.0
AI-P-05	Procurement of Pumps, Drilling Rigs & Related Equipment	NIA		206		206		Less than 5			39.7
AI-P-09	Gumain Reservoir Project	NIA		1,716	12,013	13,729		1	7	8	38.1
FL-P-02	Bacolor Comprehensive Rehabilitation Master Plan	LGU			1,500	1,500				Less than 5	38.0
Total			30,287	33,582	21,630	85,499					

### Annex-T K.2.2.7 Implementation Schedule for Group-B Projects

Sector	Code	Name of Project	Implementing Agency	Short-term	Mid-term	Long-term
Agriculture/Irrigation and Fisheries	AI-P-07	Appropriate Irrigation Technologies for Enhanced Agricultural Production	NIA	■		
	AI-C-02	Introduction of Water Saving Irrigation Technology	NIA	■		
	AI-C-03	Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	NIA	■		
	AI-G-01	Balog-Balog Multipurpose Project Phase 1	NIA	■		
	AI-G-02	Along-along Creek Irrigation Project (UPRIIS Div3)	NIA	■		
	AI-G-10	Upper Tabuating SRIP	NIA	■		
	AI-G-07	Participatory Irrigation Development Project, APLI-Infrastructure Development	NIA	■		
	AI-P-10	Rehabilitation of AMRIS	NIA	■		
	AI-P-03	Sector Loan on Rehabilitation of Irrigation Facilities	NIA	■		
	AI-P-11	Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects, Small Diversion Dam Projects	DA Region III/LGUs	■		
	AI-P-02	Balog-Balog Multipurpose Project Phase 2	NIA	■		
	AI-P-04	Casecman Multi-purpose Irrigation & Power Project Irrigation Component Phase 2	NIA	■		
	AI-C-01	New Construction of Small Scale Irrigation Project under BSWM	BSWM/LGUs	■		
	AI-P-08	Central Luzon Groundwater Irrigation Systems Reactivation Project	NIA		■	
	AI-P-06	Irrigation Water Resources Augmentation Pump Establishment Project	NIA		■	
	AI-P-05	Procurement of Pumps, Drilling Rigs & Related Equipment	NIA		■	
AI-P-01	Balintong Reservoir Multipurpose Project (BRMP)	NIA/G. Trino		■	■	
AI-P-09	Gumain Reservoir Project	NIA		■	■	
Municipal Water Supply, Sanitation and Sewerage	MP-G-01	Cabanatuan Sewerage System	LGU	■		
	MP-G-02	Expansion of Clark Sewerage System	Clark Water	■		
	MP-C-01	Septage Treatment and Disposal Facility	LWUA/WDs/LGUs/Private WSPs		■	
Management of Flood and Sediment Disasters	FL-G-01	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part I	DPWH	■		
	FL-G-02	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part II	DPWH	■		
	FL-P-01	Flood Control Measures in Mt. Pinatubo Devastated Area- Focus on Pasac Delta	DPWH	■		
	FL-C-01	Flood Mitigation for Pampanga Delta	DPWH		■	
	FL-G-04	Flood Forecasting and Warning System Capacity Building Project upon Dam Release in the Philippines	PAGASA	■		
	FL-C-02	Community Based Flood Early Warning System for Provinces of Pampanga, Tarlac and N. Ecija	LGUs		■	
	FL-P-02	Bacolor Comprehensive Rehabilitation Master Plan	LGU			■
Watershed Management	WS-G-03	Integrated Agro-Forestry Development Program (CBFM-CARP)	DENR/RCBFMO/DAR	■		
	WS-G-11	Forestlands Management Project (FMP)	DENR-FASPO	■		
	WS-G-12	Pampanga River Basin Rehabilitation Project (PRBRP)	DENR-FRCD	■		
	WS-C-01	Upland Development Program (UDP)	DA/DENR/LGUs	■		
	WS-C-02	Protected Area Management Program (PAMP)	DENR-PAWZCMS	■		
	WS-C-03	Urban Greening Program	DENR/LGUs/Pvt. Sector	■		
WS-C-04	Community-based Eco-tourism Program	DOT/DENR/LGUs	■			
Water-related Environment Management	WQ-C-01	Capacity Development to Upgrade WQ Monitoring and Data Management Program	DENR-EMB	■		
	WQ-C-02	Capacity Development to Improve Water Quality and Aquaculture Fisheries Management	DA-BFAR	■		
	WQ-C-03	Capacity Development Project to Improve Industry Adoption of Cleaner Production Options	DTI/DENR/Private Industries		■	
Others	IS-C-01	Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin	NWRB/Others	■		
	IS-C-03	Enhancement of Monitoring System for Surface Water in Pampanga River	NWRB/Others	■		
	IS-C-04	Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution	NWRB/Others	■		

Annex-T K.2.2.8 (1/3) Development Scenarios and Relevant Projects (Group-B)

Sector	Development Scenario	Target Completion Period	Project		Implementing Agency	Cost (Million)			
						Short-term (2011-2015)	Mid-term (2016-2020)	Long-term (2021-2025)	Total (2011-2025)
Agriculture/Irrigation and Fisheries	<b>(1) Improvement of Irrigation Technologies</b>  The innovative irrigation technologies shall be developed and the capacity building on usage of the technologies shall be made so as to increase the irrigation efficiency and save the irrigation water by 2015.	Short-term	AI-P-07	Appropriate Irrigation Technologies for Enhanced Agricultural Production	NIA	654			654
			AI-C-02	Introduction of Water Saving Irrigation Technology	NIA	150			150
			AI-C-03	Improvement of Monitoring System and Capacity Development for Proper Water Management in NISs and CISs	NIA	150			150
	<b>(2) Short-term Development of Irrigation Systems</b>  The agricultural productivity shall be increased through the seven (7) irrigation development projects, which contribute to the beneficial area (newly developed) of 5,880ha, the beneficial area (rehabilitated) of 37,046 ha and beneficiaries of 56,640 farm-families in total, by 2015.	Short-term	AI-G-01	Balog-Balog Multipurpose Project Phase 1	NIA	236			236
			AI-G-02	Along-along Creek Irrigation Project (UPRIIS Div3)	NIA	25			25
			AI-G-10	Upper Tabuating SRIP	NIA	76			76
			AI-G-07	Participatory Irrigation Development Project, APLI-Infrastructure Development	NIA	41			41
			AI-P-10	Rehabilitation of AMRIS	NIA	983			983
			AI-P-03	Sector Loan on Rehabilitation of Irrigation Facilities	NIA	222			222
			AI-P-11	Construction of Priority Small Scale Irrigation Systems/Small Water Impounding Projects, Small Diversion Dam Projects	DA Region III/LGUs	169			169
	<b>(3) Mid-term Development of Irrigation Systems</b>  The agricultural projects shall be increased through the six (6) irrigation development projects, which contribute to the beneficial area (newly developed) of 58,443 ha, the beneficial area (rehabilitated) of 50,904 ha and the beneficiaries of 101,893 farm-families in total by 2020.	Short-term/Mid-term	AI-P-02	Balog-Balog Multipurpose Project Phase 2	NIA	8,942	7,153		16,095
			AI-P-04	Casecan Multi-purpose Irrigation & Power Project Irrigation Component Phase 2	NIA	5,000	2,000		7,000
			AI-C-01	New Construction of Small Scale Irrigation Project under BSWM	BSWM/LGUs	257	257		514
			AI-P-08	Central Luzon Groundwater Irrigation Systems Reactivation Project	NIA		1,429		1,429
			AI-P-06	Irrigation Water Resources Augmentation Pump Establishment Project	NIA		130		130
			AI-P-05	Procurement of Pumps, Drilling Rigs & Related Equipment	NIA		206		206
	<b>(4) Long-term Development of Irrigation Systems</b>  The agricultural projects shall be increased through the two (2) irrigation development projects, which contribute to the beneficial area (newly developed) of 31,100 ha and the beneficiaries of 9,152 farm-families in total by 2025.	Mid-term/Long-term	AI-P-01	Balinting Reservoir Multipurpose Project (BRMP)	NIA/G. Trino		9,708	3,883	13,591
			AI-P-09	Gumain Reservoir Project	NIA		1,716	12,013	13,729
<b>Total</b>						<b>16,905</b>	<b>22,599</b>	<b>15,896</b>	<b>55,400</b>
Municipal Water Supply, Sanitation and Sewerage	<b>(1) Development of Sewerage Systems</b>  The on-going development for the sewerage systems for Cabanatuan City in Nueva Ecija and Clark City in Tarlac shall be completed by 2015. Upon completion of the projects, about 12 % of the population in Cabanatuan City and 100% in Clark would be served by the public sewerage system.	Short-term	MP-G-01	Cabanatuan Sewerage System	LGU	189			189
			MP-G-02	Expansion of Clark Sewerage System	Clark Water	456			456
	<b>(2) Construction/Provision of Septage Treatment and Disposal Facilities</b>  The services of the septage treatment and disposal facilities shall be provided to about 80% of the urban area in the following ten cities/municipalities by 2025: (1) Angeles, (2) San Fernando, (3) Guagua and (4) Mabalacat, (5) Baliuag, (6) Calumpit, (7) Hagonoy and (8) Malolos, (9) Cabanatuan and (10) Tarlac.	Mid-term/Long-term	MP-C-01	Septage Treatment and Disposal Facility	LWUA/WDs/LGUs /Private WSPs		255	255	510
<b>Total</b>						<b>645</b>	<b>255</b>	<b>255</b>	<b>1,155</b>

**Annex-T K.2.2.8 (2/3) Development Scenarios and Relevant Projects (Group-B)**

Sector	Development Scenario	Target Completion Period	Project		Implementing Agency	Cost (Million)				
						Short-term (2011-2015)	Mid-term (2016-2020)	Long-term (2021-2025)	Total (2011-2025)	
Management of Flood and Sediment Disasters	<b>(1) Flood Mitigation for Pasac River Basin (Eastern Pinatubo Area)</b>  All on-going, proposed and conceptual flood mitigation projects for Pasac river basin shall be completed by 2015. Upon completion of the projects, the chronic flood damage in the area of about 57,300 ha would be mitigated, and about 309,000 people would be benefited.	Short-term	FL-G-01	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part I	DPWH	470			470	
			FL-G-02	Pinatubo Hazard Urgent Project (PHUMP) Phase III Part II	DPWH	5			5	
			FL-P-01	Flood Control Measures in Mt. Pinatubo Devastated Area- Focus on Pasac Delta	DPWH	4,320			4,320	
	<b>(2) Flood Mitigation for Pampanga Delta</b>  The flood mitigation plan for Pampanga Delta shall be completed by 2020. Upon completion of the projects, the chronic flood damage in Pampanga Delta of about 32,400 ha would be mitigated, and about 175,000 people would be benefited.	Short-term and Mid-term	FL-C-01	Flood Mitigation for Pampanga Delta	DPWH	100	5,368		5,468	
	<b>(3) Capacity Building on the Appropriate Dam Reservoir Operation against Flood</b>  The capacity building on the appropriate reservoir operation against flood for Pantabangan Dam and Angat Dam shall be made through the technical cooperation by JICA by 2015.	Short-term	FL-G-04	Flood Forecasting and Warning System Capacity Building Project upon Dam Release in the Philippines	PAGASA	300			300	
	<b>(4) Establishment of Community-based Flood Forecasting and Warning System for Provinces of Pampanga, Tarlac and Nueva Ecija</b> Succeeding to Bulacan Province, Pampanga, Tarlac and Nueva Ecija shall be provided with the community-based flood forecasting and warning system by 2015.	Short-term	FL-C-02	Community Based Flood Early Warning System for Provinces of Pampanga, Tarlac and N. Ecija	LGUs	8			8	
	<b>(5) Flood Mitigation for Bacolor Municipality</b>  The current potential flood damage in Bacolor Municipality shall be reduced through river channel improvement of Gugu River, drainage improvement by 2025.	Long-term	FL-P-02	Bacolor Comprehensive Rehabilitation Master Plan	LGU			1,500	1,500	
<b>Total</b>						<b>5,203</b>	<b>5,368</b>	<b>1,500</b>	<b>12,071</b>	
Watershed Management	<b>(1) Strengthening of the On-going Reforestation Efforts</b>  The seven (7) special projects shall be implemented in order to strengthen the on-going reforestation efforts. The target outcomes by the special projects are as below:  (a) The forest cover shall expand by 39,900has. at the rate of 2,660has./yr by 2025 through implementation of WS-G-03, WS-G-11, WS-G-12, WS-C-01, WS-C-02 and WS-C-04.  (b) Agro-forestry cover shall expand by 21,500has. at the rate of 1,430has./yr through implementation of WS-G-11, WS-G-12 and WS-C-01. The expansion of agro-forestry could enhance access to the livelihood and economic opportunities for upland occupants, particularly the indigenous communities.  (c) The degraded and severely eroded uplands/untended watersheds of 10,500has. in particular shall be restored through implementation of WS-C-01.  (d) Urban greening (WS-C-03) shall cover 7,300has. of open spaces and 222 linear km of roads and riverbanks.  (e) The objective forest protection area of 56,100has. under WS-C-02 shall be officially included into the NIPAS areas and provided with the formal management in order to conserve the biodiversity in critical habitats and natural ecosystems.  (f) The facilities and services for eco-tourism to the natural integrated protected areas and/or the critical habitats in the study area shall be improved through WS-C-04 so as to increase the income levels for the communities and to enhance the present natural conditions of the important habitats and ecosystems in these areas.	Whole Period	WS-G-03	Integrated Agro-Forestry Development Program (CBFM-CARP)	DENR/RCBFMO/DAR	31			31	
			WS-G-11	Forestlands Management Project (FMP)	DENR-FASPO	498	498		996	
			WS-G-12	Pampanga River Basin Rehabilitation Project (PRBRP)	DENR-FRCD	12			12	
			WS-C-01	Upland Development Program (UDP)	DA/DENR/LGUs	490	490		980	
			WS-C-02	Protected Area Management Program (PAMP)	DENR-PAWZCMS	202	202		404	
			WS-C-03	Urban Greening Program	DENR/LGUs/Pvt. Sector	88	88	88	264	
			WS-C-04	Community-based Eco-tourism Program	DOT/DENR/LGUs	132	132		264	
<b>Total</b>						<b>1,453</b>	<b>1,410</b>	<b>88</b>	<b>2,951</b>	

KT-14

Annex-T K.2.2.8 (3/3) Development Scenarios and Relevant Projects (Group-B)

Sector	Development Scenario	Target Completion Period	Project		Implementing Agency	Cost (Million)			
						Short-term (2011-2015)	Mid-term (2016-2020)	Long-term (2021-2025)	Total (2011-2025)
Water-related Environment Management	(1) <b>Improvement of Monitoring and Processing System for the Water Quality Data</b>  DENR shall improve the monitoring and processing system for the water quality data taking the following measures: (a) Rationalize water quality monitoring and pollution regulatory compliance, (b) Compile inventory of pollution sources, (c) Upgrade management capability of DENR Staffs and other stakeholders and (d) Upgrade the data management system	Short-term	WQ-C-01	Capacity Development to Upgrade WQ Monitoring and Data Management Program	DENR-EMB	140			140
	(2) <b>Capacity Development to Reduce Pollution Load</b>  The capability of fishpond operators and non-compliant industries will be improved over the mid-term towards adopting cleaner production options in order to reduce their impacts on water quality.	Short-term and Mid-term	WQ-C-02	Capacity Development to Improve Water Quality and Aquaculture Fisheries Management	DA-BFAR	48			48
			WQ-C-03	Capacity Development Project to Improve Industry Adoption of Cleaner Production Options	DTI/DENR/Private Industries		60		60
<b>Total</b>						<b>188</b>	<b>60</b>	<b>0</b>	<b>248</b>
Others	(1) <b>Enhancement of Monitoring of Groundwater and Surface Water</b>  The monitoring of the groundwater and surface water shall be enhanced in order to apprehend the actual status of the water resources in Pampanga river basin	Whole Terms	IS-C-01	Establishment of Comprehensive Groundwater Monitoring in Pampanga River Basin	NWRB/Others	99	99	99	297
			IS-C-03	Enhancement of Monitoring System for Surface Water in Pampanga River	NWRB/Others	10			10
	(2) <b>Capacity Development on Water Allocation and Distribution</b>  The appropriate methodologies on the water allocation and distribution for municipal water use, irrigation, hydropower generation and other various water uses shall be introduced to NWRB and other relevant agencies	Short-term	IS-C-04	Capacity Development of NWRB and Relevant Agencies on Water Allocation and Distribution	NWRB/Others	300			300
<b>Total</b>						<b>409</b>	<b>99</b>	<b>99</b>	<b>607</b>
<b>Grand Total</b>						<b>24,803</b>	<b>29,791</b>	<b>17,838</b>	<b>72,432</b>



***Sector L***

***Legal and Institutional Framework***





# Sector L. Legal and Institutional Framework

## Table of Contents

	<u>Pages</u>
<b>L.1 Present Institutional-Setup for Water Resources Management .....</b>	<b>L-1</b>
L.1.1 Present Legal Framework .....	L-1
L .1.1.1 Background of National and Regional Administration .....	L-1
L .1.1.2 Hierarchy of Law.....	L-1
L .1.1.3 National Policies and Laws .....	L-2
L .1.1.4 Legal Frameworks for Policy, Planning, Approval, Implementation, and Monitoring of Water-related Projects .....	L-3
L.1.2 Present Institutional-Setup .....	L-5
L .1.2.1 National Government Agencies.....	L-5
L .1.2.2 Functional Relationship among National and Local Governments .....	L-5
L .1.2.3 Institutional Structure by Sector .....	L-6
L .1.2.4 Institutional Framework for the Study Area .....	L-8
L.1.3 Present Framework of Water Resources Management .....	L-9
L .1.3.1 The Constitution and Water Code.....	L-9
L .1.3.2 Regulation of Water Resources Allocation.....	L-11
L .1.3.3 Water Use Regulation during Draught .....	L-13
L .1.3.4 Water Resources Planning and Assessment.....	L-14
L .1.3.5 Strengthening of NWRB and Water Code by EO 123.....	L-15
L .1.3.6 Present Status of IWRM and River Basin Organization.....	L-17
<b>L.2 Problems and Issues on IWRM Institution .....</b>	<b>L-20</b>
L.2.1 Mission of IWRM .....	L-20
L .2.1.1 Issues .....	L-20
L .2.1.2 Historical Background of IWRM .....	L-20
L .2.1.3 Mission of IWRM.....	L-20
L.2.2 Functions of RBOs.....	L-21
L .2.2.1 Issues .....	L-21
L .2.2.2 Type of RBOs .....	L-21
L .2.2.3 Functions of RBOs in Philippines and Other Countries .....	L-22
L.2.3 Gap Analysis and Strategic Issues .....	L-24
L .2.3.1 Gap Analysis.....	L-24
L .2.3.2 Definition of Strategic Issues .....	L-25
<b>L.3 Proposed Institutional-Setup for IWRM.....</b>	<b>L-30</b>
L.3.1 Study Framework.....	L-30
L.3.2 Strategic Issues and Key Actions .....	L-30
L .3.2.1 Basic Aspects of Actions .....	L-30
L .3.2.2 Proposed Key Actions .....	L-31
L.3.3 Amendment of Related Laws, Rules and Guidelines .....	L-36
L .3.3.1 Constitution, Water Code, Civil Code and Local Government Code .....	L-36
L .3.3.2 Improvement of Water Code and Other Related Laws, Rule and Guidelines.....	L-37
L.3.4 Capacity Improvement of Organizations .....	L-39

L .3.4.1	Capacity Assessment of Existing Line Agencies and LGUs .....	L-40
L .3.4.2	Key Actions to Strengthen NGAs/RLAs and LGUs.....	L-42
L .3.4.3	Capacity Building of Missing Functions for IWRM .....	L-42
L .3.4.4	Design of River Basin Committee.....	L-44
L.3.5	Strengthening of Financial Capacity for Sustainable IWRM.....	L-48
L .3.5.1	Key Actions to Strengthen Financial Capacity .....	L-48
L .3.5.2	Fund Sources for Sustainable IWRM.....	L-48

## **List of Tables**

### **List of Tables in Report**

Table L. 1.1.1	Hierarchy of Laws and Regulations in Philippines.....	L-2
Table L. 1.3.1	Existing and Planned River Basin Management Organizations .....	L-18
Table L. 2.2.1	Type of RBOs .....	L-22
Table L. 2.2.2	Type of River Basin Organization in Philippines and Other Countries .....	L-22
Table L. 2.2.3	Key Functions of Typical Existing and Proposed River Basin Organization .....	L-23
Table L. 2.3.1	Key IWRM Functions and Strategic Issues .....	L-25
Table L.3.2.1	Strategic Issues and Aspects of Actions.....	L-31
Table L.3.4.1	Countermeasures and Corresponding NGAs/RLAs and LGUs for Empowerment.....	L-42
Table L.3.4.2	Advantages and Disadvantages of three RBO options .....	L-43
Table L.3.4.3	Allocation of Operation Cost of RBC.....	L-47
Table L.3.4.4	Role of NGAs/RLAs and LGUs for Monitoring System.....	L-48

### **List of Annex Tables**

Annex-T L.1.1.1	Water Sector Laws and Policies.....	LT-1
Annex-T L.1.2.1	Mandate of Key Government Agencies in Water Resources Management.....	LT-3
Annex-T L.1.2.2	Key Water Supply Sector Agencies: Delineated Roles and Responsibilities.....	LT-6
Annex-T L.1.2.3	Institutional Structure of Water Supply and Sanitation.....	LT-7
Annex-T L.1.2.4	Institutional Structure of National Government Agencies in Flood Mitigation .....	LT-8
Annex-T L.1.2.5	Institutional Structure of Watershed and Forest Management (Draft) .....	LT-9
Annex-T L.1.3.1	NWRB 2005 Fees and Charges .....	LT-10
Annex-T L.3.3.1	Key Actions to Improve Water Code and Related Rules and Guidelines .....	LT-12
Annex-T L.3.3.2	Key Actions to Introduce Specific Multipurpose Dam Law.....	LT-13
Annex-T L.3.4.4	Key Actions to Strengthen Line Agencies and LGUs.....	LT-14
Annex-T L.3.5.1	Key Actions to Strengthen Financial Capacity for Sustainable IWRM.....	LT-14

## List of Figures

### List of Figures in Report

Figure L. 2.1.1	Mission of Water Resources Management .....	L-21
Figure L. 2.3.1	Approach for Defining Strategic Issues .....	L-24
Figure L. 3.1.1	Role of Institutional-Setup .....	L-30
Figure L. 3.2.1	Empowerment Elements for Basic Aspects .....	L-31
Figure L. 3.4.1	Organizational Structure of River Basin Committee .....	L-45

### List of Annex Figures

Annex-F L.1.2.1	Functional Chart of Water Related Agencies in the Philippines .....	LF-1
Annex-F L.1.2.2	Functional Relationship among Central Government Agencies and Local Governments.....	LF-2
Annex-F L.1.2.3	Organizational Chart of Province of Pampanga .....	LF-3
Annex-F L.1.3.1	Flowchart for Processing of Water Permit Application .....	LF-4
Annex-F L.1.3.2	Organization Chart of Present NWRB as of March 2009 Source: NWRB .....	LF-5
Annex-F L.1.3.3	NWRB's Proposed Organizational Structure as of March 2009.....	LF-6
Annex-F L.1.3.4	Logical Framework for NWRB .....	LF-7
Annex-F L.1.3.5	NWRB's Proposed Organizational Structure, September 2010 .....	LF-8
Annex-F L.2.2.1	General Relationship of State Water Resource Plans to the Basin Plan for the Murray-Darling River.....	LF-9
Annex-F L.2.2.2	Objective, Mission and Activities of Japan Water Agency .....	LF-10
Annex-F L.3.4.1	Organization Structure of Regional Development Council of Region III .....	LF-11
Annex-F L.3.4.2	RBO under of RBCO and Satellite RBCO, Manila Bay Site Coordination Committee.....	LF-12
Annex-F L.3.4.3	Proposed creation of a Committee on River Basins under the Regional Development Council (RDC) III.....	LF-13
Annex-F L.3.4.4	Independent Pampanga River Basin Council .....	LF-14
Annex-F L.3.4.5	Position of NWRB for Water Rights Regulation among RBCO and RBO .....	LF-15

### List of Appendix

Appendix L-1	Related Articles of CHAPTER III APPROPRIATION OF WATERS, Water Code of the Philippines (1966)
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## **Sector L. Legal and Institutional Framework**

### **L.1 Present Institutional-Setup for Water Resources Management**

#### **L.1.1 Present Legal Framework**

##### **L .1.1.1 Background of National and Regional Administration**

The administration of the Philippines is divided in three levels of governance: namely, national, regional and local governments. The nation has been divided into 17 administrative Regions based on their geographical locations: namely, Regions I to XII, NCR, CAR, ARMM, CARAGA and Autonomous Region of Muslim Mindanao. NCR covers Metro Manila.

The local governments are classified into three hierarchies; namely, province, city/municipality and barangay. Province is composed of city, municipalities and barangays. Provinces, city, municipalities and barangays have respective council (Sanggunian) for their own legislation. Region is the national administrative division for regional administration and coordination among multiple provinces.

The Local Government Code (LGC) enacted in 1991 essentially re-defined the role, relationship and linkages of national, provincial, city/municipal and barangay institutions in provisions of basic services, infrastructures and utilities. The new direction mandated the Local Government Units (LGUs) to play a larger role in planning and implementing local infrastructures and utilities in particular water supply and sanitation. This raised significant institutional capacity and resource allocation issues.

The LGUs are subdivided into 81 provinces, 136 cities, 1,495 municipalities and 42,008 barangays as of December 31, 2008. The LGUs are grouped into seventeen (17) regions. The Department of Interior and Local Government (DILG) exercises general supervision in the provinces and cities of 16 regions. The Autonomous Region of Muslim Mindanao is not part of the general supervision function of DILG.

The main national government agencies establish respective regional and provincial offices for regulating own responsible sector among provinces and municipalities, allocation of national budget, implementation of national projects, etc.

##### **L .1.1.2 Hierarchy of Law**

The hierarchy of the laws enacted by the National Government of the Philippines is shown in Table L.1.1.1 (5.1.1). The Constitution and the Republic Act (RA) are enacted by the Congress while the Executive Order (EO) is promulgated by the President. The Presidential Decree (PD) was promulgated by the President during the martial law period, 1972-1986. The Administrative Order (AO) and the memorandum circular (MC) are issued by the secretary of a department and the head of agencies or offices respectively.

Provincial ordinance is enacted by the provincial council, while provincial governors, municipal and city mayors have authority to issues local administrative order.

The executive order, administrative order, memorandum circular and local administrative orders could be cancelled if the national or local administration changed. Legislative actions of Congress predominate over the executive actions or decision of the Office of the President. The government administrators and managers in the Philippines tend to consider that the institution and organizations established by laws (Republic Act and Presidential Decree) are sustainable, but those established by Executive Orders and Administrative Orders are tentative and tend to be abolished or not functioning after change of the administration.

**Table L. 1.1.1 Hierarchy of Laws and Regulations in Philippines**

Hierarchy	Enactment	Example
<b>I. National Laws and Regulations</b>		
(1) Constitution	Congress	-The Philippine Constitution (1987 new)
(2) Republic Act 1946-1972, 1987-present	Congress	-The Water Code of the Philippines-1776 (Common Wealth Act No.146) -The Civil Code of the Philippines (RA No. 386-1949)
(3) Presidential Decree 1972-1986 period	President	-Water Code (PD No. 1067-1976) as amended
(4) Executive Order 1987-present	President	EO 123-2002
(5) Administrative Order	Department Secretary	-DENR Administrative Order No. 2005-10 Implementation Rules and Regulations of the Clean Water Act
(6) Memorandum Circular	Head of Agency/Office	-NWRB Resolution No.010-0305-2005 -NIA: MC17S78 Clarification on the ...
(7) Others, Guidelines	Head of Agency	-Implementing Rules and Regulations, the Amended of the Water Code-1979 (March 2005), Guideline by NWRB
<b>II Laws and Regulations for Local Governments</b>		
(1) Provincial Ordinance	Provincial Council (Sanggunian Panlalawigan)	Provincial Revenue Code of Bulacan (Bulacan PO No. C-003, 2004)
(2) City/Municipal/ Barangay-Resolution/ Regulation	City/Municipal/Barangay-Council (Sanggunian Panlungsod/ Sanggunian Bayan/ Sanggunian Barangay)	
(3) Local Administrative Order	Governor (Province), Mayor (City/ Municipality), Punong barangay	

Note: Refer to the legislative body of Barangay/Municipal/City/Province in SEC.390,445,457,467 of LGC; Philippine Commonwealth 1935-1946; Modified Parliamentary Republic 1978-1985; Republic under martial law 1972-1986; Republic 1987-present

Source: JICA Study Team

### **L .1.1.3 National Policies and Laws**

Transformation of the national policies for water supply, water resources management, decentralization, privatization, environmental protection and rationalization, and corresponding main laws and orders in the water resources sector from 1970s are summarized in Annex-T L.1.1.1.

#### **(1) Water Supply and Water Resources Management Policy**

The main three legislations defining the institutional setup of the water supply sector were enacted in 1970s. Those are Republic Act No. 6234-1971 created Metropolitan Waterworks and Sewerage System (MWSS) for water supply in Metro Manila, Provincial Water Utilities Act-1973 authorized formation of local water districts in provincial centers outside Metro Manila, and the Water Code of the Philippines-1976 established the framework for water resources management. The Public Service Law, Presidential Decree No. 1206-1977 mandated National Water Resources Board (NWRB) to supervise water utilities including the regulation of water tariff except those under MWSS and Local Water Utility Administration (LWUA).

#### **(2) Decentralization Policy**

The Local Government Code-1991 transferred responsibility for public services to local governments in their areas. Local governments at all levels (provinces, city/municipalities and barangays) were made responsible for basic service delivery. Pursuant to this Code the LGUs shall endeavor to be self-reliant and shall continue exercising the power and discharging the duties and functions currently vested upon them.

**(3) Privatization Policy of Infrastructures**

Privatization of infrastructure was initiated for electric-power projects by the first legal framework, Executive Order No. 215-1987. The former BOT Law, RA No. 6959-1990 sought to enable the framework for private sector participation in infrastructure development including water supply. The Republic Act No. 7718-1994 (present BOT Law) amended RA No. 6959-1990 more flexible to implement roads, airports, water, information technology, etc. allowing nine type of scheme.

National Water Crisis Act-1995 provided the government with special powers to recognize sector agencies and pursue private sector participation. This act facilitated the privatization of water supply and sanitation in Metro Manila.

**(4) Environmental Policy**

Presidential Decree 1152-1977, the Philippine Environmental Code established the standards for air and water quality, and guidelines for land use management, natural resources, groundwater, and waste management. The Philippines Environmental Impact Statement (EIS) System was established by Presidential Decree No. 1586-1979. The Philippine Clean Water Act-2004 defines the policies for pursuing economic growth within the framework of sustainable development in the aspect of water quality management of all water bodies. The Department of Environment and Natural Resource (DENR) is responsible for the execution of these laws.

**(5) Rationalization Policy of Governments**

Rationalization of government agencies stem from the Public Service Law, PD No.1206-1977. The Administrative Code-1987 vested the President with residual powers to reorganize the Executive Branches of the governments. NWRB has been being restructured through Executive Order No. 123-2002, and been entrusted with responsibility for regulation of water service providers in water districts. Executive Order No. 366-2004 directed all department secretaries to conduct strategic review of the operations of the executive branches. Implementation of EO 123 has not yet finalized. Executive Order No. 279-2004 outlined substantial reforms in the financing of the water supply sector, particularly with regard to the role of LWUA on providing finance to water districts, by pursuing more actively water districts and other water providers to the private capital market.

The Department of Budget and Management (DBM) has approved the Rationalization Plan of seven government agencies. The seven agencies include the Office of President, the Office of the Vice President, the Department and Labor and Employment, DBM, Department of Science and Technology, Department of Tourism, and the Civil Service Commission. Applications of the rest of agencies are still pending at DBM for approval as of June 2009.

Since 1995 successive governments have pursued their policy objectives through executive orders issued by the president rather than laws passed by the Congress.

**L .1.1.4 Legal Frameworks for Policy, Planning, Approval, Implementation, and Monitoring of Water-related Projects**

**(1) Background**

Mandate and responsibility of National Governments and sectoral agencies are governed by laws and regulations in the Philippines, but authority and responsibility for sector policymaking, planning, regulation, implementation and monitoring of projects are severely fragmented, spread across different government tiers and various national government agencies<sup>1</sup>. Fragmentation might be partly induced by the three policies of privatization, decentralization and rationalization.

**(2) NEDA as the Highest Social and Development Planning and Policy Coordination Body**

The National Economic Development Authority (NEDA) is the country's highest social and development planning and policy coordination body. In performance of its function, the

NEDA Board is assisted by five Cabinet-level agency committees: namely, Development Budget Coordination Committee (DBCC), Infrastructure Committee (INFRACOM), Investment Coordination Committee (ICC), Social Development Committee (SDC), and Committee on Tariff and Related Matters (CTRM). The NEDA Secretariat serves as the technical secretariat to all these committees, except for the DBCC, which is served by the DBM.

The NEDA defines the institutional roles and responsibilities of sector agencies; sets broad coverage targets for the country; and defines broad policies, particularly regarding access of low-income groups to service, cost recovery to sustainability, incentive to improve operational efficiency, and mechanism for private sector improvement. Allocation of the national funds is determined by Department of Budget and Management (DBM). The Department of Finance (DOF), for its part, sets and implements policies on the use of grants and guarantees from the national government and official development assistance (ODA). The projects of which budget exceed Peso 500 millions are subject to review and approval by NEDA.

**(3) National Sector Policies, Planning and Implementation, and Local Government**

Key national government agencies are responsible for sector policy, planning, implementing and monitoring of national projects, and regulatory function specific to their jurisdiction. Each department issues Department Order for authorities of officials of respective department for planning, approval, implementation and monitoring of projects under its responsible sector.

Local Governments at all administrative levels retain de facto responsibilities of public utilities including water supply and sanitation for policy, planning, and regulatory functions specific to their jurisdictions, through respective Local Government Unit (LGU). This includes choosing financing and management options, deciding on tariffs, providing investment and funding support, and setting performance standards.

The Regional Development Council (RDC) regulates and approves inter-provincial and government loan projects. The NEDA requires endorsement for implementation from the concerned all provinces for the RDC's approval. The secretariat of RDC is NEDA.

**(4) Allocation of Sector Roles between National Government and Local Governments**

The present Implementing Rules and Regulations (IRR) of the national and local governments were prepared reflecting the new sector role of the LGUs based on Local Government Code-1991 (LGC-1991). The basic services and facilities vested in the LGUs are listed for Barangay, Municipality, Province and City respectively in SEC.17, CHAPTER I of the LGC-1991.

**(a) Basic Services and Facilities Vested in LGUs**

Those basic services and facilities in water-related sector include, but not limited to, the following:

**For a Barangay** -Services and facilities related to general hygiene and sanitation, and maintenance of water supply systems;

**For a Municipality** -Extension and on-site research and facilities related to agriculture and fishery activities, inter-barangay irrigation systems, water and soil resources utilization and conservation projects, and enforcement of fishery laws in municipal waters including conservation of mangroves; Implementation of community-based forestry projects including integrated social forestry programs subject to supervision, control and review of DENR, and management and control of communal forests; Services and facilities related to general hygiene and sanitation; and Communal irrigation, small water impounding projects, artesian wells, spring development, rain water collections and water supply systems, sea walls, dikes, drainage and sewerage, and flood control;

**For a Province** -Assistance in organization of farmers and fisherman's cooperatives and



other collective organizations, and transfer of appropriate technology; and Inter-municipal water-works, drainage and sewerage, flood control, irrigation systems and reclamation projects; and

**For a City** -All the services and facilities of the municipalities and provinces.

**(b) Public Works and Infrastructures Vested in National Government**

National agencies or offices concerned should have devolved to LGUs the responsibility for the provision of basic services and facilities enumerated in SEC.17 of LGC. Regional offices of national agencies or offices whose functions were devolved to LGUs should also have been phased out. However, sector projects have been still led generally by national agencies in coordination with LGUs due to limitation of funds and resources of LGUs.

Notwithstanding the provision of subsection (b) of SEC.17 of LGC the public works and infrastructure projects and other facilities, programs and services funded by the National Government Appropriation Act, other special laws, pertinent executive orders, and those wholly or partially funded from foreign sources, are not covered under SEC.17, except in those cases where the LGU concerned is duly designated as the implementing agency for such projects, facilities, programs, and services.

**L.1.2 Present Institutional-Setup**

**L .1.2.1 National Government Agencies**

The key national government agencies involved in the water resources management are Office of the President (OP), the National Economic Development Authority (NEDA), National Water Resources Board (NWRB), Department of Public Works and Highways (DPWH), Department of Agriculture (DA), Department of Energy (DE), Department of Environment and Natural Resources (DENR), Department of Finance (DOF), Department of Interior and Local Government (DILG), and Department of Health (DOH). The mandates of the key government agencies in water resources management are summarized in Annex-T L.1.2.1.

The National Water Resources Board (NWRB) and National Commission on Indigenous People (NCIP), Metropolitan Water Works and Sewerage System (MWSS), National Irrigation Administration (NIA), National Power Corporation (NPCOR/NPC), Environmental Management Bureau (EMB), and Local Water Utilities Administration (LWUA) are regulatory and/or implementation agencies under OP, DPWH, DA, DE, DENR and DOH respectively.

The mandates of these national agencies and line and staff bureaus are mutually correlated. The functional chart of the water-related national agencies over 30 in the Philippines is illustrated in Annex-F L.1.2.1. The functional relationship with the local governments is presented in subsection L.1.2.2 of this report. Detailed functions of these agencies with respective responsible sector are presented in subsection L.1.2.3. The mandate and organization structure of NWRB are presented in subsection L.1.3.2 (1) and subsection L.1.3.5 (1) respectively.

**L .1.2.2 Functional Relationship among National and Local Governments**

Part of the roles and authorities of the national government agencies were transferred to the local governments based on LGC-1991(refer to subsection L.1.1.4 (4)). Under decentralization and rationalization policies, the present institutional arrangements for the functional relationships among the national government agencies and local governments are still in transition. The roles of the national government and local governments have not been unified, and those vary depending on the sector policy and prevailing conditions. Annex-F L.1.2.2 illustrates the present functional relationships among the water related national government agencies and local governments. The illustrated relation is still progressive as of June 2009, and it is subject to clarification among the agencies concerned.

### **L .1.2.3 Institutional Structure by Sector**

This section deals with further allocation of the responsibility and authority of the national government agencies and the local governments focusing on the key water-related sectors and subjects (refer to Annex-F L.1.2.2).

#### **(1) Water Supply and Sanitation**

The delineated roles and responsibilities of the key agencies of water supply sector are summarized in Annex-T L.1.2.2. Annex-T L.1.2.3 illustrates the institutional structure of domestic and municipal water supply and sanitation among national government agencies and local governments.

The NWRB, Metropolitan Water Works and Sewerage System (MWSS), Local Water Utilities Administration (LWUA) and LGUs are regulatory agencies for water supply. The NWRB regulates water service providers including some LGU managed water utilities in terms of water supply tariff and coverage and services. The water supply and sanitation services to cities and municipalities of Metro Manila are regulated by MWSS. The services are currently provided by two private concessionaires, Manila Water Company, Inc. (MWCI) and Maynilad Water Services, Inc. (MWSI).

NEDA Resolution No.4 (series of 1994) allows LGUs to implement all levels of water supply projects and redefines the role of other sector agencies.

The LWUA regulates urban water supply except the Metro Manila. The Department of Interior and Local Government (DILG) regulates and implements rural water supply. The LWUA and the Water Supply and Sanitation Project Management Office (WSSPMO) of DILG, through their respective funding activities, define and enforce specific quality and performance standards of service for water districts and LGU-managed systems, respectively. They also assist water and sanitation service providers through capacity building and technical assistance.

Services by LWUA initially implemented the Level III water supply projects which were financially viable. LWUA's support, in particular, extends beyond technical assistance to actual improvement in execution of individual water district projects and governance of Water Districts.

The WSSPMO plays a critical role in the rural water supply sector due to their area management role in local territories. It participates in general administration and institutional building, such as assistance to LGUs in the formation of rural and/or barangay water works and sanitation associations and identification of water supply systems.

The DPWH, together with DILG and DOH provided initially technical assistance to LGUs in planning, implementation and operation and maintenance of water supply facilities limiting to the period of two years.

Under the 2004-2010 Medium Term Philippine Development Plan (MTPDP), the National Anti-Poverty Commission Water Supply Coordination Office (NAPC-WASCO) was created as the national coordinating unit for the implementation of the President's Priority Program of Water (P3W). This program gives special attention to "waterless" LGUs nationwide.

NEDA resolution No.5 reaffirms the principle of provision of sewerage and sanitation services on the basis of willingness-to-pay. The resolution mandates the establishment of a Central project Support Office (CPSO) at LWUA to assist LGUs in the formulation, preparation and implementation of sewerage and sanitation projects.

EO 279 (February 2004) instituted reforms in the financing policies for the water supply and sewage sector and water service providers; rationalizing the LWUA's organizational structure and transferring it to the office of the President. EO 387 (November 2004) transferred LWUA from the office of the president to DPWH. EO 421 (April 2005) refocused LWUA's functions

and organizational structures as envisaged in EO 279. EO 738 (July 2008) transferred LWUA from DPWH to DOH.

**(2) Irrigation**

There are three types of irrigation systems in the Philippines; national, communal and private. Under the jurisdiction of Department of Agriculture (DA), the functions of National Irrigation Administration (NIA), created initially by RA 3601-1963, were broadened under Presidential Decree Nos. 552-1974 and 1702-1980, both amendments to RA-3601. NIA undertakes program-oriented and comprehensive water resources projects for irrigation purposes as well as concomitant activities such as flood control, drainage, land reclamation, hydropower development, watershed management, etc. except private irrigation systems. Communal irrigation systems were devolved to LGUs based on Irrigation Management Transfer (IMT) started in 2009 and the LGC-1991. Private irrigation systems are composed of plantations operated by companies and small private irrigation systems.

In irrigation sector NIA plays a main role of implementation, operation and maintenance of the nation's irrigation systems in collaboration with local governments except private irrigation systems. The IMT is planned to be completed in 5 years under the NIA's rationalization plan approved in 2008. The National Irrigation System Offices (NISOs) and the Provincial Irrigation Offices (PIOs) have been merged within a province or a cluster of 2-4 provinces as the Irrigation Management Offices (IMOs) in order to strengthen financial viability of National Irrigation Systems (NISs). IMOs are managed by Regional Irrigation Offices (RIOs) under NIA.

NIA issued several manuals for design, operation and maintenance: for example, Design Manual for Diversion Dams (1987 under process), Design Manual for Canals and Canal Structures (under process), General Operation & Maintenance Manual (Final Report January 1991).

**(3) Flood Control**

Flood control requires a river basin approach participated with multiple government agencies. Annex-T L.1.2.4 illustrates the institutional structure of national government agencies in flood control. The DPWH has played a main role in flood control and oversees its national and regional projects.

The projects under DPWH have been executed at present based on Department Order No. 24, Series of 2007, Amended Omnibus Levels of Authorities of Officials of DPWH. The levels of authorities delegated are 11 groups based on the DPWH project cycle and functions and services of other offices. Those levels are planning, environment and social aspects, design, land acquisition and infrastructure right-of-way, procurement, contract management, infrastructure maintenance, quality control, human resources, financial resources, and equipment and property (other than real estate).

PMO-Major Flood Control Projects (PMO-MFCP) manages the planning, design, construction, and operation and maintenance of major flood control projects of the nation. PMO-MFCP transfers the role of operation and maintenance of river and flood control facilities of selected river basins to Regional Offices of DPWH such as the Agno-PMO Flood Control Office after construction. Some provincial governments contribute to a part of operation and maintenance based on the memorandum between DPWH and the LGU concerned by arrangement of NEDA depending on the prevailing local conditions.

The Flood Control and Sabo Engineering Center (FCSEC) under DPWH takes charge of planning of flood control and sabo works.

DPWH issued a series of technical guidelines and standards: for example, Design Guidelines, Criteria and Standards for Public Works and Highways in 4 volumes (1987 called Red Book), DPWH Standard Specifications for Public Works Structures (1995), Technical Standards and Guidelines for Planning and Design (draft March 2002), Manual on Construction Supervision

of Flood Control Project (December 2004), Manual on Maintenance of Flood Control and Drainage Structures (April 2005). Upgrading of the Red Book is in process.

**(4) Watershed Management**

Pursuant to Executive Order No. 192 (10 June 2007), the DENR is the primary government agency responsible for the conservation, management, development and proper use of the environment and natural resources, including forests and watershed areas. The Forest Management Bureau (FMB) under DENR formulates and recommends policies and/or programs for the effective protection, development, occupancy, management and conservation of forest lands and watershed.

Annex-T 1.2.5 illustrates the regulatory functions and corresponding responsible national government agencies and LGUs in watershed and forest management. NIA, NPC, PNOC (the Philippine National Oil Company) MWSS and the WDs are guided by DENR policies and collaborate with the latter to protect and preserve the watershed areas in their respective areas of responsibility. There are inter-agency agreements by and among them to combine their efforts and resources in maintaining and promoting environmentally sound watershed areas. Community involvement is also encouraged by enlisting people participation in undertakings and development projects on watershed areas, and safeguarding them.

On the other hand, the Bureau of Soils and Water Management (BSWM) under the Department of Agriculture (DA) remains responsible for the assessment, development and preservation of existing and potential soil and water resources for agriculture.

The LGUs also can perform watershed management functions but are subject to supervision and control of DENR based on the Local Government Code. Province and municipalities implement the community-based forest management, social forestry, and watershed project, with discretion of LGU executives.

**(5) Water Quality**

The Clean Water Act (CWA), RA No. 9275-2004 enacts comprehensive water quality management in all water bodies and in the control and abatement of pollution from the land-based sources. The water quality standards and regulations are being enforced irrespective of sources of pollution. The act provides, among others, that DENR in coordination with NWRB shall designate certain areas as water quality management areas using appropriate physiographic units such as watersheds, river basins or water resources regions. The implementing rules and regulations (IRR) of CWA-2004 was promulgated pursuant to Section 32 of CWA-2004 and EO 192-1987, DENR Charter.

**(6) Large Dam**

Most of the large dams were planned and constructed by NPC and NIA. However, no unified nationwide planning and design standard for dam and its appurtenant structures were established yet. NPC customarily applied the USBR standards and manuals to dams.

**L .1.2.4 Institutional Framework for the Study Area**

There are no specific institutional and legal arrangements in the study area with respect to water-related sector planning and implementation, and IWRM. The legal framework for policy, planning, approval, implementation of water-related projects, and the regulatory framework of water resources management are basically same as those applied nationwide except those transferred to the provincial, city, municipal and barangay governments based on the LGC-1991. The power and attributes of local government, inter-government relationship, local legislation, organization structure and staffing, local taxation and fiscal matters, local fiscal administration including budgeting, and share of local government units in the national wealth are enumerated in the LGC. The local governments have not initiated yet further specific and/or own arrangements for the management of water related sector.

Annex-F L.1.2.3 shows the organization chart of the Government of Province of Pampanga as a typical organization chart in the study area. The organization under Provincial Governor is composed of the provincial treasurer office, the provincial engineer's office, the provincial planning and development office (PPDO), the provincial budget office, the provincial agriculturist office, the provincial assessor's office, the integrated provincial health office, the provincial library and information office, and the provincial jail. This organizational structure is basically same as those in other provinces.

The PPDO takes charge of planning of provincial strategic development plan.

### **L.1.3 Present Framework of Water Resources Management**

#### **L .1.3.1 The Constitution and Water Code**

##### **(1) The Constitution**

The national policy on water, as a natural resource, is enshrined in Section 2, Article XII of the Philippine Constitution-1987 which, as pertinent, wits:

"All lands of the public domain, waters, minerals, coal, petroleum and other mineral oils, all forces of potential energy, fisheries, forests or timber, wildlife, flora and fauna, and other natural resources are owned by the State. The exploration, development, and utilization of natural resources shall be under the full control and supervision of the State. In cases of water rights for irrigation, water supply, fisheries, or industrial uses other than the development of water power, beneficial use may be the measure and limit of the grant."

##### **(2) The Water Code**

###### **(a) Objective**

The Water Code of the Philippines (Presidential Decree No. 1067-1976) is the basic water law of the Philippines. It is anchored on the principle that all waters belong to the State. Proceeding from this premise, these waters are not subject to acquisitive prescription. The State may allow the use or development of water by administrative concession, but the utilization, development, conservation and protection of water resources shall remain within the control of and regulation by government.

In synthesis, the objectives of the Water Code are to:

- Establish the basic principles and structural framework relating to the appropriation, control, conservation and protection of water resources to achieve their optimum development and efficient use, to meet present and future needs;
- Define the scope of the rights and obligations of water users and provide for the protection and regulation of such rights;
- Institute a basic law to govern the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources and rights to land related thereto; and
- Identify the administrative agencies which will enforce the Code.

###### **(b) Definition and state ownership of water**

"Water" is expansively defined by the Code. Thus, Article 4 thereof declares that "Waters, as used in this Code, refers to water under the ground, water above the ground, water in the atmosphere and the waters of the sea within the territorial jurisdiction of the Philippines." This definition practically captures the entire segment and categories of water resources in their natural state or from the perspective of their source. This fundamental policy was enunciated in the Philippine Constitution, incorporated in the Civil Code (see succeeding section), and now reiterated in the Water Code. Other provisions of the Water Code categorically reinforce this stand as can be seen from the

provisions of Articles 5 and 6 of the Water Code.

**Article 5.** The following belong to the State:

- Rivers and their natural beds;
- Continuous or intermittent waters of springs and brooks running in their natural beds and the beds themselves;
- Natural lakes and lagoons;
- All other categories of surface waters such as water flowing over lands, water from rainfall whether natural or artificial and water from agricultural runoff, seepage and drainage;
- Atmospheric water;
- Subterranean or ground water; and
- Seawater

**Article 6.** The following waters found on private lands also belong to the State:

- Continuous or intermittent waters rising on such (private) lands;
- Lakes and lagoons naturally occurring on such lands;
- Rain water falling on such lands;
- Subterranean or ground waters; and
- Waters in swamps and marshes.

The owner of the land where the water is found may use the same for domestic purposes without securing a permit, provided that such use shall be registered, when required by NWRB. NWRB, however, may regulate such use when there is wastage or in times of emergency.

**(c) Separation of water from land**

The provisions of Article 6 of the Water Code are a departure from the stipulations of the Civil Code on water. Before their repeal by the Water Code, certain provisions of the Civil Code, particularly those on ownership of waters (Section 503) recognized private ownership of certain categories of water (i.e., continuous or intermittent waters rising on lands of private ownership; lakes and lagoons, and their beds, formed by Nature on such lands; subterranean waters found on the same; etc.). These laws on the ownership of waters found in private lands are now expressly abrogated by Article 6 of the Water Code. Other instances of repeal of Civil Code provisions by the Water Code are treated, in passing, in succeeding sections.

**(d) Appropriation**

The appropriation of water which is the acquisition of rights over the use of water or the taking or diverting of waters from a natural source, is governed by the Water Code. Provided such use or taking or diversion is accomplished in a legal manner and for a lawful purpose, the Code allows appropriation of water for any of the following purposes:

- Domestic - the utilization of water for drinking, washing, bathing, cooking or other household needs, home gardens, and watering of lawns or domestic animals;
- Municipal - the utilization of water for supplying the water requirements of the community;
- Irrigation - the utilization of water for producing agricultural crops;

- Power generation - the utilization of water for producing electrical or mechanical power;
- Fisheries - the utilization of water for the propagation and culture of fish as a commercial enterprise;
- Livestock raising - the utilization of water for large herds or locks of animals raised as a commercial enterprise;
- Industrial - the utilization of water in factories, industrial plants and mines, including the use of water as an ingredient of a finished product;
- Recreational - the utilization of water for swimming pools, bath house, boating, water skiing, golf courses and other similar facilities in resorts and other places of recreation. (Art. 10, Water Code)

**(e) Water rights and permit**

Under the Water Code, no person shall appropriate water without a water right. A water right is acquired with the issuance of a water permit which is the evidence of the water right granted. The following may apply for a water permit:

- Citizens of the Philippines who are of legal age;
- Associations, duly registered cooperatives or corporations organized under the laws of the Philippines, at least 60% of the capital of which is owned by citizens of the Philippines; and
- Government entities and instrumentalities including government-owned or controlled corporations.
- The measure and limit of appropriation of water is its beneficial use. Beneficial use as defined in the Code is the utilization of water in the right amount during the period that water is needed for producing the benefits for which the water is appropriated. Standards of beneficial use are prescribed by NWRB to the appropriators of water for different purposes and conditions.

**(f) Revision**

The National Water Resources Board (NWRB; former NWRC) promulgated the Implementing Rules and Regulations (IRR-1979) of the Water Codes (PD No. 1067-1976) as a guideline. Revision of the IRR-1979 in accordance with EO 123-2002 was approved and implemented in 2005.

The revision of the Water Code -1976 has been initiated for the meetings with the head of offices and stakeholders. The progress and the content of the draft have not been disclosed yet to the public.

**L .1.3.2 Regulation of Water Resources Allocation**

**(1) NWRB as Apex Regulatory Body**

The overall responsibility for coordination of water resources development and management is vested in the National Water Resources Board (NWRB) which was initially created as National Water Resources Council (NWRC) by Presidential Decree No. 424-1974. Its basic mandate is to administer and enforce the Water Code. NWRC was converted to NWRB by Executive Order No. 124-A-1987.

The jurisdictional powers, functions and duties of NWRB include: (a) to formulate policies and guidelines on water resources development and management; (b) to effect cross-sectoral and inter-departmental coordination of water resources development activities; (c) to grant or issue water permits and certificates of public convenience/and necessity; (d) to advise NEDA

on matters relating to water resources development plans, programs and projects, and (e) to exercise jurisdiction over disputes concerning water allocation and utilization.

The NWRB is a manifestly a collegial and quasi-judicial body. Its governing board is composed of five cabinet departments (DENR, NEDA, DOF, DOJ, DOH) and a water agency, NHRC. Three cabinet departments, DPWH, DA and DTI involved in water users and four water agencies, LWUA, MWSS, NIA, NPC were excluded from the board members after Executive Order No. 123-2002. The Chairman of the board is the Secretary of DENR at present.

**(2) Water Permit Procedure**

NWRB's procedure for processing and approval of water permit application is illustrated in Annex-F L.1.3.1. Procedure Item No.9 Technical Appraisal and Clearance from other agencies are done by deputized agencies in practice: for example, NIA for agriculture and fisheries, NPC for hydropower, LGUs and MWSS for municipal water. Issue of permit to drill for groundwater (Procedure Items No. 11-13) requires much manpower in urban and rural areas. Procedure No. 6 Hearing Adjudication/Decision and Procedure No. 14 Technical Evaluation also require much manpower of the Board.

The NWMB has a plan to empower deputizing any official or agency of the government to perform any of its specific functions or activities in order to resolve its chronic shortage of manpower. In particular it was sought to achieve the regular submission of an accomplishment report to monitor performance related to water permits in remote areas from the office of NWRB in Manila. Memorandum of Agreement were signed in 2004 between NWRB and the three municipalities based on Resolution No.008-1003, Deputizing the Three Municipalities of Sta. Fe, Bantayan and Madridejos in Batanyan Island, Cebu, October 23, 2003. The task of the deputy stipulated in the agreement covers:

- Receive water permit application (WPA);
- Verify details on application and compliance with requirements;
- Receive filing fees;
- Ensure the postings of WPAs at designated posting areas;
- Conduct field investigations/site inspections;
- Submit recommendations on the WPA to the Board;
- Deliver Permit to Drill (PTD) to applicant issued by the Board;
- Receive well data after the well has been drilled;
- Verify that water permittees comply with the conditions imposed in the water permit;
- Monitor drilling of wells and other water resources development activities in the area consistent with the positions of the Water Code of the Philippines;
- Collect well data;
- Perform such other similar functions relative to the processing of WPAs.

**(3) Levy Related to Water Permits**

**(a) Fees and Charges**

The NWRB is responsible to collect the levy (water fees and charges) related to the water permit as stipulated in the Water code.

Pursuant to Executive Order No. 1973 series of 2000 and per NWRB Resolution No. 010-0305 dated 21 March 2005, NWRB on its 29th Meeting approved the application/filing fees and annual water charges as shown in Annex-T L.1.3.1.



**(b) Responsibility of Concessionaires**

The National Power Corporation (NPC) was exempted from the annual water charge (item B) due to its non-profit character based on Presidential Decree No. 938 (May 1976)<sup>2</sup>. However, after issue of the NWRB Resolution-1998 all the parties granted water permit (concession) must pay the annual water charges regardless of private or public entity. The NPC still does not pay in spite of the opinion of Department of Justice (DOJ) that NPC must pay. National Irrigation Authority (NIA) also had not paid the annual water charges without legal exemption though the charge to irrigation use is less than a half of other uses. The filling fee can be exempted.

Irrigators associations who rely on the irrigation system of NIA are responsible to pay the irrigation service fee (ISF) to NIA. NIA is responsible to pay the annual water charges for the system's granted water permit (concession).

Irrigators who operate own irrigation systems are also responsible to pay the annual water charges for their granted water permit.

**(c) Collection Rate of Annual Water Charges**

The water utility division of NWRB sends the annual water charge bills to the concessionaires. The Chares paid to NWRB are remitted to Bureau of Treasury under Department of Finance (DOF), and those are treated as the national funds. Manila Water Company Inc. and Manilad Water Service Inc. of MWSS paid the annual water charges in 2007.

Many water users do not pay the annual water charge after granting of respective water permits. The water utility division of NWRB has a capacity of billing to only 30 – 40 % of the concessionaires due to limited staff capacity. Out of the entities billed about 80 – 85 % pay the charge at present.

Out of the number of entities not billed (60 – 70% of the concessionaires) 20% is NIA, 10% is NPC and 70% is Water Districts. There are four types of irrigation water users: individual farmers using shallow wells, irrigators associations for communal irrigation, NIA for government irrigation systems, and corporations mainly plantations. It is technically difficult to capture the individual farmers because many individual farmers abandoned their farms due to dry out of shallow wells. Majority of the irrigators associations paid the charge, but exact number of the irrigators associations is not captured at present because collapsed associations were not captured. NIA intentionally does not pay the charge. Some of the large corporations do not pay too. Those entities which do not pay are subject to review and inspection because many irrigation lands were converted to sub-division lots (household residential areas) in particular in Bulacan and Dampang. Review and inspection surveys were not conducted yet due to shortage of the manpower of NWRB.

**L .1.3.3 Water Use Regulation during Draught**

**(1) Technical Working Group**

The NWRB executes appropriate water use regulation during draught case by case. For example the technical working group (TWG), established in 1960s for the water allocation of the Angat dam, currently holds monthly regular meeting under secretariat of NWRB. The Angat multipurpose dam (hydropower, irrigation, municipal water supply to Manila, etc.) is located at Angat River, the tributary of Pampanga River in the province of Bulacan. The TWG regular meeting for the Angat dam is functioning as a kind of draught regulation committee.

**(2) A Case of Litigation for Water Right Allocation**

During the severe draught in September 1997 caused by El. Nino the majority of the water of Angat Dam allocated to NIA by the water permit, of which water users are irrigators associations, was transferred to MWSS based on the fist priority to the domestic and

municipal use as stipulated in Article 95 of the Water Code. Farmers (irrigators association) did not claim the compensation for the water rights following the regulation by the secretary of NIA. Majority of farmers had not paid the irrigation service fee fully for long time. Farmers had to pay the irrigation service fee if they claim the compensation. On the other hand, the provincial government of Bulacan litigated against MWSS. The Regional Trial Court determined that Manila Water Supply System (MWSS) shall pay the royalty (1% of the gross sales) to the province of Bulacan based on Section 13 of the Local Government Code-1991. The resolution has not been finalized yet. MWSS plans to appeal to the Court of Appeal if the resolution is finalized.

This case suggests that the position of the irrigators association in terms of water rights is weak and unstable under the present Water Code. The purpose of the annual water charges based on water permit and the purpose of the royalty of water based on the Local Government Code 1991 are different, thus those will be subject to review.

#### **L .1.3.4 Water Resources Planning and Assessment**

##### **(1) Water Resources Planning and IWRM**

The NWRB is tasked with collating, coordinating and updating the framework plans for water resources and for NEDA to integrate the plans for water resources development and management into national strategies and policies. In 1994, NWRB produced an updated National Framework Plan on Water Resources Management that incorporated Regional framework Studies. The NWRB also recommends to NEDA suitable action plans to address emerging issues in the water resources sector as they evolve.

On the other hand, the NEDA Board, which is chaired by the President of the Philippines, formulates national policies and strategies including those on the water resources sector. The NEDA has been the leading agency in preparing the Medium Term Philippine Development Plan (MTPDP) and the Medium Term Public Investment Plan (MTPIP). Both planning documents incorporate water resources sector plans at the national and regional levels. There are also coordinating committees established to align development of water resources with the national strategies and fiscal direction of the government. The role of NWRB in this segment of water resources management is confined to updating policies on water resources and integrating various sub-sector policies, strategies and plans on water resources.

The NWRB does not have the authority to determine the priority of the projects for implementation of a specific river basin water resources master plan. Neither a national government agency nor a local government has authority to determine and implement such an IWRM Master Plan which involved in multiple provinces and multiple water sectors in a river basin.

For planning and implementation of an IWRM Basin Master Plan which involved in multiple regions and sectors, cross-coordination of the Regional Development Council (RDC) and the Infrastructure Committee (INFRACOM) may be necessary for provincial governments and national agencies respectively.

The RDC regulates and approves inter-provincial projects and government loan projects under the secretariat by NEDA. The function of INFRACOM, chaired by the Director General of NEDA Secretariat, is to advise the President and the NEDA Board on matters concerning infrastructure development, including highways, airports, seaports and shore protection, railways, power generation, transmission and distribution, tele-communication, irrigation, flood control and drainage, water supply and sanitation, national buildings for government offices, hospitals and related buildings, state colleges and universities, elementary and secondary school buildings, and other public works.

##### **(2) Water Resources Assessment**

Assessment of water resources is a collaborative effort by several agencies of government. The Bureau of Research and Standards (BRS), the National Irrigation Administration (NIA)

and the National Power Corporation (NPC) are the three agencies that are primarily responsible for the collection of stream flow data.

In 1974, NWRB assumed the responsibility of accumulating and processing data on river stages and discharges. In 1987, the functions of NWRB were realigned and the maintenance of the national network of stream flow data was transferred to BRS. The actual collection and processing of the stream flow data in the field are under the direct control and supervision of the regional offices of DPWH. There are about 274 monitoring stations nationwide which daily register river stages. The information and data collected from these stations are submitted to the DPWH regional offices where they are fed and processed through the BRS developed computerized data processing system. It is reported that BRS does not have sufficient capacity to continue recoding and processing of stream flow as of September 2010.

It is noted that the regional offices are primarily project-oriented and are the implementing arms of the department. Water data collection is not an inherent mandate of the office.

The NIA and NPC are also involved in generating stream flow data mainly for the purpose required by their respective projects. Data collection activities by these agencies are normally confined to monitoring stations surrounding their project sites. Information gathered by these agencies are processed but are hardly published. Collectively, these agencies maintain about 168 stream flow stations which monitor river stages and discharges. It is necessary that the data gathered by these agencies are included in the information network for stream flow data to be useful.

#### **L .1.3.5 Strengthening of NWRB and Water Code by EO 123**

##### **(1) Progress of EO 123**

The NWRB is composed of five divisions with 126 positions under the Office of Executive Director (OED): namely, policy and program division, water right division, water utilities division, monitoring and enforcement division, and administrative and financial division. Its organization chart is shown in Annex-F L.1.3.2. The total staff number is only 103 including 8 of the OED as of June 2009 for the 126 positions. It is reported that shortage of present manpower is serious to execute its mandate.

The NWRB was attached to President Office at the end of 2009. EO 123 aims to strengthen NWRB, to attach NWRB to DENR and transferred the review and approval of the tariff of Water Districts to NWRB from the Local Water Utility Administration (LWUA). Under EO 123 the NWRB is required to execute the three tasks:

- (a) Review of the Implementing Rules and Regulations (IRR) of the Water Codes and amend the same,
- (b) Formulate a new or revised organization structure for its secretariat to effectively and efficiently carry out its mandate under PD 424 (1974) and PD 1067 (1976),
- (c) After approval of the new or revised organization and manpower structure of NWRB secretariat by the president, NWRB shall then be transferred to DENR as a bureau for purpose of administrative control and supervision.

The first task was approved and implemented in 2005. For the second task NWRB proposed, to DBM for its approval in 2008, a new organization which provides three services with 182 positions: namely, policy, coordination and integration service, economic regulatory service, and resource regulation service. The new organization structure is shown in Annex-F L.1.3.3. It was prepared based on the logical framework for NWRB<sup>3)</sup> illustrated in Annex-F L.1.3.4. The mandate of NWRB stipulated in the Organizational Performance Indicator Framework (2008) is “NWRB coordinates and regulates all water resources development and management of the country. It is responsible for achieving a scientific and orderly development of all water resources consistent with the principles of optimum utilization, conservation, and protection to meet present and future needs”.

After NWRB was transferred from President Office to DENR based on Executive Order No. 860 on 8 February 2010, NWRB reviewed the proposed organization structure of 2008, and drafted amendment as shown in Annex-F.1.3.5 where the legal and adjudication office is extended to Service and the number of position is increased from 182 to 196. Section 4 of E. O. No. 860 wits, “the NWRB shall desist from regulating the water tariffs of Water Districts, which shall hereinafter be undertaken by the Local Water Utilities Administration in accordance with Presidential Decree No. 198 as amended by Executive Order 124-A, series of 1987”.

**(2) Past Legislative Reform Initiatives**

**(a) Initiative by DENR with UNDP**

In 1996 President Ramos created the Presidential Task Force on Water Resources Management and Development (PTFWRDM) under DENR, assisted by the United Nations Development Program (UNDP), to develop a comprehensive water resources management strategy as well as to prepare a draft bill on water resources to respond to the Water Crisis Act in 1995. In August 1997, the PTFWRDM drew up a legislative proposal to create a new apex body to take charge of water resources management and economic regulation of all utilities within the country. The proposal sought to create the Water Resources Authority of the Philippines (WRAP) as a new entity to take over the functions, powers and responsibilities of NWRB, in addition to new and broad powers and functions. The bill was pended and adjourned during the 10th Congress (1995-1989), and re-filed during the 12th Congress (2001-2004) and 13th Congress (2004-2007), but it never led to the committee hearing stage. The task force was disbanded in 2002. A new WARP bill, as Senate Bill No. 799 was filed with the Public service committee of the Senate during the 14th Congress (2007-2010).

**(b) Initiative by NEDA with IBRD**

A policy report made by NEDA for International Bank for Reconstruction and Development (IBRD) in 1996 recommended that economic regulation (regulation of water service providers) be separated from resource management (regulation of water utilization including issue of water permit and enforcement of laws) and proposed the creation of a Water Regulatory Commission (WRC) as an independent economic regulatory body. The WRC proposal was originally initiated in 1997 by DPWH as an offshoot of the MWSS privatization. The farmers envisaged that water resources regulation would still remain with NWRB while the WRC would devote itself to purely economic regulation. The WRC draft bill completed in July 2001 was filed in the Senate as Senate Bill No. 1227 during the 12th Congress (2001-2004) but it never reached the Committee hearing stage. In the 14th Congress (2007-2010) Senate Bill No. 519 which proposed to create the WRC was referred to two Senate committees where it remained pending.

**(c) Conflict of Two Bills (WRAP and WRC)**

Both bills for the WRAP (by DENR) and WRC (by NEDA) intended to strengthen the country’s economic regulatory framework but the underlying principles are divergent. While the WRC separates the resources regulatory functions from economic regulation, the WRAP proposes to create an apex body incorporating both functions. Both bills drafted at almost the same period by two different executive departments were funded by two different donor agencies.

There was not enough consultation done with the different stakeholders regarding the two bills. Many stakeholders were very worry about the powers vested in the WRAP and raised their objections with some resorting to lobbying against the bill with their Congress allies. The WRC bill appeared later also failed to get active support from the stakeholders including the main sector players, i.e. NWRB, LWUA, DILG, Philippine Association of Water Districts (PAWD) and LGUs without enough consultation.

During the 14th Congress these two conflicting bills, WRAP and WRC have been filed. To move forward these bills the major stakeholders in the sector must agree on the end result.

**(3) Recommendation by NEDA**

The NEDA, the NWRB and the GTZ jointly recommended a regulatory reform of the water supply sector in the Philippines in November 2008<sup>4</sup>. The theme of the recommendations is summarized below.

- (a) The NWRB shall continue to exist purely as a resource management regulatory agency after the time when WRC is formed. During the interim period or prior to creation of WRC, it shall continue to function as a resource and economic regulator and shall be strengthened to be able to improve the both functions. NWRB shall also start discussions with other economic regulators to harmonize functions and start the deputization process.
- (b) The LWUA should continue to function as a specialized funding agency and a provider of technical and management assistance to all types of water utilities. All WDs with the Conditional Certificates of Conformance (CCC) should automatically be granted an operating license by WRC.
- (c) A special law creating WRC should be enacted by the government purely for economic regulation of the sector. All types of water utilities should be under the ambit of WRC except those created under special laws.

**L .1.3.6 Present Status of IWRM and River Basin Organization**

**(1) IWRM as National Policy**

The Medium-Term Philippine Development Plan (MTPDP) 2004-2010 adopted the Integrated Water Resources Management (IWRM) through the river basin approach as the general strategy for water resources management. In this regard, the creation of river basin organizations or any appropriate authorities was identified as a specific strategy to manage water resources. It envisages that water resources management is a society's responsibility, sharing and transparent and fully integrated planning of the whole stretch of the river system considering all upstream and downstream users.

**(2) Current Situation of RBO**

In the Philippines River Basin Organizations (RBO) were established as authority, council, commission or board in the past for four river basins: namely, Laguna Lake Development Authority (LLDA) in 1969, the Bicol River Basin Council in 1973, the Agno River Basin Development Commission, and Bohol Integrated Water Resources Management Board (BIWRMB) in 2007. A non-governmental multi-sectoral body, PCEEM Davao Foundation Inc. is also functioning to assist protection and/or rehabilitation of watersheds and water quality management of the Talomo-Lipadas Watersheds (TLWs) since 2002. There is a movement to establish Agusan River Basin Authority, Cagayan River Basin Authority and several river basin development authorities drafted as House Bills in 2009.

There is no official river basin organization for Pampanga river basin at present. The Upper Pampanga River Basin (UPRB) Coordination Council was established by Province of Nueva Ecija collaborated with the Central Luzon State University, NIA and others in 2002, but there is no official report of activities in NEDA Region III. The present status of activities of the RBOs is summarized in Table L.1.3.1.

**Table L. 1.3.1 Existing and Planned River Basin Management Organizations**

River Basin	Presence of River Basin Authority/Council/Commission/RBO
Pasig-Laguna Lake River Basin (2,520 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>Laguna Lake Development Authority (RA No. 4850-1969), Presidential Decree No. 813, 1975, LLDA under DENR</li> </ul>
Bicol River Basin (3,771 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>Bicol River Basin Council (EO No. 412-1973)</li> <li>Bicol River Basin PMO (EO No. 359-2004)</li> <li>Bicol River Basin and Watershed Management Project, Phase II, World Bank, planned</li> </ul>
Agno River Basin (5,952 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>The existed Agno River Basin Development Commission was abolished, but movement to reactivate to create Agno River Basin Development Authority, draft House Bill Nos. 2379, 2498</li> </ul>
Bohol Province (island of 4,177 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>Bohol IWRM Board (Executive Order No.10, 2007, Province), to materialize Bohol Environment Code of 1998</li> </ul>
Agusan River Basin (10,921 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>Agusan River Basin Authority, proposed with a draft bill in Master Plan for the Agusan River Basin Project, Final Report, 2007</li> </ul>
Cagayan River Basin (25,469 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>Cagayan River Basin PMO (EO No.474-2008)</li> <li>Draft House Bill No.5090 creating Cagayan River Basin Authority</li> </ul>
Pampanga River Basin (10,434 km <sup>2</sup> )	<ul style="list-style-type: none"> <li>UPRB Coordination Council established in 2002 but no activities</li> <li>PRCS-PMO (Project Flood Control Cluster 2) of DPWH Region III for flood control exists</li> <li>Integrated Water and Soil Resources Management (IWSRM) proposed by NEDA-Region III</li> </ul>

Source: JICA Study Team

**(3) RBCO**

DENR envisaged to be the primary government agency which responsible for the conservation, management, development and proper use of the country's environment and natural resources, including those in reservations, watershed areas and lands of the public domain, as well as the licensing and regulation of all natural resources utilization as may be provided by law. The RBCO intended to orchestrate and provide the overall direction and technical assistance in the implementation of policies, plans and programs for the protection, conservation, management and wise use of the country's river basins. It shall ensure effective and efficient improvement of all mandates and provision of EO 510.

The DENR, River Basin Control Office (RBCO) proposed to establish National River Basin Commission (NRBC) chaired by the DENR secretary which is to be supported by RBCO, Water Resources Management Bureau (a line bureau), River Basin Organization (RBO), DENR-RENRO (Regional Environmental and Natural Resources office), etc. in March 2007<sup>5)</sup>, (Refer to the proposed organizational set up<sup>6)</sup>). Under this proposal the RBO was composed of River Basin Field Management Office (RBFMO) and River Basin Council (RBC). The NWRB was proposed to be reorganized into the Water Resources Management Bureau (WRMB) mainly tasked to administer regulatory functions on water resources use, rights, granting of water permits, imposition of penalties for administrative violations and other water related regulations relative to the principle of integrated and ecosystem-based water resources management approach. It also tasks to implement water regulations and monitor compliance to the regulations. In order to materialize this proposal RBCO of DENR intended to introduce a concept of river basin management under the River Law of Japan in line with the amendments of the Water Codes. This proposal was canceled in 2009.

Since February 2010 the NWRB has been attached to DENR and RBCO is scheduled to be merged with the River Basin Development Division of NWRB as proposed in the organization structure (refer to Section L.1.3.5(1), Annex-F L.1.3.3 and Annex-F L.1.3.5) based on the Rationalization Plan submitted to DBM for approval.

**(4) Proposed House Bills Creating River Basin Authority**

Five House Bills were drafted for creating River Basin Authorities infringing the concept of managing the whole stretch of the river system. The House Bill Nos. 927 (An Act creating the Ifugao-Isaberla River Basin Authority), 1299 (the Zamboanga River Development Authority), 1338 (the Iloilo and Muelle Loney Development Authority), 1810 (Each City or Municipality to create a River Basin Development Authority), 3199 (Each City or Municipality to create a River Basin Development Authority) cover only cities and tributaries of the major river basins. The House Bill No. 5090 creating the Cagayan River Basin Authority (CAVARIA) is consistent with the MTPDP.

## **L.2 Problems and Issues on IWRM Institution**

### **L.2.1 Mission of IWRM**

#### **L .2.1.1 Issues**

The intended function of IWRM of the RBOs in the Philippines tends to be very broad. The IWRM mission targeted by some RBOs, such as Laguna Lake Development Authority (LLDA), Ifugao-Isabela River Basin Development Authority (House Bill), etc. is an integrated management of all sector projects exceeding the frame of water-related sectors. There seems to be no such case in the other countries. What should be the IWRM envisaged for the target year 2025 in Pampanga river basin?

#### **L .2.1.2 Historical Background of IWRM**

A concept of river basin management was established by the Tennessee Valley Authority in the USA in the 1930<sup>th</sup>. In the Lake Conference Sussex in 1949 the term, comprehensive river basin developments was identified first. An initial international activity for IWRM was the recommendation of United Nations Economic Commission for Europe (ECE) in 1971 to ECE Governments concerning River Basin Management<sup>7)</sup>. Stockholm Declaration on Human Environment of the United Nations Conference on the Human Environment in 1972 recommended an integrated approach to water resources management<sup>8)</sup>. The International Water Law Association (Association Internationale De Droit Des Eaux) clarified legally the IWRM concept in Caracas Conference 1976. The principles of the Dublin statement on Water and Sustainable Development (1992)<sup>9)</sup> inspired the Rio declaration in 1992. Global Water Partnership (GWP) was established in 1996 to clarify the principles for water resources management.

What is the difference of the two terms; comprehensive management and integrated management? Both comprehensive management and integrated management consider five perspectives; function, geography, administration, hydrology and ecology, and interdisciplinary<sup>10)</sup>. Hydrology and ecology is part of function but it is assumed independent from the specific aspect of environmental conservation. Difference between the two terms, 'comprehensive' and 'integrated' will be originated from firstly, to which extent related perspectives are well taken into consideration for the subject water issues. Secondly to which extent administrative power and mandates of concerned implementing organizations are clearly defined and well allocated to achieve the specific goal of IWRM<sup>11)</sup>.

Though the concept of IWRM has been acknowledged internationally it has not been institutionally materialized yet in most countries including USA (depending on State), United Kingdom, Japan, etc.

#### **L .2.1.3 Mission of IWRM**

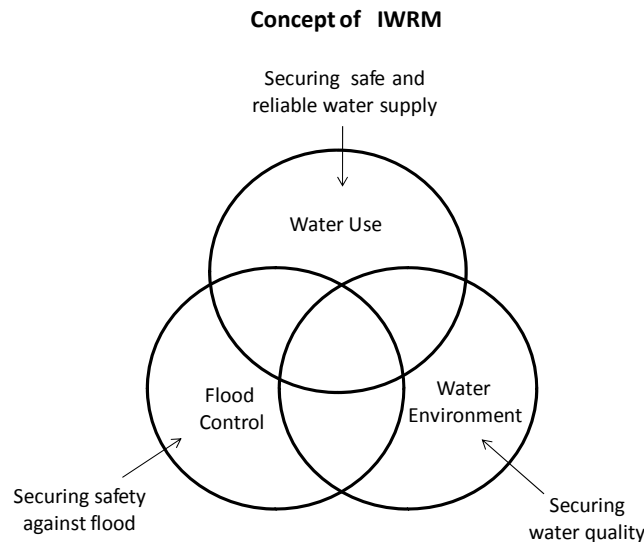
The mission of IWRM adopted in Agenda 21 (Chapter 18) aimed mainly to manage the whole water environment by a river basin unit, and to develop relevant water codes and concerned administrative organizations. The IWRM mission has been expanded gradually toward three different aspects. The first essential mission that is applied in arid and semi-arid countries aims to manage the key inter-active water elements; surface water and groundwater for water use, and water quantity and water quality. Its key management elements were i) securing safe water supply to various uses and ii) securing water quality for sanitation and ecology (effluent control and waste water treatment). The second, a broader mission aims to integrate the three key inter-active elements; water, land and environments including securing safety against flood (flood control). Its key management elements cover flood control, soil erosion, compound pollution, preservation of watersheds and habitats, and irrigation and drainage issues in addition to ones in the first mission. The third, an extreme broad mission aims to integrate water and social and economic developments which form a broad aspect of sustainable development in long-term. Its key management elements expand from the water related development and environment to all kind of development activities by integrating infrastructure plans, land use plans and urban development plans.

The second mission that covers the three attributes; water use, flood control and water environment



illustrate in Figure L.2.1.1 has been widely acknowledged both in the OECD countries and the developing countries, but the third broadest mission is still in conceptual level. The third mission crates a new layer of authority which is confronted with the reality of the existing mandates of line agencies that reflected historical background of the politics and socioeconomic structure of the country concerned. Creation of a new layer of authority is subject to discussion in Pampanga river basin.

The IWRM concept at any level is made functional provided with an essential support system of monitoring system and database system for scientific and equitable coordination and management.



**Figure L. 2.1.1 Mission of Water Resources Management**

## L.2.2 Functions of RBOs

### L .2.2.1 Issues

The National Water Resources Board (NWRB) recommended that a river basin organization should be organized in line with the preparation of the Study. Both the NWRB and JICA agreed that the creation of the river basin organization will be the best interest of the Study<sup>12</sup>). The NWRB envisages that the creation of the RBO would materialize IWRM by a river basin unit and positive effect to reinforce water resources management including water rights would be gained. On the other hand the IWRM Plan concept was accepted as part of the Medium-Term Philippine Development Plan (2004-2010) during the Central Luzon Water Summit, but creation of RBO or other organizational structure is not part of NEDA Region III plan because the existing Regional Development Council (RDC) is functioning well at present. The NEDA Region III respects the present mandates of the national and regional line agencies and local governments keeping basically unchanged. Strengthening of the existing institution and organizations is recommended without creating a new layer of authority. The NEDA Region III have apprehension that creation of a RBO would create a new layer of authority which overlaps with the authority of the RDC to coordinate implementation of the projects concerned with multiple provinces and sectors.

This Section analyzes the present RBOs in the Philippines presented in Section L.1.3.6 by classifying RBOs in terms of dimensions of their functions or authority, and by comparing with cases in other countries, and reviews the direction of appropriate RBO functions of Pampanga River.

### L .2.2.2 Type of RBOs

The RBOs presented in Section L.1.3.6 are classified into five types in terms of dimensions of the functions or authority of RBOs as shown in Table L.2.2.1. Type 1 has the broadest and strongest functions while Type 5 has narrow functions.

**Table L. 2.2.1 Type of RBOs**

Functions/Authority in the River basin	Type	1	2	3	4	5
To make policy, plan, coordinate, implement all projects concerned		○				
To make policy, plan, coordinate, implement river-related projects together with River Basin Management Office			○			
To regulate and monitor water rights		○	○	○	○	
To prepare water resources development plan for the basin's water rights					○	
To advocate IWRM and monitor water and watershed environment		○	○	○	○	○
To operate and maintain river and hydraulic structures		○			○	○

○: Function included.

Source: JICA Study Team

The existing, planned and studied RBOs in the Philippines and two practices in Australia and Japan are classified based on the corresponding functions in Table L.2.2.2.

**Table L. 2.2.2 Type of River Basin Organization in Philippines and Other Countries**

Type	Case of Philippines		Case of Other Countries
	Existing	Studied/Planned	
1. Statutory body for integrated area development and management of all infrastructures	LLDA(1966/ amended 1975)	Ifugao-Isabela River Basin Development Authority(House Bill)	
2. Statutory body for policy making, planning, coordinating all inter-agency activities	Bicol River Basin Council (1973), Implementation by Bicol River Basin Management Office EO No. 359 (2004)		
3. Statutory coordination body for advocating IWRM and monitoring watershed environment	Bohol IWRM Board (2008), PCEEM-Davao Inc. (2002)	Agusan River Basin Authority	
4. National agency for water resources management for the specified basin			Murray-Darling Basin Authority, Australia (2008)
5. National agency for construction and O&M of the facilities in the specified basin			Japan Water Agency (2003)

Source: JICA Study Team

The Laguna Lake Development Authority (LLDA) classified as Type-1 RBO, but it is a body for an integrated area development. LLDA has extremely broad and powerful functions in particular planning and regulating all kind of infrastructures not limiting to advocating water resources and environmental management. Functions of Type-2 are broad and similar to Type-1 though its main services are focused on water-related projects in a river basin or a tributary of a river basin. The Bohol IWRM Board classified as Type-3 is a statutory coordination body for advocating IWRM and monitoring watershed environment. Its functions are limited to mainly management of watershed environment and water quality. Pceen-Davao Foundation Inc. classified as Type-3 is a NGO for multi-sector collaboration through net working ad collaboration of local stakeholders. The Agusan River Basin Authority (ARBA) aims to integrate comprehensive land use and water use plan, and also to integrate the ARB Master Plan into the local government code, but its functions are limited to coordination.

### L .2.2.3 Functions of RBOs in Philippines and Other Countries

Type-1 and Type-2 RBOs in the Philippines are basically different from those have been operated in the advanced countries in particular Australia and Japan. Type-1 and Type-2 will create a new layer of authority due to their broad functions which overlaps the functions of RDCs or NEDA Regional offices or other line agencies. Type-3, Type-4 and Type-5 do not create overlapping authority with the line agencies in principle. The key functions of the five RBOs in the Philippines and two RBOs in Australia and Japan are compared with in Table L.2.2.3.

The water rights administration has been linked with the basic plan for water resources development in Type-4 and Type-5 (Refer to Annex-F L.2.2.1 and L.2.2.2). There is no such legal arrangement in the Philippines. For example, the Basic Plan for Water Resources Development, which is linked with water rights of a river basin, is under the mandates of the national river administrator, Minister of Land, Infrastructure, Transport and Tourism, Japan. The NWRB explains that the micro and macro framework of water rights is not delineated well by a river basin unit in the Philippines. The micro framework of water rights is a management framework to issue respective water permits (water rights), while the macro framework is a management framework to regulate water rights allocation and conflicts in a region from a part of the basin to the whole basin between more than two water rights based on the water resources policy. Allocation of the function of operation and management of the river and hydraulic structures is not well defined between the national government and local governments in the Philippines, and this underlines a basic difference of the functions of RBOs.

The Murray-Darling Basin Authority (MDBA) - Type-4 was transferred to a national agency for water resources management in 2009. Its mission is noted to aim at the most advanced water resources management. Its functions are limited to manage the river basin's water resources including water-related environment and the river basin water resources development plan. Reallocation of water rights is facilitated through water rights trading to achieve reasonable, efficient and equitable allocation of water rights among water users. Japan Water Agency (JWA) – Type-5 is a national agency for IWRM, but its functions are limited to only construction and operation and maintenance of the river facilities within the specified river basins. For both Type-4 and Type-5 operation and management of the river and hydraulic structures is a key basic function.

**Table L. 2.2.3 (1/2) Key Functions of Typical Existing and Proposed River Basin Organization**

Type	Name	Key Functions
1	Laguna Lake Development Authority (Republic Act No. 4850, 1966)	<ul style="list-style-type: none"> <li>• Survey, planning, management and technical assistance</li> <li>• Approve or disapprove all plans, programs and projects proposed by local governments within the region</li> <li>• Develop water supply for various purposes</li> <li>• Plan, finance and undertake all infrastructure projects in the area</li> <li>• Issue a water use permit and a discharge permit, and collect fees for use of water and discharges and environmental user fee</li> <li>• Regulating, monitoring and O&amp;M activities</li> <li>• Require the cities and municipalities to pass zoning ordinances and regulatory measures</li> <li>• Act coordination with existing government agencies in establishing water quality standards</li> </ul>
1	Inugao-Isabela River Basin Development Authority (House Bill, 2009)	<ul style="list-style-type: none"> <li>• Prepare, review, evaluate River Basins Comprehensive Master Plan in the interest of Regional Development Plans and other areas and sectoral plans as basis for proposing improvements in existing policies governing the protection, preservation, management and development of resources within the basin</li> <li>• Spearhead the coordination of inter-agency activities within its jurisdiction in implementation</li> </ul>
2	Bicol River Basin Council (EO No. 412, May 1973)	<ul style="list-style-type: none"> <li>• Review and pass upon the programming and allocation of funds of agencies for all projects</li> <li>• Integrate and coordinate with implementing agencies of the government all plans and programs affecting the Bicol River Basin</li> <li>• Call on any department, bureaus, office, etc. of the government for assistance as required</li> <li>• Do all such other things and to transact all such business as necessary</li> </ul>
3	UPRB Coordinating Council (2002)	<ul style="list-style-type: none"> <li>• Orchestrating planning, implementing and evaluating of an integrated water resources management program</li> <li>• Serve as a policy making body and a clearing house of ideas as far as planning and implementing programs and activities</li> <li>• Develop plans and programs in order to address the problems identified in the diagnostic study: rational utilization of water, establishment of a database, monitoring and evaluating of surface and groundwater quality, and watersheds.</li> </ul>

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**Table L.2.2.3 (2/2) Key Functions of Typical Existing and Proposed River Basin Organization**

Type	Name	Key Functions
3	Bohol IWRM Board (EO No. 10, 2007)	<ul style="list-style-type: none"> <li>Establish environmental indicators related to water resources to monitor and report</li> <li>Propose and implement policies and action plans related to IWRM</li> <li>Advocate for IWRM operational localization</li> <li>Harmonize the development, management, control, and regulation of land use and monitor the implementation of laws and regulations</li> <li>Execute water permit application (WPA), monitor, compliance activities</li> </ul>
3	Pceen-Davao Foundation Inc. (NGO 2002)	<ul style="list-style-type: none"> <li>Assist government and civil society by: empowering communities; providing technical and monitoring assistance; establishing, information; building capabilities and generating financial and other resources</li> <li>Undertake technical and policy studies; provide venue for conflict resolution; undertake community-based resource management projects; facilitate tours; document and share traditional knowledge on natural resource management</li> </ul>
4	Murray-Daring Basin Authority, Australia (2008)	<ul style="list-style-type: none"> <li>Preparing the Basin Plan and future amendments</li> <li>Implementing and enforcing the Basin Plan</li> <li>Advising the minister on the accreditation of state water resource plans</li> <li>Developing a water rights information service which facilitates water trading</li> <li>Gathering information, monitoring and undertaking research</li> <li>Construction, operation and maintenance of the river assets</li> <li>Natural resource management programs</li> </ul>
5	Japan Water Agency (2003)	<ul style="list-style-type: none"> <li>Construction, reconstruction and operation of structures related to power generation</li> <li>Studies, surveys, tests and researches for water resources development</li> </ul>

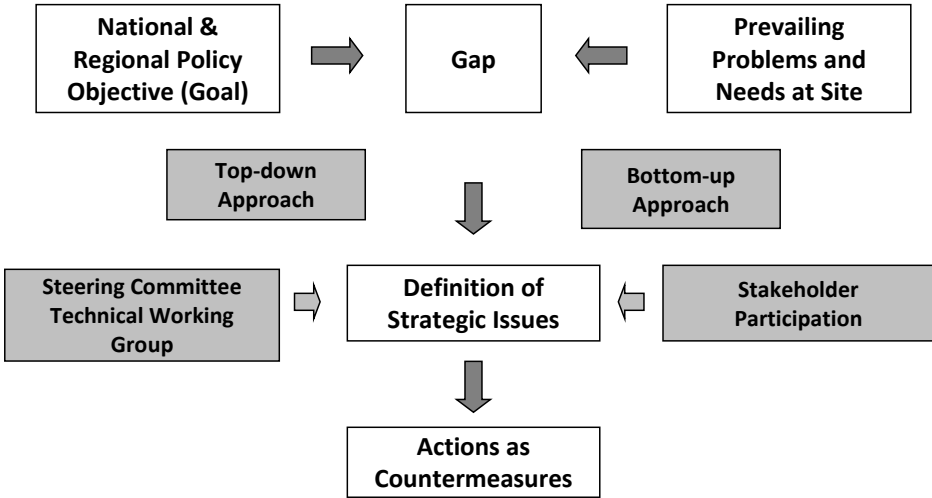
Source: JICA Study Team

**L.2.3 Gap Analysis and Strategic Issues**

**L .2.3.1 Gap Analysis**

**(1) Objective**

The objective (goal) of the institutional and organizational arrangements is to materialize the IWRM Plan in Pampanga river basin in practice. The gaps between the objective and the prevailing problems and needs have been analyzed. Then the strategic issues have been identified and defined to fulfill the gaps and to achieve the objective through the top-down and bottom-up approaches. Appropriate actions are studied as alternative countermeasures for the strategic issues. Four sustainable outcomes and nine strategic themes delineated in the National IWRM Plan Framework (November 2006) have been also referred to define the strategic issues.



Source: JICA Study Team

**Figure L. 2.3.1 Approach for Defining Strategic Issues**

**(2) Key IWRM Functions and Strategic Issues**

Eleven strategic issues have been defined for five key IWRM functions as set out in Table L.2.3.1 based on the problem-cause and objective-analyses done through a series of the joint steering committee meetings with the technical working group, the technical working group meetings, the stakeholder consultation, the focus group discussion and the counterpart meetings. Those IWRM functions and strategic issues are not directly related to prioritization and implementation of projects but are the basis for the integrated water resources management. Definition of the eleven strategic issues is presented in the following section. The key alternative actions for these strategic issues are presented in Section L.3.

**Table L. 2.3.1 Key IWRM Functions and Strategic Issues**

Key IWRM Functions	Strategic Issues
1. Water use management and water rights allocation	Issue-1: Strengthen Water Rights Regulation Capacity Issue-2: Enhance Efficient Water Use and Re-allocation of Water Rights Issue-3: Modify Overlapping Water Charge System Issue-4: Achieve Sustainability of Groundwater Issue-5: Introduce Specific Law to Enhance Multipurpose Dam Projects
2. Water quality and environmental management	Issue-6: Enforce to Maintain Environmental Flow Issue-7: Strengthen Water Quality Monitoring and Management
3. Management of flood and natural disasters	Issue-8: Manage and Mitigate Risks from Water-related Disasters
4. Watershed and forest management	Issue-9: Improve Watershed and Forest Management
5. Localize, implement, O&M of IWRM Plan from regional interests	Issue-10: Set up Authority to Implement IWRM Plan Issue-11: Strengthen Execution and Financial Capacity for Sustainability

Source: JICA Study Team

**L .2.3.2 Definition of Strategic Issues****(1) Strategic Issue-1 Strengthen Water Rights Regulation Capacity****(a) Background Issues**

Strengthen water rights regulation to secure the rational, equitable, efficient and ecologically sustainable allocation of water, and to secure seasonal water supply reliability and long-term water supply is one of the sustainable outcomes of the National IWRM Plan Framework. The NWRB's resolution on the water rights allocation among MWSS, AMRIS (NIA), Bulacan and NPC (non-consumptive) concerning the Bustos Dam and the Angat Dam operation is pending due to partly of the situation the aggregate quantity of the present water use permit exceeds the potential dependable flow (refer to Section 5.7 Water Resources Development, Allocation and Distribution of the Main Report). If present institution is kept unchanged the water supply security level (reliability) in Angat river basin will decrease, and it will result in increasing a risk of the regional socio-economic loss.

Short coming of the present system is:

- There is no legal target or standard to define the minimum water resources supply security level and to control aggregated quantity of water permit to be issued for a region or the whole basin;
- The present quantitative monitoring system is very weak at cross-checking the regional water balance and regulate the aggregated discharge and quantity of more than two water permits in a region where daily or seasonal water diversion conflicting is expected;
- Present enforcing power is also not effectively functioning to regulate over issues or to control of the aggregate rate and quantity of water permit; and
- With reference to the grid law (RA 9136), NPC' responsibility of peak power

generation, NPC does not follow the NWRB's regulation to modify the daily peak hydropower generation for meeting the regional demand of irrigation water and municipal water supply. The water code and the grid law are competing.

**(b) The Water Code and Water Permit**

In Art. 18 of the water code, the water permit specifies first; the maximum amount of water which may be delivered or withdrawn, second; the maximum rate of diversion or withdrawal, third; the time or times during the year when water may be diverted or withdrawn. But the present water permit is granted by the maximum rate of diversion only. There is no requirement for the regulation on the seasonal diversion and daily fluctuation of water use.

The permit shall specify the maximum rate, maximum quantity, daily or seasonal variation of diversion (the time or times during the year) to control efficient water use.

Art. 20, 21, 23, 24, 26, 28, 29, 30 of the water code is not appropriately enforced by NWRB due to partly insufficient definition of these articles and/or weak enforcement power. The related Articles of CHAPTER III APPROPRIATION OF WATERS, Water Code of the Philippines (1966) are listed in Appendix L-1.

**(2) Strategic Issue-2 Enhance Efficient Water Use and Re-allocation of Water Rights**

**(a) Background Issues**

Sustainable water resources and responsive services for present and future needs is one of the sustainable outcomes of the National IWRM Plan Framework. However, the present public and user base allocation system of water rights results in wasteful consumption of water and spawns the growing scarcity of water. There is no incentive for water users in particular irrigators to save water or to increase water use efficiency. Reduction of non-revenue water including leakage reduction has been achieved dramatically by Manila Water Company (MWC) due to high incentive to increase its profit. However, irrigators using the NIA irrigation system have no incentive to save their water use. Irrigation facilities fee is accounted by the unit of irrigation land area instead of the unit of used water quantity (m<sup>3</sup>). The water right title holder is NIA instead of irrigators and thus water saving does not result in reduction of annual water charges. NIA has not paid it to NWRB yet. Saving of irrigation water does not increase income of irrigators like MWC. Benchmarking of best practices in water allocation from other countries is also anticipated.

**(b) Present Water Code**

Art.19 of the water code enables the title holder to lease or transfer of water rights, but lease and transfer may not be implemented by this article only because detailed IRR is not clear including definition of lease and transfer, required conditions, process, compensation for lease or transfer, etc. Rule, guidelines, procedure, etc., are subject to the approval of NWRB.

**(3) Strategic Issue-3 Modify Overlapping Water Charge System**

**(a) Present Water Code**

On June 6, 2003, the provincial Bulacan Governor filed a suit against MWSS to compel the water agency to furnish the local government its financial statements or any financial document showing MWSS' income from 1992 up to the present, and that it be paid its share in the earnings of agency resulting from the latter's utilization of the water resources derived from Angat Dam. During the case two legal questions were raised: whether or not the water in Angat Dam is part of the national wealth of the country; and whether or not the Bulacan provincial government is entitled to collect a share from the proceeds of the water stored in Angat Dam. The Regional Trial Court decided on June 3, 2005. In June 2008 the Court of Appeal ordered MWSS to remit to Bulacan

Province its share from the water firm's earnings generated from its use of water from Angat Dam from 1992 up to the present based on Section 291 of the Local Government Code (LGC) of 1991.

The NWRB comments that the overlapping provisions on the water charges in the Water Code (NWRB's water fees and charges for concession) and the LGC (a share of the national wealth by LGUs) are to be unified.

**(b) Present Water Code and Local Government Code**

Art.3&6(waters belong to the State) of the water code, and IRR Section 8 (water fee or charges) deals only water fees and charges for all appropriators.

Chapter 2- Share of Local Government Units in the National Wealth (sec. 289 to Sec. 295) of the LGC stipulates details of the share of the national wealth.

**(4) Strategic Issue-4 Achieve Sustainability of Groundwater**

**(a) Background Issues**

In Bulacan Province in Pampanga River land subsidence and saline water intrusion in the groundwater are progressive due to excessive groundwater withdrawal. Enhancing effectiveness in groundwater management and aquifer protection is one of the strategic themes of the National IWRM Plan Framework. However, there is no institutional arrangement to prevent excessive groundwater pumping. There is also no extensive groundwater monitoring system for sustainable groundwater development; both quantity and groundwater level. On the other hand Section 46 of IRR, Water Code allows exhaustion of groundwater. It is expected to clarify the organization and its responsibility of groundwater management and also to enhance transfer of the municipal water supply sources from groundwater to surface water.

**(b) Present Water Code**

IRR Section 46 Requirement of Drilled Well, item d is subject to modification, with: 'Groundwater mining may be allowed provided that the life of the groundwater reservoir system is maintained for at least 50 years.'

**(5) Strategic Issue-5 Introduce Specific Law to Enhance Multipurpose Dam Projects**

**(a) Background Issues**

At present one line agency or one main entity can take charge of implementation of a large reservoir dam, where cost allocation of the dam body (common facilities) or allocation of reservoir capacity is not defined. The beneficiary's pay principle (BPP) is not enacted yet. The reservoir operation rule for the peak daily hydropower operation, water discharge allocation rule during draught among irrigation and municipal water supply has not been rationally and equitably executed as expected by water users. There is also no specific cost allocation for the flood control purpose for the dam reservoir operation in the Philippines. The reservoir operation rule during extreme flood events has not been settled yet among the stakeholders in the central Luzon area after the flood events in 2009. This issue is originated partly from the fact that there is no legal basis about cost and reservoir volume allocation rule among multiple water users (also among public and private entities) in the Philippines yet, such as the specific multipurpose dam law in Japan. Without definition of the cost allocation of the dam reservoir for flood control the reservoir operation rule described in the strategic issue-8 also may not be consolidated.

**(b) Present Water Code**

Art.30 of the water code deals with only compensation in case modified to multi-purpose development.

**(6) Strategic Issue-6 Enforce to Maintain Environmental Flow**

**(a) Background Issues**

Among water users environmental flow is considered to be a major determinant of ecosystem health, not provision of a minimal quantity. Effective protection and regulation of ecosystem is one of the sustainable outcomes of the National IWRM Plan Framework. One of the strategic objectives is to establish policy framework and to undertake innovative programs to restore and/or to improve the health of priority stressed rivers, lakes, and other water bodies as well as to ensure that those currently not significantly stressed remain healthy. However, no concessionaires comply with the required discharge of the minimum flow (10% of the dependable flow), which is responsible for the concessionaries with the condition of water permit. Definition of the present minimum flow is not well comprehended among water users. The water managers argue lack of scientific technical tools and data and information for setting the standard minimum flow.

**(b) Present Water Code**

Art.66 (minimum stream flows for rivers and streams, minimum water levels for lakes) of the water code and Section 47 of IRR deal with the issues.

**(7) Strategic issue-7 Strengthen Water Quality Monitoring and Management**

**(a) Background Issues**

Groundwater quality deterioration is serious at some local areas due to discharges of effluents, mainly organic matters from the domestic sewerage and the incompliant industries. Manila Bay Coordination Committee was established as a satellite office of RBCO of DENR to control the increasing pollution loads to the Manila Bay. In spite of inter-sector and inter-regional efforts sources of pollution loads have not been clarified yet. However, the present institution to monitor and to enforce water quality control is not effective. There are a few water quality monitoring stations in Pampanga River except at large dam or headwork sites.

**(b) Present Water Code and Clean Water Act**

Chapter VI Conservation and Protection of Waters and Watershed and Related Land Resources (Art. 66 to Art. 78.) deals with water quality management, where pollutants are defined by the National Pollution Control Commission. The clean water acts govern comprehensive water quality framework. However, there are no specific regulations or standards for the density of water quality monitoring stations, responsibility of water users, and functions of establishment, operation and maintenance of the water quality monitoring. In particular there is no specific responsibility on the water users in Pampanga river basin to share the cost of water quality monitoring and management.

**(8) Strategic Issue-8 Manage and Mitigate the Risk from Water-related Disasters**

**(a) Background Issues**

There is no flood control basin plan (FCBP) in Pampanga River except for the Pampanga Delta Development Project, Phase I to III for the lower stretch of the river. There is also no target flood control level (for example once in 10 years or 20 years) for the serious flood plain lands in Pampanga River. The reservoir operation rules during the extreme floods incidents have not been officially establish yet by the JOMC for Angat Dam, Pantabangan Dam, San Roque Dam, Binga Dam, etc. This is partly originated from the fact that there is no legal basis to define the responsibility to mitigate risks from floods of each of the water users concerned. Establishment of the FCBP for the whole river basin or the concerned river stretch, and establishment of the flood control account for the dam reservoirs related with the strategic issue-5 might



provide a clue to resolve the issue. Other issues with respect to manage and mitigate flood disasters are:

- Right-of-way is one of the serious barriers for implementing flood control projects in the study area in particular construction of dike systems; and
- Responsibility of O&M of the flood control and river facilities is not well defined after transfer of the facilities from DPWH to LGUs based on the LGC of 1991. Lack of funds for O&M and monitoring of flood control and river facilities is also serious.

**(b) Present Water Code**

Chapter V Control of Waters (Art.53. to Art.65.) deals with control of flood plain lands, flood control structures, and flood plain management plan, etc. Art.51. defines the public domain of the river. There are no IRR or technical standards for the flood control plan, flood control target level, reservoir operation rule, and maintenance of the river facilities at present.

**(9) Strategic Issue-9 Improve Watershed and Forest Management**

**(a) Background Issues**

Responsible functions and territory of watershed management are not well defined, fragmented and overlapping among DENR, related national agencies and different level of local governments in particular forest management. Funds for implementation, maintenance and monitoring are also limited. Necessity of institutional strengthening has been reported but detailed and concrete problems and causes about the weak capacity have not been clarified well.

**(10) Strategic Issue-10 Set up Authority to Implement Pampanga River Basin IWRM**

**(a) Background Issues**

There are no specific institutional and legal arrangements in Pampanga river basin to localize and implement IWRM Plan in practice in particular water resources management and maintenance. It is necessary to study further if creation of a RBO is required for Pampanga river basin, and the direction of the basic conditions, and what functions of RBO are to be targeted.

RDC Region III is the highest policy and decision-making body in the region for development plans, investment programs, project monitoring, etc.

There are several conflicting institutional proposals for River Basin Organization (RBO) such as a committee under RDC Region III, RBO as a part of the line agency, River Basin Control Office (RBCO), DENR, Independent River Basin Council as a coordination body, and RBO as a operation and maintenance body of the river facilities.

The Purpose and function of RBO is not well defined yet among the options. Advocate and implement the IWRM Plan particularly monitoring of water rights, water quality, ecosystem and O&M of flood control facilities are the key missing functions of the existing organizations.

**(11) Strategic Issue-11 Strengthen Execution and Financial Capacity of LGUs for Sustainability**

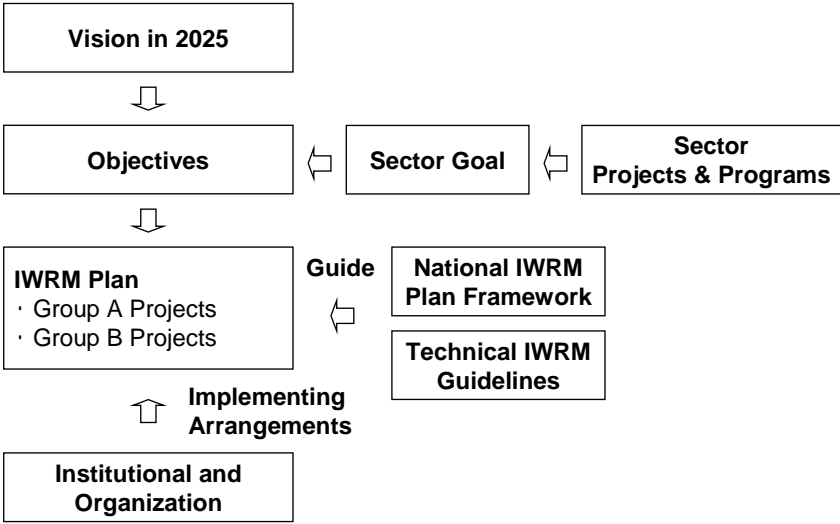
**(a) Background Issues**

It is necessary to clarify institutionally allocation of responsibility of the operation and maintenance, and the burden of operation and maintenance costs of the river facilities in the basin if projects of river facilities such as dikes and flood retarding basins are implemented. It is also indispensable to strengthen the financial capacity of both LGUs and the line agencies to set up sustainable IWRM from the regional interests.

### L.3 Proposed Institutional-Setup for IWRM

#### L.3.1 Study Framework

The role of the institutional-setup is at the position of implementing arrangements to localize and implement the IWRM Plan as illustrated in Figure L.3.1.1.



Source JICA Study Team

**Figure L. 3.1.1 Role of Institutional-Setup**

The IWRM Plan would neither be implemented by amendment of the existing laws only nor capacity strengthening of the existing organizations only. The key actions are structurally reviewed from the three basic aspects: i.e., the legal aspect, the organizational aspect, and the financial aspect. Three aspects of actions are the basic elements to empower implementing functions, and thus those are to be executed simultaneously. Section L.3.2 deals alternative key actions for the respective strategic issues defined in Section L.2.3.2 at first. Sections L.3.3 to L.3.5 integrate the key actions from the three aspects respectively.

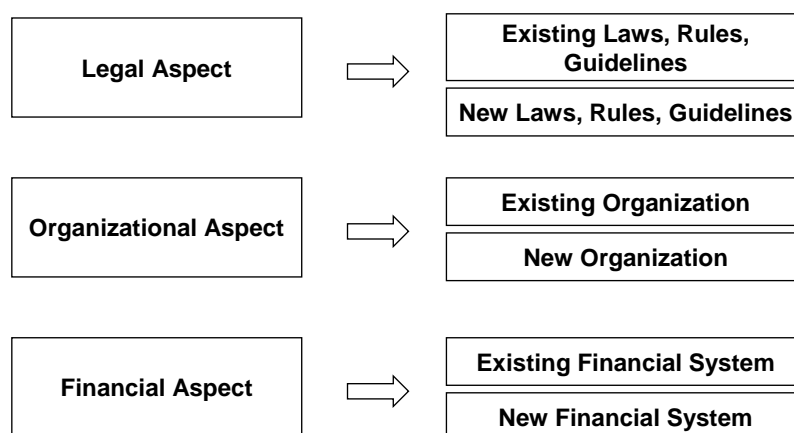
#### L.3.2 Strategic Issues and Key Actions

##### L.3.2.1 Basic Aspects of Actions

The three basic aspects of actions are defined as follows:

- i. Legal Aspect: Amendment of related laws (the water code, the local government code, etc.), regulation, rules, standards, guidelines;
- ii. Organizational Aspect: Capacity strengthening of the existing organizations (NGAs/RLAs, LGUs, etc) and supplement of missing functions to the existing ones; and
- iii. Financial Aspect: Strengthening of financial capacity necessary to achieve sustainable IWRM for Pampanga river basin.

Key alternative actions are studied as countermeasures to empower the existing and new institution from the three aspects as shown in Figure L.3.2.1.



Source JICA Study Team

**Figure L. 3.2.1 Empowerment Elements for Basic Aspects**

The respective strategic issues and the corresponding basic aspect of actions are summarized in Table L.3.2.1.

**Table L.3.2.1 Strategic Issues and Aspects of Actions**

Key IWRM Issues	Strategic Issues	Basic Aspects of Actions
1. Water use management and water rights allocation	Issue-1: Strengthen Water Rights Regulation Capacity	i. Legal Aspect ii. Organizational Aspect
	Issue-2: Enhance Efficient Water Use and Re-allocation of Water Rights	
	Issue-3: Modify Overlapping Water Charge System	
	Issue-4: Achieve Sustainability of Groundwater	
	Issue-5: Introduce Specific Law to Enhance Multipurpose Dam Projects	
2. Water quality and environmental management	Issue-6: Enforce to Maintain Environmental Flow	ii. Organizational Aspect
	Issue-7: Strengthen Water Quality Monitoring and Management	
3. Management of flood and natural disasters	Issue-8: Manage and Mitigate Risks from Water-related Disasters	i. Legal Aspect ii. Organizational Aspect
4. Watershed and forest management	Issue-9: Improve Watershed and Forest Management	ii. Organizational Aspect iii. Financial Aspect
5. Localize, implement, O&M of IWRM Plan from regional interests	Issue-10: Set up Authority to Implement IWRM Plan	ii. Organizational Aspect iii. Financial Aspect
	Issue-11: Strengthen Execution and Financial Capacity for Sustainability	

Source: JICA Study Team

### L .3.2.2 Proposed Key Actions

The description of the background of respective strategic issues is presented in Section L.2. This section presents the alternative key actions (solutions) from the three aspects if applicable. Prospective outcomes by the respective key actions are presented in Section L.3.3.2 for the amendment of the water code and other related laws, rule and guidelines, Section L.3.4.2 for the capacity strengthening of the line agencies and LGUs, Section L.3.4.3 for the capacity building of the missing functions for IWRM, and Section L.3.5.2 for the strengthening of financial capacity.

**(1) Strategic Issue-1 Strengthen Water Rights Regulation Capacity**

**(a) Amend Articles of Water Codes**

The articles of the water code subject to amendment or modification to resolve the issue are set out below.

- Establish an effective period of the water permit for 5 to 10 years to allow the NWRB to review and enforce rational and efficient use of water (Art.26 & 28);
- Establish a rule to enforce the concessionaire to take concrete water saving measures (Art.29 & 30, IRR Section22);
- Establish a penal rule to revoke the water permit if its concessionary executes no measures of efficient use other than act of violation (Art.29 & 30);
- Provide Article to let the water code prevail over the other law (the grid law) specifically for water rights regulation;
- Provide clear compensation rule for the loss of the priority concessionaire in time of emergency (Art.22 & 23); and
- Modify the condition of water permit to specify concrete seasonal water use schedule including non-consumptive use instead of only the maximum rate of diversion or withdrawal (seasonal quantity and rate), (Art.18).

**(b) Key Actions**

The issue-1 will not be resolved by the amendment of the water code only. Appropriate combination of legal, organizational and financial strengthening of water resources management will be required as was in the advanced countries. Those actions will cover:

**(i) Legal Aspect**

- Amend the relevant article of the water code and IRR;
- Establish a legal basis to make a water resources basin development plan (the Basin Plan) to execute quantitative management of daily and/or seasonal variation of regional water budget (balance) for Pampanga river basin and the strategic river;
- Link legally water rights and the Basin Plan;
- Establish planning technical standards for the Basin Plan;

**(ii) Organizational Aspect**

- Establish NWRB owned reliable and accurate monitoring stations for discharge, ecological flow and water quality at key water conflict areas;
- Strengthen the capacity of NWRB for monitoring and enforcing water rights; and

**(iii) Financial Aspect**

- Strengthen financial capacity of NWRB including annual water charge collection.

**(2) Strategic Issue-2 Enhance Efficient Water Use and Re-allocation of Water Rights**

**(a) Amend Article of Water Code**

The articles of the water code subject to amendment to resolve the issue are set out below.

- Provide articles to link the water permit and the basin water resources development plan (Basic Plan) to enable short and long term quantitative water

rights management with securing water supply reliability;

- Provide an article to establish relevant monitoring stations for transparent and equitable water rights regulation including daily discharge;
- Establish planning standards for the Basic Plan to secure safe bulk water supply to various water uses with a reliable risk; and
- Provide article to enable to reallocate the present water rights title granted to the public entities such as NIA, MWSS and Bulacan Province to the water users such as irrigators and/or water supply companies.

**(b) Key Actions**

The issue-2 will not be resolved by the revision of the water code only. Appropriate combination of strengthening of legal power of water resources management will be required in line with the issue-1. Those actions will cover:

**(i) Legal Aspect**

- Amend relevant articles of the water code and Implementing Regulation and Rules (IRR);
- The key actions for the issue-1 are to be implemented simultaneously;
- Clarify risk of water supply failure of the conflicting water rights to enhance water rights transfer and trading;
- Change the present constant annual water charge system for water permit into different water charge for different supply reliability and seasonal variation; i.e., high charge for high reliability, high season, and longer concession like in Australia;
- Establish reliable assurance and compensation rule for water transfer and trading; and
- Establish IRR and technical guidelines for water transfer and trading.

**(3) Strategic Issue-3 Modify Overlapping Water Charge System**

**(a) Key Actions**

The issue-3 might not be resolved by the revision of the related article of the water code or that of the local government code only. At present the public entities (NIA, MWSS, Bulacan Province) still hold the water rights title which were granted before privatization of NIA and water companies. MWSS re-granted the water permit to the water users, two companies. Bulacan Province also has a plan to re-grant its water right to the water supply providers in the province in the future. NWRB and Bulacan Province are both government entities (in spite national or local). The water permit annual charge and the charge based on the share of the national wealth seem to be overlapping to the water users. However, the purpose of these charges is basically different. The former is national charge on water rights while the latter is a kind of royalty to the natural resources. The LGUs are entitled to charge royalty to the beneficiary as a part of local revenue if necessary based on the LGC. The duplication issue is originated partly from such a condition that the title holders of the water rights are still the government entity. If the water right of the public entities is transferred totally to the water users, the charge by NWRB and the charge by LGU as royalty would not be duplicated. Those actions will cover:

**(i) Legal Aspect**

- Review the overlapping provisions of the local government code with the water code (Art.3&6, IRR Section8), etc;

- Provide an Article in the water code not to allow duplicated layer of granting water permit to public entities; and
- The public entities that have water rights at present independently transfer those to the water users.

**(4) Strategic Issue-4 Achieve Sustainability of Groundwater**

**(a) Key Actions**

The issue-4 will not be resolved by the revision of the water code only. Appropriate combination of legal and organizational strengthening will be required. Those actions will cover:

**(i) Legal Aspect**

- Modify IRR Section 46(Requirement of Drilled Well), item d;

**(ii) Organizational Aspect**

- Empower the groundwater monitoring and enforcing function of the LGUs from the regional interests; and
- Establish a regional monitoring system to monitor regional groundwater level collaborated with EMB and LGUs including quantity and quality.

**(5) Strategic Issue-5 Introduce Specific Law to Enhance Multipurpose Dam Projects**

**(a) Key Actions**

The actions to empower legal arrangements cover:

**(i) Legal Aspect**

- Establish a account for flood control reservoir capacity instead of incidental function for the multipurpose dams;
- Establish a specific law to define an equitable cost allocation rule among public (in particular flood control) and private beneficiaries for multi-purpose projects to reduce dam construction cost share among water users; and
- Link the reservoir operation rule with the cost share of reservoir volume allocation and the flood control basin plan.

**(6) Strategic Issue-6 Enforce to Maintain Environmental Flow**

**(a) Key Actions**

The necessary actions to empower legal arrangements cover:

**(i) Legal Aspect**

- Provide concrete standard, enforcement measures and penalty to breakers in order to execute strict regulation of Art.66, and IRR Section 47; and
- Set up an institution to enforce and monitor all concessionaires to comply with requirement of the minimum stream flows for rivers and minimum water levels for lakes to ensure environmental conservation.

**(7) Strategic issue-7 Strengthen Water Quality Monitoring and Management**

**(a) Present Water Code and Clean Water Act**

Chapter VI Conservation and Protection of Waters and Watershed and Related Land Resources (Art. 66 to Art. 78.) deals with water quality management, where pollutants are defined by the National Pollution Control Commission. The clean water acts govern comprehensive water quality framework. However, there are no specific regulations or

standards for the density of water quality monitoring stations, responsibility of water users, and functions of establishment, operation and maintenance of the water quality monitoring. In particular there is no specific responsibility on the water users in Pampanga river basin to share the cost of water quality monitoring and management.

**(b) Key Actions**

To resolve the issue-7 appropriate combination of institutional, organizational and financial strengthening will be required as was in the advanced countries. Those actions will cover:

**(i) Legal Aspect**

- Execute the key actions for the strategic issues-6 on parallel;
- Establish responsibility and role of water users on the water quality management in the Basin;

**(ii) Organizational Aspect**

- Strengthen the capacity of RBCO, EMB, FMB and related LGUs to execute and enforce water quality management effectively;
- Strengthen the water quality monitoring system;

**(iii) Financial Aspect**

- Increase the fund of DENR to set up monitoring stations and O&M of the monitoring systems; and
- Introduce the beneficiary's pay principle (BPP) for the cost of water quality management.

**(8) Strategic Issue-8 Manage and Mitigate the Risk from Water-related Disasters**

**(a) Key Actions**

The necessary actions to empower institutional arrangements cover:

**(i) Legal Aspect**

- Prepare the flood control basin plan (FCBP) for the severe flood prone areas based on Art.53. of the water code (promote, coordinate protection of flood plain lands, and flood plain management plan by the secretary of DPWH);
- Establish IRR and planning standards for the FCBP;
- Link legally the FCBP with reservoir operation rule of the large dams concerned;
- Amend IRR for the Right-of-way of the public domain of river regime; and
- Reconfirm the definition of the responsibility of O&M of the flood control and river facilities after transfer of the facilities from DPWH to LGUs (MOA).

**(9) Strategic Issue-9 Improve Watershed and Forest Management**

**(a) Key Actions**

The necessary actions to empower organization cover:

**(ii) Organizational Aspect**

- Monitor the progress and outcomes of the ongoing capacity development of the development projects and programs for forest and watershed management financed by JICA and other donors;
- Conduct capacity assessment on the outcomes from the ongoing projects and

programs; and

- Strengthen the execution capacity of the weak functions of FMB and LGUs still remained based on the capacity assessment.

**(10) Strategic Issue-10 Set up Authority to Implement Pampanga River Basin IWRM**

**(a) Key Actions**

The necessary actions to empower organization cover:

**(ii) Organizational Aspect**

- Clarify the necessary functions and missing functions in the existing organizations for IWRM implementation;
- Supplement the function to the line agency (NWRB, DENR) or RDC and execute capacity strengthening for monitoring and execution; and
- Set up an appropriate RBO for Pampanga river basin based on the regional consensus.

**(11) Strategic Issue-11 Strengthen Execution and Financial Capacity for Sustainability**

**(a) Key Actions**

The necessary actions to empower financial capacity cover:

**(iii) Financial Aspect**

- Increase the share of O&M budget for the river facilities in both LGUs and NGAs/RLAs (DPWH);
- Establish specific finances in LGUs for O&M;
- Set up a water users association to advocate sustainable IWRM in the Basin;
- Collect association fee for the O&M of RBO and IWRM; and
- Set up special accounts for sustainable IWRM in Pampanga river basin.

**L.3.3 Amendment of Related Laws, Rules and Guidelines**

Key issues concerned with the present Water Code and the related articles of the Constitution, the Civil Code, and the Local Government Code are recited from Section L.1.3.1. In Section L.3.3.2 the key actions with respect to the institutional aspect are integrated and recompiled out of the key actions in Section L.3.2.2. Prospective key outcomes by the key institutional actions are also briefed in Section L.3.3.2(1).

**L .3.3.1 Constitution, Water Code, Civil Code and Local Government Code**

**(1) The Constitution and Water Code**

Definition and state ownership of water

The national policy on water, as a natural resource, is enshrined in Section 2, Article XII of the Philippine Constitution of 1987. The Water Code of the Philippines (Presidential Decree No. 1067-1976) is the basic water law of the Philippines. It is anchored on the principle that all waters belong to the State. Proceeding from this premise, these waters are not subject to acquisitive prescription.

Separation of water from land

The provisions of Article 6 of the Water Code are a departure from the stipulations of the Civil Code on water. Before their repeal by the Water Code, certain provisions of the Civil Code, particularly those on ownership of waters (Section 503) recognized private ownership of certain categories of water. These laws on the ownership of waters found in private lands are



now expressly abrogated by Article 6 of the Water Code. Other instances of repeal of Civil Code provisions by the Water Code are treated.

#### Improvement of Water Code and Civil Code for Strategic Issue-2

The Water Code enable to lease or transfer of water rights in Article 19 based on Articles 5 and 6. To resolve Strategic issue-2 supplemental provision of article may be necessary to define water rights as tradable property in the Civil Code.

Refer to further details of the Constitution and Water Code in Section L.1.3.1.

### **(2) Local Government Code**

#### Basic Services and Facilities Vested in LGUs

The Local Government Code of 1991 transferred responsibility for public services from the national agencies to local governments in their areas at all levels (provinces, city/municipalities and barangays). The basic services and facilities vested in the LGUs are listed for Barangay, Municipality, Province and City respectively in SEC.17, CHAPTER I of the LGC- of 1991.

#### Public Works and Infrastructures Vested in National Government

Regional offices of national agencies or offices whose functions were devolved to LGUs should also have been phased out. However, sector projects have been still led generally by national agencies in coordination with LGUs due to limitation of funds and resources of LGUs.

#### Share of Local Government Units in the National Wealth

Chapter 2- Share of Local Government Units in the National Wealth (sec. 289 to Sec. 295) of the LGC stipulates details of the share of the national wealth.

Refer to further details of the Local Government Code in Section L.1.1.4 (4).

### **L .3.3.2 Improvement of Water Code and Other Related Laws, Rule and Guidelines**

#### **(1) Improvement of Water Code and Related Rules and Guidelines**

The strategic issues and key actions related with improvement of the water code and other related laws, rules and guidelines in Section L.3.2.2 are re-compiled in Annex-T L.3.3.1. The highlighted actions for the strategic issues-1 to 4 and 6 to 8 are: to establish an effective period of water permit for review by NWRB, to provide clear compensation rule for the loss due to the priority concessionaire in time of emergency; to modify the condition of the amount of water permit to specify concrete seasonal water use schedule; to make a water resources basin development plan (the Basin Plan) for the strategic river basins and to link legally with the water rights; to enable to reallocate the present water right title of the public entities to actual water users; to establish reliable assurance and compensation rule for water transfer and trading; and to prepare the flood control basin plan (FCBP) for the severe flood prone areas and to link legally with the reservoir operation rules of large dams.

With the actions in Annex-T L.3.3.1 the following outcomes would be materialized to cope with the corresponding strategic issues:

- The water resources supply security level in a region or the whole basin will be controlled within the target risk of failure (for Issue-1);
- The regional water rights conflict will be significantly mitigated by the quantitative regulation of the regional water budget covering the aggregated discharge and quantity of more than two water permits in a region where daily or seasonal water diversion conflict prevails (for Issue-1);

## Sector L: Legal and Institutional Framework

- Enforcing power of NWRB will effectively function to regulate over issues or to control of the aggregate rate and quantity of water permit, and the prevailing water rights conflict will be mitigated. Provision of the NWRB owned monitoring system is also essential (for Issue-1);
- Incentive of water saving activities for water users in particular irrigators will be enhanced, the present wasteful consumption of water will be mitigated, and the growing scarcity of water will be mitigated (for Issues-2 & 3);
- The national and local governments will be legally responsible to maintain the sustainability of groundwater (for Issue-4);
- The national and local governments will be legally responsible to monitor the environmental flow and water quality for sustainability of the regional water environment (for Issues-6 & 7);
- The national and local governments will be legally responsible to mitigate regional risks from floods linked with the flood control basin plan (FCBP) (for Issue-8); and
- Flood control function of dam reservoirs will be legally justified to mitigate regional risk from floods linked with the FCBP (for Issue-8).

Details of the background and corresponding outcomes are noted hereunder.

### Verification of Regional Water Supply Security Level

With the foregoing outcomes it will also be made possible to assess if the water shortage in Angat River during the draught period could be mitigated in reality by the construction of the proposed two dams, Balintingon Dam and Bayabas Dam. It will also provide instrumentation to verify quantitatively if the water shortage in the Manila metropolitan area and the related water source area will occur only in time of emergency (extreme draught event) stipulated in Article 22 of the water code or as chronic events.

### Incentive of Water User's Water Saving Activities

The purpose to provide an Article is to enable to reallocate the present water rights title granted to the public entities such as NIA, MWSS and Bulacan Province to the water users such as irrigators and/or water supply companies is to enhance water saving activities (Strategic Issue-2). With this provision the irrigators relied on the irrigation system of NIA will be required to pay the annual water charge for the water permit while NIA will be required by the irrigators to reduce the irrigation facilities fee (IFF) as the balance to the annual water charge to NWRB. NIA is also required to change the charge system of IFF from the unit of irrigation area to the unit of used water quantity.

Those disadvantages will be balanced by the advantages, surplus benefits between the advantages and disadvantages that are estimated to be positive and large based on the experiences in the advanced countries. If the irrigators of NIA system pay the annual water charge regularly it will become a legal evidence of the water use (water rights) and the irrigators would be legally entitled to charge the compensation for the loss induced by the priority of the municipal water supply in time of emergency to the water supply company. The surplus water right which is created by the water saving activities by irrigators can be transferred to the municipal water supply companies with costs by regulation and/or by trading. The surplus water rights will become an income source of irrigators. The irrigators also have an incentive to reduce the water permit charge and/or IFF.

### Legal Basis to Determine Reservoir Operation Rule to Mitigate Risk from Floods

There is a conflict among water users of Angat Dam, and the regional governments and residents concerning how to mitigate the region's flood risks after the flood incident in 2010. The reservoir operation rule during the extreme floods has not been officially established yet for Angat Dam by the Joint Operation and Management Committee (JOMC). It is still pending

in spite of the regulatory arrangements by JOMC due to partly no legal basis on the reservoir operation rule.

The water rights were vested among NIA, MWSS, NPC and Province of Bulacan, but its reservoir operation is conflicted among those water users due to shortage of the dependable flow inside the watershed and the limited storage capacity for flood control during the rainy season. On the other hand the flood control by the reservoir is the significant interests of the regional governments and residents downstream. Water uses in the dry season and flood control in the wet season are mutually tradeoff under its reservoir operation rule. The water users demand the dam operator to keep the reservoir water level at the highest level even just before the rainy season, while the local governments and DPWH in charge of mitigating flood risks demand to keep the reservoir water level at the lowest level. The construction cost of Angat Dam facilities were originally borne by NPC except a part by MWSS for the municipal water supply facilities. Neither storage volume allocation nor cost allocation of the common facilities of the dam was determined among the beneficiaries at the time of the dam commission. In particular flood control function was simply treated as incidental. The downstream residents have enjoyed the incidental flood control benefit without the cost share and the legal basis for the flood control function of the dam. In Japan the flood control function of large dams is defined legally by the allocation of reservoir volume to flood control. The cost allocation for the flood control volume is also shared legally among the concerned beneficiaries in terms of allocation of the common facilities cost of a dam.

In order to resolve the present issue the legal basis to determine the reservoir operation rule of a large dam shall be established by specifying the flood control function of dam reservoir linked with the flood control basin plan (FCBP) in which the regional flood control risk level in a river basin is legally defined. The cost required to keep flood control storage shall be borne by the public entity concerned.

## (2) **Specific Multipurpose Dam Law and Civil Code**

The key actions related with the strategic issue-5, introduction of specific multipurpose dam law presented in Section L.3.2.2 are compiled in Annex-T L.3.3.2. The issue-5 and the issue-8 (Manage and Mitigate Risks from Water-related Disasters) are mutually correlated. The highlighted actions for the strategic issues-5 and 8 are: to introduce specific law to define an equitable cost allocation of multipurpose dams; to establish flood control account for multipurpose dams; and to define water permit as tradable property in the civil code.

With the actions to resolve the strategic issue-5 and 8 the following outcomes would be materialized:

- Multipurpose dam projects will be enhanced based on the legal basis on the cost and reservoir volume allocation rule among multiple water users including both public and private sectors (Issue-5);
- The national and regional government will be legally responsible to share equitably the cost of flood control function of dam reservoirs with water users to mitigate regional risks from floods linked with the flood control basin plan (Issue-5 & 8); and
- Water permit will be defined as property or asset which can be treated as guaranty in the civil code (Issue-5).

The heavy cost burden owing to the reservoir operation rule for flood control function of a large dam will be equitably mitigated by the cost share by the relevant national and local governments.

### **L.3.4 Capacity Improvement of Organizations**

Section L.3.4.1 briefs the result of the capacity assessment of the existing line agencies and LGUs for respective sector roles: planning of provincial governments and integrated area development, water resources management, irrigation, municipal water supply, sanitation and sewerage, flood control and

## Sector L: Legal and Institutional Framework

mitigation of natural disasters, forest and watershed management, water quality management, and mitigation of sediment disaster and soil control.

The key actions related with the capacity strengthening of the line agencies and LGUs in Section L.3.2.2 are integrated and recompiled from the organizational aspect, and presented in Section L.3.4.2 only for the organizations for which capacity strengthening is assessed necessary. Section L.3.4.3 presents the key actions required for capacity development of the missing functions focusing on the functions of river basin organizations.

### **L .3.4.1 Capacity Assessment of Existing Line Agencies and LGUs**

#### **(1) General**

Under the decentralization and rationalization policies, the present institutional arrangements for the functional relationships among the national government agencies and local governments are still in transition. The roles of the national government and local governments have not been unified, and those vary depending on the sector policy and prevailing conditions. Annex-F L.1.2.2 illustrates the present functional relationships among the water related national government agencies and local governments. The illustrated relation is still progressive as of March 2010,

#### **(2) Planning of Provincial Governments and Integrated Area Development**

Planning of the provincial government is well executed by the provincial planning and development office (PPDO) under LGC of 1991. Integrated area development approach has been well deployed for integration and prioritization of inter-provincial and inter-municipal development projects under Regional Development Council (RDC) of Region III. The role of RDC is the policy coordination and decision-making body in the region. The functions of RDC are formulation of development plans and investment programs, project monitoring, and budgeting and investment programming. The organization structure of RDC Region III is illustrated in Annex-F L.3.4.1.

No specific issues were identified to empower the existing PPDO and RDC management through the steering committee meetings, technical working group meetings and stakeholder consultations except missing functions for IWRM Plan implementation.

#### **(3) Water Resources Management**

The various issues identified for water resources management include (refer to Section 5.7 and Section 8.4 of the Main Report):

- (d) Risk of failure of sustainable water sources for the municipal water supply in the region including groundwater;
- (e) Risk of failure of securing water sources for expansion of large irrigation system;
- (f) Inadequate reliability of water supply in Angat-Umiray System; and
- (g) Expected increase of conflict among water users, municipal and irrigation water, and hydropower generation.

Both legal and organizational empowerment is required to resolve these issues.

#### **(4) Irrigation**

In irrigation sector National Irrigation Administration (NIA) plays a main role of implementation, operation and maintenance of the nation's irrigation systems in collaboration with local governments except private irrigation systems (refer to present status of the irrigation sector in Section L.1.2.3 (2)).

No specific issues were identified to empower the existing irrigation management through the steering committee meetings, technical working group meetings and stakeholder consultations (refer to Section 5.2 and Section 8.2 of the Main Report). Water rights of irrigators are weak in Pampanga river basin.

**(5) Municipal Water Supply, Sanitation and Sewerage**

Annex-T L.1.2.3 illustrates the institutional structure of domestic and municipal water supply and sanitation among national government agencies and local governments. The NWRB, Metropolitan Water Works and Sewerage System (MWSS), Local Water Utilities Administration (LWUA) and LGUs are regulatory agencies for water supply (refer to present status of the water supply and sanitation sector in Section L.1.2.3 (1)).

No specific issues were identified to empower the existing urban and rural water supply management in Pampanga River through the steering committee meetings, technical working group meetings and stakeholder consultations except implementation of sewerage system (refer to Section 5.3 and Section 8.3 of the Main Report).

**(6) Flood Control and Mitigation of Natural Disasters**

Flood control requires a river basin approach participated with multiple government agencies. Annex-T L.1.2.4 illustrates the institutional structure of national government agencies in flood control. The DPWH has played a main role in flood control and oversees its national and regional projects (refer to present status of the flood control and natural disasters sector in Section L.1.2.3 (3)).

No specific issue was identified to empower the existing flood control and natural disaster management in Pampanga River through the steering committee meetings, technical working group meetings and stakeholder consultations except O&M of the river facilities (refer to Section 5.4 and Section 8.4 of the Main Report).

The issue of the reservoir operation of the multipurpose dam, mostly operated by NPC and NIA, is identified to improvement for both during draught period and during extreme floods incidence (refer to Section L.3.2.2).

**(7) Forest and Watershed Management**

Annex-T L.1.2.5 illustrates the regulatory functions and corresponding responsible national government agencies and LGUs in watershed and forest management. Pursuant to Executive Order No. 192 (10 June 2007), the DENR is the primary government agency responsible for the conservation, management, development and proper use of the environment and natural resources, including forests and watershed areas through the Forest Management Bureau (FMB) (refer to present status of the flood control and natural disasters sector in Section L.1.2.3 (4)).

The legal and organizational framework of forest and water shed management is well defined. The issue identified is how to empower the executing capacity at site with collaboration with RBCO, FMB, LGUs, NIA and NPC (refer to Section 5.5 and Section 8.5 of the Main Report).

**(8) Water Quality Management (fresh water, coast water)**

The Clean Water Act (CWA), RA No. 9275-2004 provides, among others, that DENR in coordination with NWRB shall designate certain areas as water quality management areas using appropriate physiographic units such as watersheds, river basins or water resources regions (refer to present status of the flood control and natural disasters sector in Section L.1.2.3 (5)).

The issue identified is how to empower the monitoring system and the executing capacity with collaboration with RBCO, EMB, LGUs and related line agencies through the steering committee meetings, technical working group meetings and stakeholder consultations (refer to Section 5.6 and Section 8.6 of the Main Report).

**(9) Mitigation of Sediment Disaster and Soil Control**

The Bureau of Soils and Water Management (BSWM) under the Department of Agriculture (DA) remains responsible for the assessment, development and preservation of existing and potential soil and water resources for agriculture.

## Sector L: Legal and Institutional Framework

No specific issues were identified to empower the sediment disaster and soil control management in Pampanga river basin through the steering committee meetings, technical working group meetings and stakeholder consultations (refer to Section 5.4 and Section 8.4 of the Main Report).

### L .3.4.2 Key Actions to Strengthen NGAs/RLAs and LGUs

The national government agencies (NGAs) and the local government units (LGUs) subject to legal amendment and capacity improvement based on the organizational capacity assessment in Section L.3.4.1 are summarized in Table L.3.4.1.

**Table L.3.4.1 Countermeasures and Corresponding NGAs/RLAs and LGUs for Empowerment**

Key IWRM Issues	Countermeasures	NGAs/RLAs and LGUs for Empowerment
1. Water rights allocation	Revision of water code, etc.	NWRB
	Capacity development	NWRB, DENR
2. Water quality management	Capacity development	EMB/DENR, LGUs
3. Flood control: Right of way	Revision of water code, etc.	PMO/DPWH, LGUs, NWRB
	Land use law	NEDA, LGUs
3. Flood control: O&M cost	Capacity development	DPWH, DPWH-Region III, LGUs
	Establish RBO	NEDA-Region III, RBCO/DENR, DPWH, NIA
4. Watershed and forest management	Capacity development	RBCO&FMB/DENR, LGUs
5. Localize, implement, O&M of IWRM Plan from regional interests	Capacity development	NEDA-Region III, RBCO/DENR, NWRB, DPWH, NIA, LGUs
	Establish RBO	NEDA Region III, LGUs, RBCO/DENR, DPWH, NIA, RDC Region III, LGUs

Source: JICA Study Team

The key actions and the strategic issues related with the capacity strengthening of NGAs/RLAs and LGUs in Section L.3.2.2 are re-compiled in Annex-T L.3.4.4.

### L .3.4.3 Capacity Building of Missing Functions for IWRM

#### (1) Mission and Functions for IWRM

To which extent the mission of the IWRM is to be targeted? The IWRM mission covering the three key management elements is recommended to apply to Pampanga river basin among the three options presented in Section L.2.1.3 (refer to Figure L.2.1.1).

The IWRM mission at any level is made functional provided with an essential support of monitoring system and database system for scientific and equitable coordination and management.

To achieve the mission of the foregoing IWRM the following functions are envisaged to be introduced (Refer to Issue-1, Issue-10 & Issue-11 in Table L.2.3.1):

- To make IWRM policy and plan, coordinate, localize the IWRM Plan;
- To implement and maintain the IWRM Plan including key water-related projects and corresponding operation and maintenance;
- To regulate and monitor water rights;
- To prepare water resources development plan for the basin's water rights;
- To advocate IWRM and monitor water and watershed environment; and

#### (2) Definition of Missing Functions under Existing Organizations

Creation of new agencies is not encouraged in Region III because the existing instrumentalities of the bureaucracy are very capable and in better position to implement IWRM initiatives. New entities may only be created out of the abolition of existing ones or merger of two or more government organizations under scrap-and build principle. The role of RDC is the policy coordination and decision-making body in the region. The functions of

RDC are formulation of development plans and investment programs, project monitoring, and budgeting and investment programming. Integration and prioritization of development projects can be handled by RDC.

The mission and functions of the IWRM will not be materialized in Pampanga river basin by the capacity strengthening of the existing organizations presented in Section L.3.4.2 and Section L.3.4.3 only. The questions related with the missing functions are:

- Who will maintain and manage the IWRM Plan for Pampanga river basin after the JICA Study?
- Who will take charge of overseeing, advocating, localization and maintenance of the IWRM Plan for Pampanga river basin?
- How the NWRB regulates the water rights conflicts which could be more serious in the future?
- Who will take charge of the financial burden of implementing IWRM in practice?
- How to authorize publicly a core or apex regulating organization with relevant mandates without creation of a conflicting layer of authority?

RBO will be designed to take charge of the missing functions identified in Section L.3.4.3 (2), and it is also envisaged to answer to these questions.

### (3) Options of River Basin Organization

#### Description of Options

The TWG Meetings (February 24, 2010), Stakeholder Consultation (March 11, 2010) and Focus Group Discussion (March 17, 2010) were executed to discuss about the IWRM mission, the position of the regional water governance, the type, functions and options of river basin organization (RBO) (refer to Section L.2.1 and L.2.2). The advantages and disadvantages of the three of options, RBO under RBCO/ DENR, River Basin Committee (RBC) of RDC, and an independent River Basin Council (RBC) are summarized in Table L.3.4.2. The organization charts for the three options are illustrated in Annex-F L.3.4.2 for RBO under RBCO, Annex-F L.3.4.3 for RBC of RDC and Annex-F L.3.4.4 for independent RB Council respectively. The position of water rights regulation of NWRB is illustrated in Annex-F L.3.4.5.

**Table L.3.4.2 Advantages and Disadvantages of three RBO options**

RBO Option	Advantage	Disadvantage
RBO under RBCO/DENR	-Strong integration of watershed, forest and water quality management under DENR; -Strong mandate under President Office; -Budgetary allocation from DENR;	-Weak leadership of LGUs; -Unclear function of water rights regulation; -Weak technical capacity at field works; -Potential overlapping functions with RDC -Implementation by NGAs/RLAs and LGUs is required because RBO has no execution function;
RBC of RDC	-Strong coordination by the existing RDC without overlapping authority; -NWRB keeps function of water rights regulation; -RDC leadership of IWRM Plan and investment programs;	-Implementation by NGAs/RLAs and LGUs is required because RBO has no execution function; -Weak technical capacity at field works; -Present MOA for O&M of Pampanga Delta FCF does not work well;
Independent RBC	-Strong advocacy power with the regional interests; -NWRB keeps the function of water rights regulation;	-Implementation by NGAs/RLAs and LGUs is required because RBO has no execution function; -O&M Budgetary allocation by LGUs and NGAs/RLAs;

Source: JICA Study Team

### Description of River Basin Committee of RDC Region III

The attendants of the Focus Group Discussion supported the River Basin Committee proposed by NEDA region III under RDC Region III as the best option among the three options. It is still not final but is subject to the review and decision by the steering committee.

The mission and functions of IWRM recommended by the Study Team separates basically the function of RDC from the functions of IWRM; the policy coordination and decision-making on the area development projects in the region.

The advantage of the RBC of RDC is that advocate and maintenance of the IWRM Plan for Pampanga river basin can be executed under the strong coordination by the existing RDC without overlapping authority, while the implementation of the project plans and programs will remain under the jurisdiction of concerned LGUs, RLAs, or Government Owned and Controlled Corporation (GOCC). The RBC will lead in the advocacy for the adoption of the IWRM Plan in the respective plans and investment programs of the bureaucratic levels. Working together, Pampanga river basin-IWRM Plan implementation will be the joint and collective responsibilities of all the sectors concerned.

Its disadvantage is that the technical execution capacity at field works is weak and a financial support from the national government agency is not available because the RBC is independent from NGAs.

#### **L .3.4.4 Design of River Basin Committee**

##### **(1) Objective of River Basin Committee**

The objective of the Pampanga River Basin Committee setup under the Regional Development Council of NEDA Region III, hereinafter referred to as the Committee is to materialize the IWRM Plan for Pampanga river basin (Pampanga river basin-IWRM) in collaboration with the implementing line agencies and local governments. The mission of the IWRM for Pampanga river basin is to manage the whole water resources and environment for securing safe water supply, safety against flood and other natural disasters, and water quality by a river basin unit in line with the National IWRM Plan Framework (November 2006).

##### **(2) Territorial Jurisdiction**

The Committee shall have jurisdiction over all the area within Pampanga river basin from the origins to the estuaries.

##### **(3) Allocation of Power and Functions for Implementing IWRM**

Key national government agencies (NGAs) are responsible for sector policy, planning, implementing and monitoring of national projects, and regulatory function specific to their jurisdiction. Local Governments at all administrative levels retain de facto responsibilities of public utilities including water supply and sanitation for policy, planning, and regulatory functions specific to their jurisdictions, through respective Local Government Units (LGUs). The NGAs also takes charge of the public works and infrastructure projects and other facilities, programs and services funded by the National Government Appropriation Act, other special laws, pertinent executive orders, and those wholly or partially funded from foreign sources.

The Regional Development Council (RDC), a policy coordination and decision-making body regulates and approves inter-provincial and government loan projects (refer to Annex-FL3.4.1). The NEDA requires endorsement for implementation from the concerned all provinces for the RDC's approval. The secretariat of RDC is NEDA.

The Committee takes charge of the decision making and coordination at the level of committee specific to the mission of the IWRM for the Pampanga river basin-IWRM only which is not included in the existing functions of NGAs/RLAs, LGUs and RDC: to make policy and plan, to monitor, oversee and coordinate, and to secure funding to conduct activities for Pampanga river basin-IWRM, while NGAs, RLAs and LGUs are responsible to



implement the decision of the Committee specific to Pampanga river basin-IWRM (refer to Annex-FL 3.4.3).

The provincial river basin sub-committee is an option that is able to be established depending on necessity of respective provinces.

**(4) Power and Functions of the Committee**

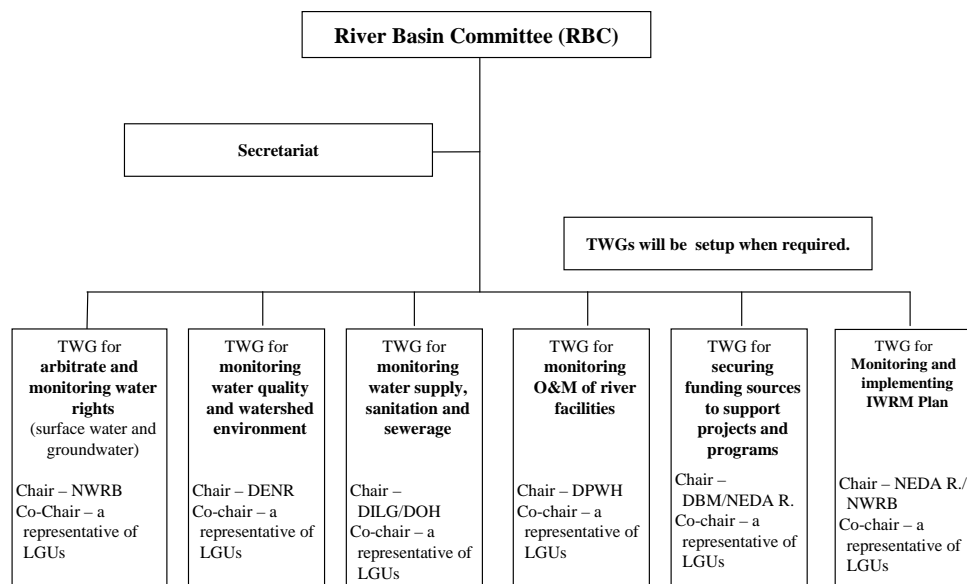
The Committee has a power of decision on its functions at the level of committee of RDC. However RDC Region III has authority to reverse the decision.

The Committee shall perform the following functions:

- To make Pampanga river basin-IWRM policy and plan, coordinate, localize the IWRM Plan;
- To oversee and coordinate the implementation of Pampanga river basin-IWRM Plan;
  - To arbitrate (resolve issues/conflict) and monitor water rights;
  - To regularly review and update water resources development plan based on the monitoring data;
  - To advocate Pampanga river basin-IWRM and monitor water quality and quantity and watershed environment;
  - To monitor O&M of the river facilities;
- To secure funding sources to support the activities for Pampanga river basin-IWRM;
- To establish, to supplement or to scrap Technical Working Groups (TWG) for specific purposes which support the Committee such as providing necessary information and technical advocating and monitoring activities including data collection, clarification and analyses;
- To enforce the committee members (LGUs, RLAs, NGAs, NGOs) to execute the specific tasks as determined by the Committee;

**(5) Organizational Structure and Secretariat**

The Committee shall be composed of members, a chairperson, a co-chairperson, vice chairperson, secretariat and TWGs as shown in Figure L.3.4.1.



Source: JICA Study Team

**Figure L. 3.4.1 Organizational Structure of River Basin Committee**

## Sector L: Legal and Institutional Framework

The members of the Committee are composed of major stakeholders in the water related sectors. The members, the chairperson, the secretariat, the technical working groups and the term are as follows<sup>1</sup>:

- Member of the Committee; Provincial governors (7 provinces), Regional Directors of the Technical Secretariat (6), NWRB, DA, RBCO, NPC<sup>2</sup>, a representative of NGOs<sup>3</sup>, a representative of private sector, etc. inside Pampanga river basin,
- Chairperson of the Committee; a representative elected from the provincial governors by all the Committee members,
  - Co-chairperson; a representative of NGO<sup>4</sup>,
  - Vice chairperson; NWRB or RBCO/DENR<sup>5</sup>,
- Secretariat to the Committee; NEDA Region III,
- Technical Working Groups (TWGs); to be established as required,
  - Chairpersons of TWGs: a representative from the concerned NGAs/RLAs and other stakeholders such as NEDA Region III, NWRB, DENR, DILG, DOH, DPWH, DBM, NIA, NPC, LGUs, NGOs, private sectors, etc.,
  - Co-chairperson of TWGs<sup>6</sup>; a representative from LGUs or NGO,
- Term of chairperson, co-chairperson and vice chairperson: the same as the RDC chairperson (4 years) or power sharing (2 years).

### (6) Responsibilities of the Committee Members

The organizations represented by the Committee members are responsible to execute the specific tasks as determined by the Committee and to contribute to the relevant TWG activities.

### (7) Responsible Activities

#### (a) The activities of the Committee

The Committee is responsible to conduct the functions of the Committee (refer to Item (4)), to organize and to operate the committee meeting with support of the secretariat and the TWGs.

#### (b) The Activities of the Member Regional Line Agencies, the Member Local Government Units, NWRB, NPC

- (i) All the members of the Committee (the member Regional Line Agencies, the member Local Government Units, NWRB, NPC, NGOs) and the TWGs are responsible to conduct the relevant activities of the TWG as determined by the Committee.
- (ii) All the members of the Committee are responsible to conduct the relevant

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<sup>1</sup> Those will be subject to clarification by the RDC.

<sup>2</sup> The Region III, Central Luzon Region is comprised of 7 Provinces of Tarlac, Nueva Ecija, Pampanga, Zambales, Bulacan, Aurora and Bataan, and 5 cities of Angeles, Cabanatuan, Olongapo, Palayan, and San Jose (Nueva Ecija) with 2 Regional Centers, San Fernando and Pampanga. NEDA, DENR, DILG, DOH, DPWH (including BRS), DBM are included as the Regional Directors of the Technical Secretariat in the Committee. NWRB, DA, NPC and RBCO are also supplemented as the committee members. Legal basis will be necessary to include as the members the provinces and cities which are inside Pampanga river basin but are not included in the Region III.

<sup>3</sup> People's Organizations are treated as one of NGOs.

<sup>4</sup> Option of Co-chairperson is suggested in the focus group discussion (FGD), but possibility of NGO representative is subject to clarification if NGOs have mandate.

<sup>5</sup> Option of Vice-chairperson is suggested in the FGD to support the chairperson because the IWRM requires technical support.

<sup>6</sup> Option of Co-chairperson is suggested in the FGD to share the responsibility between NGAs and LGUs.

activities of the relevant tasks based on the functions specific to their jurisdiction by the use of respective funds as determined by the Committee.

**(8) Allocation of Operation Cost of the Committee and the Specific Tasks**

The operation cost of the Committee is composed of the secretariat operation cost, the office operation (rent, utilities, office facilities, etc.), meeting costs of the Committee, and activity cost of the TWGs.

The operation cost of the Committee shall be allocated among the members of the Committee depending on the relevant tasks.

**Table L.3.4.3 Allocation of Operation Cost of RBC**

Task	Responsible Operation Cost
Secretariat	NEDA Region III
Office space including utilities, etc.	NEDA Region III
Meeting costs	Shared by NEDA Region III & other member organizations
Activities of TWGs	Concerned RLAs, LGUs and NGAs

Source: JICA Study Team

The cost of the activities and the meeting of TWGs shall be responsible to the concerned RLAs, LGUs and NGAs. (subject to confirmation)

The cost of the specific tasks and activities of the implementing organizations (RLAs, LGUs and NGAs) which are determined and enforced by the Committee shall be responsible of the concerned implementing organizations.

**(9) Technical Working Groups**

The technical working groups (TWGs) listed below shall be established to support the relevant functions and activities of the Committee. The Committee is able to supplement or to scrap the TWGs depending on the necessity.

- IWRM Plan (Chair NWRB/NEDA Region III): make Pampanga river basin-IWRM policy and plan, coordinate, oversee to localize, to implement and to maintain Pampanga river basin-IWRM Plan,
- Water Right Arbitration (Chair NWRB): prepare water resources development plan for the basin's water rights, and monitor water rights regulation and enforcement (surface and groundwater),
- Monitoring Water Quality and Watershed Environment (Chair DENR): advocate IWRM in coordination with NWRB and monitor water quality, ecosystem and watershed,
- Monitoring Water Supply, Sanitation & Sewerage (Chair DILG/DOH): monitor implementation, operation and maintenance of water supply, sanitation and sewerage projects,
- O&M of River Facilities (Chair DPWH): operate and maintain river facilities,
- O&M Costs (Chair NEDA Region III/ DBM); monitor to secure availability of O&M cost for the Committee, the river facilities and the monitoring facilities.

**(10) Monitoring System**

It is necessary to establish a set of monitoring systems for surface water, ground water and an information system for management and data sharing. The role of NGAs/RLAs and LGUs for the monitoring systems is as set out below.

**Table L.3.4.4 Role of NGAs/RLAs and LGUs for Monitoring System**

Organization	Information System	Surface Water	Groundwater
NWRB	Specific system for Angat Dam reservoir operation	Water Rights Regulation/ Discharge gauging at key stations	Water Rights/ Regulation, Monitoring regional water level
NIA/MWSS/NPC	Share of OM costs, data	Water use recording, system OM	
BRS	Share of data	Discharge gauging under the mandate of BRS	
PAGASA	Weather & FFWS	Rainfall recording, FFWS, system OM	
LGUs	Share of OM costs, data		Recording & system OM
DENR/DOH	Share of OM costs, data	Water quality, Ecology & system OM	Water quality & system OM

Source: JICA Study Team

### (11) Implementation Guidelines

The TWGs shall prepare the implementing guidelines to execute smooth operation of the Committee and the TWGs in consultation with the stakeholders.

### (12) Legal Basis

The power and functions of the Committee and the source of funds to implement the Committee, the TWGs and the specific tasks of the executing organizations shall be appropriated by MOAs or Executive Order. In the long term enactment of Republic Act will be targeted.

## L.3.5 Strengthening of Financial Capacity for Sustainable IWRM

### L .3.5.1 Key Actions to Strengthen Financial Capacity

The Strategic issues and key actions to strengthen financial capacity for sustainable IWRM of the line agencies and local government units are re-compiled in Annex-T L.3.5.1. The key actions are namely: to empower the financial capacity of NWRB; to increase the fund of DENR for water quality monitoring; to introduce the beneficiary's pay principle and to collect funds from the proposed Pampanga river basin-Water Users Association; to increase the share of DPWH O&M budget for the river facilities; and to set-up special accounts for sustainable Pampanga river basin-IWRM.

### L .3.5.2 Fund Sources for Sustainable IWRM

#### (1) General

How to materialize the financial sustainability for Pampanga river basin-IWRM is one of the biggest challenges in the prevailing policy of the Philippines. To achieve the financial sustainability sources of the necessary funds, method of collection and allocation of the funds are to be clarified. In-depth discussion and concrete actions will be necessary about this agenda during the course of implementing Pampanga river basin-IWRM.

#### (2) Potential Fund Sources

There are various potential fund sources for the activities of RLAs, LGUs and NGAs and for operating the River Basin Committee (RBC). Enacting the Republic Act or an Executive Order is a definitive solution but it may be not practicable. The concerned National and Regional Line Agencies and LGUs will be required to find new fund sources by themselves. Potential fund sources are listed below as an example.

##### (a) For the Activities of RLAs, LGUs and NGAs for Pampanga river basin-IWRM

- 1) Annual operation and maintenance (O&M) budget for the infrastructures such as dikes, pumping stations, flood gates, dredging, etc. of NGAs/RLAs and LGUs
- 2) Revenue in General Accounts of
  - a. Exploitation fee/royalty of LGUs: gravels and sands, mining, floating logs, fish

culture, etc.

- b. Annual water charge for water permit (municipal, fisheries, livestock, irrigation, power generation, industrial, recreation, others) of NWRB
- c. Land tax from new lands created by coastal reclamation, former channel reclamation, etc. of LGUs
- d. Utilization fee of the area inside the river regime (parks, tennis court, baseball ground, school ground, driving school, golf course) of LGUs

3) Financial Aid Program (Sector loan for rehabilitation of river facilities)

**(b) For Operating the Committee**

1) Allocation of the revenue of the General Accounts

- a. Exploitation fee/royalty of LGUs
- b. Annual water charge for water permit

2) Water user's association fee

Annual water charge for water permit collected by NWRB is the revenue of DBM at present but some portion of the charge may be allowed to be allocated to the specific purpose of water resources management and water rights regulation. The utilization of the area inside the river regime is a potential source of the public land use. Fee from the water user's association of industries and factories is also a potential source.

**(3) Collection and Allocation**

Potential methods of collecting necessary funds and allocating collected funds are listed as follows:

- (a) Increase the share of the O&M budget of DPWH for the river facilities which is much smaller than that of highways and roads, of NIA for the irrigation facilities (IFF is not sufficient), and of DENR for the monitoring systems
- (b) Make a part of the revenue in the general accounts as a special account for the O&M: items a, b, c, d
- (c) Collect strictly the annual water charge for water permit based on the beneficiaries' pay principle (BPP) from the organization which does not pay now, such as NIA, NPC, etc. It can be used as a fund to establish and operate water right monitoring and enforcement. The annual charge for hydropower use is generally highest from BPP in the international standard.
- (d) Establish water user's associations for the new RBC and collect association member fee for commercial and industrial activities (hydro-electric power, fish culture, river – water tourism, navigation, plant, agriculture, etc) based on the BPP for the operation and maintenance of monitoring systems and preservation activities of water environment in the river basin as is in some European countries.

**References**

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- 12) Item 10 (3) River basin organization of Minute of Meetings on Implementation Arrangement of the Study (March 14, 2008)

# *Annex-Tables*





Annex-T L.1.1.1 (1/2) Water Sector Laws and Policies

National Legislation and Policies	Salient Provision
Republic Act No. 6324 of 1971	Creating the MWSS and making it responsible for water supply in Metro Manila. In 1997, the MWSS was privatized with the management and operations transferred to MWSI and MWCI under a 25-years concession contract.
Presidential Decree No.198 of 1973 (Provincial Water Utilities Act as amended)	Creating the LWUA and the local WDs. It established LWUA as the government resources provider and the WDs as the local water service providers. It is also gives authority to LWUA as a specialized lending institution for, and provides technical and training assistance to the WD's.
Presidential Decree No. 424 of 1974 (National Water Resources Council-NWRC Charter)	Creating the NWRC, now the NWRB, to coordinate the planning of some 30 water resources agencies of the government.
Presidential Decree No. 856 of 1975 (Sanitation Code of the Philippines)	Codifying and enforcing the various sanitation policies of the government including standards for water supply, food processing and servicing, sanitary facilities, sewerage and sewage management, markets and abattoirs, industrial hygiene and funeral parlors.
Presidential Decree No.1067 of 1976 (Water Code of the Philippines, as amended)	Provides the framework for complementing the provisions of the constitution on water resources development and management with regard to water quality. This includes the rule governing the rights and obligation of water uses as well as the administrative structure to enforce the provisions of the water code. The code adopts prior appropriation doctrine of "first in time, first in right" for water allocation.
Presidential Decree No.1152 of 1977 (The Philippine Environmental Code)	Provides the comprehensive program on environmental protection and management covering air, water quality, land use, natural resources and waste management for fisheries and aquatic resources; wildlife; forestry etc.
Presidential Decree No. 1206 of 1977 (Public Service Law)	Mandates NWRB to supervise, control and regulate all water utilities except those falling under the jurisdiction under the MWSS and the LWUA. EO 123 of September 2002 mandates NWRB to approve tariffs of local water districts.
The Philippine Constitution of 1987	Provides the basic principles of water resources development and management, which stipulate that all water of the Philippines belong to the states.
Executive Order No. 292 of 1987 (The Administrative Code)	Vested the President with residual powers to reorganize the Executive Branch.
Executive Order No. 124-A of 1987	Converted NWRC into the NWRB.
EO 192 of 1987 (Department of Environmental and Natural Resources-DENR Charter)	Provides for the organization of the DENR as the lead agency in, among others, promulgating the (a) rules and regulation for the control of water, air and land pollution, and (b) ambient and effluent standards for water and air quality.
Executive Order No. 215 of 1987	The first legal framework for privatization of power projects by President Corazon Aquino resulting in the implementation of about 20 power projects.
Republic Act No. 6957 of July 1990	Authorized the financing, construction, operation and maintenance of government infrastructure projects by the private sector resulting in the implementation of only two projects.
Republic Act No. 7160 of 1991 (Local Government Code)	Defines the function and powers of LGUs) i.e., provinces, cities, municipalities and barangays, in environmental protection. R.A No.7160 mandates LGUs to undertake watershed- related activities, initially confined to community- based management (CBFM) social forestry and watershed projects. Since then, a number of environmental functions of various NGAs have been developed to LGUs.

Annex-T L.1.1.1 (2/2) Water Sector Laws and Policies

<b>National Legislation and Policies</b>	<b>Salient Provision</b>
Republic Act No. 7718 of April 1994 (The Philippine BOT Law)	Amending certain sections of Republic Act No. 6957-1990, entitled “An Act Authorizing the Financing, Construction, Operation and Maintenance of Infrastructure Projects by the Private Sector, and for Other Purposes”.
National Water Crisis Act of 1995	Provided the legal basis for the privatization of the MWSS in 1997.
Executive Order No. 123 of September 2002 (Reconstructing the NWRB)	Straightening the NWRB including assumption of LWUA’s WD tariff approving authority.
Republic Act No. 9206 of 2003 (General Appropriation Act)	Reenact, authorize the President to direct changes in the organizational units or key positions in any department or agency, and require all department/agencies of the Executive Branch to conduct a comprehensive review of their respective mandates, missions, objectives, functions, programs, projects, etc., and to improve government’s service delivery and productivity.
Republic Act No. 9275 of 2004 (Philippine Clean Water Act)	Provisions for comprehensive water quality management. It also provides the framework for sustainable development to achieve a policy of economic growth in a manner consistent with the protection, preservation and revival of the quality of fresh, brackish and marine waters. The passage of R.A 9275 is also the first attempt to consolidate different fragmented laws of the Philippines on water resources management and sanitation.
Executive Order No. 279 of February 2004	Instituted reforms in the financing policies for the water supply and sewerage sector and water service providers; rationalizing the LWUA’s organizational structure and transferring it to the Office of the President.
Executive Order No. 366 of October 2004 (Strategic Review of the Operations of the Executive Branch)	Directing to all Department Secretaries a strategic review of the operations of the Executive Branch and providing options and incentives for government employees who may be affected by the rationalization of the functions and agencies of the Executive Branch.
Executive Order No. 387 of November 2004	Transferred LWUA from the Office of the President to DPWH.
Executive Order No. 421 of April 2005	Refocusing LWUA’s functions and organizational structure as envisioned in EO 279.
Executive Order No. 510 of March 2006 (Creating River Basin Control Office)	Creating River Basin Control Office (RBO) in DENR. RBCO has power and function, together with DPWH, to rationalize the various existing river basin projects such as: Mt. Pinatubo Hazard Urgent Mitigation, Iloilo Flood Control, Lower Agusan Flood Control, Bicol River Basin and Watershed Management, etc., to develop a national master plan for flood control together with DPWH and National Disaster Coordinating Council, to rationalize and prioritize reforestation in watersheds, and to perform other functions as President and DENR secretary may direct.

Annex-T L.1.2.1 (1/3) Mandate of Key Government Agencies in Water Resources Management

<b>Unit of Government</b>	<b>Line Bureau or Concerned Agency</b>	<b>Responsibility / Concerns Related to Water</b>
1. National Economic and Development Authority (NEDA)	Infrastructure Staff	Formulates and approves policies on water resources, and coordinate social and development planning as the government central planning body
	Regional Development Councils (RDCs)	Sets direction of economic and social development in region through which regional development efforts are coordinated
	Investment Coordination Committee/NEDA Board	Evaluates/appraises/approves major development projects
2. Office of the President (OP)	National Water Resources Board (NWRB)	Coordinates and regulates water activities in the country; supervise and regulates operations of water utilities outside jurisdiction of LWUA and MWSS; formulates and recommends policies on water resources
	The National Commission on Indigenous Peoples (NCIP)	Protects and promotes the interest and well-being of the Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) with due regard to their beliefs, customs, traditions and institutions
3. Department of Public Works and Highways (DPWH)	Metropolitan Waterworks and Sewerage System (MWSS)	Constructs, maintains and operates domestic/municipal water supply and sewerage projects in Metro Manila and Contiguous areas including watershed management
	Bureau of Research and Standards (BRS)	Undertakes hydrological survey and data collection
	PMO - Major Flood Control Projects (PMO-MFCP)	Manage the planning, design, construction, operation and maintenance of major flood control projects
	PMO - Rural Water Supply (PMO-RWS-CARP)	Manage the planning, design, construction, operation and maintenance of foreign-assisted rural water supply projects
	PMO - Small Water Impounding Projects (PMO-SWIM) devolved to LGUs	Manages the planning, design, construction, operation and maintenance of locally-founded and foreign assisted SWIM projects
4. Department of Agriculture (DA)	National Irrigation Administration (NIA)	Undertakes program-oriented and comprehensive water resources projects for irrigation purposes as well as concomitant activities such as flood control, drainage, land reclamation, hydropower development, watershed management, etc.
	Bureau of Soils and Water Management (BSWM)	Undertakes assessment, development and conservation of existing and potential soil and water sources for agriculture; undertakes cloud seeding activities
	Bureau of Fisheries and Aquatic Resources (BFAR)	Formulates plans for the proper management, accelerated development and proper utilization of country's fisheries and aquatic resources
5. Department of Energy (DOE)	National Power Corporation (NPCOR/NPC)	Develops electricity power generation facilities including hydroelectric and geothermal power; constructs dams, reservoirs, diversion facilities and plants and watershed management
	National Electrification Administration (NEA)	Promotes, encourages and assists public service entities to achieve service objectives, implements
	Office of Energy Affairs (OEA)	Promotes development of indigenous energy resources such as mini-hydro projects

Annex-T L.1.2.1 (2/3) Mandate of Key Government Agencies in Water Resources Management

<b>Unit of Government</b>	<b>Line Bureau or Concerned Agency</b>	<b>Responsibility / Concerns Related to Water</b>
6. Department of Environment and Natural Resources (DENR)	Environmental Management Bureau (EMB)	Formulates environment quality standards for water, air, land, noise and radiation; approves environmental impact statements and issues Environmental Compliance Certificate
	Mines and Geo-Science Bureau (MGSB)	Manages, develops and conserves the country's mineral resources; monitors and maps groundwater resources
	Forest Management Bureau (FMB)	Formulates and recommends policies and programs for the effective protection, development, management and conservation of forest lands and watersheds
	Protected Areas and Wildlife Bureau (PAWB)	Undertakes the protection and conservation of natural wetlands such as lakes, marshes, swamps, etc.
	National Mapping and Resources Inventory Authority (NAMRIA)	Responsible for integrated surveys, mapping, charting, oceanography, land classification, aerial photography, remote sensing, etc.
	Laguna Lake Development Authority (LLDA)	Responsible for regional water resources development and management in the Laguna Lake catchment area
7. Department of Health (DOH)	Environmental Health Service (EHS)	Responsible for water supply and sanitation programs and strategies to forestall environment-related diseases
	Bureau of Research Laboratories (BRL)	Monitors quality drinking water
	Local Water Utilities Administration (LWUA)	Specialized lending institution for promoting, developing, regulating and financing water utilities, excluding Metro Manila
8. Department of Science and Technology (DST)	Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)	Disseminates atmospheric, geophysical and astronomical data for use by economic sectors, the scientific and engineering communities, and the general public
	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCAFNRRD)	Formulates national agriculture, forestry, and natural resources research and development programs on multi-disciplinary, inter-agency approach for the various commodities including water resources
9. Department of Interior and Local Government (DILG)	Water Supply and Sanitation Program Management Office (WSS-PMO)	Supports the provision of water supply and sanitation services by local government units (LGUs)
10. Local Government Units (LGUs)	Provincial Governments	Promotes the development of infrastructure including irrigation, water supply, electricity power and roads
	Municipal and Barangay Governments	Promotes municipal and barangay WS & S, watershed and other programs

Annex-T L.1.2.1 (3/3) Mandate of Key Government Agencies in Water Resources Management

<b>Unit of Government</b>	<b>Line Bureau or Concerned Agency</b>	<b>Responsibility / Concerns Related to Water</b>
11. Department of National Defense (DND)	Office of Civil Defense (OCD)	Monitors safety dams and other water resources projects; prepares and supports the general public in emergencies
	Philippines Air Force (PAF)	Undertakes rain enhancement through cloud seeding
12. Department of Transportation and Communication(DTC)	Philippine Ports Authority (PPA)	Plans, develops, operates and maintains ports and port facilities
13. Department of Tourism (DOT)	Philippine Tourism Authority (PTA)	Promotes and develops the recreational use of water resources
14. Department of Trade and Industry (DTI)	Board of Investment (BOI)	Proponent of the CALABARZON integrated area study, covering water resources, among other aspects
15. Department of Social Welfare and Development (DSWD)		Implements the government's flagship anti - poverty project - Kapit - Bisig Laban sa Kahirapan - Comprehensive and Integrated Delivery of Social Services (KALAHI-CIDSS) which includes water system construction in priority municipalities
16. Department of Agrarian Reform (DAR)		Lead implementing agency of Comprehensive Agrarian Reform Program (CARP) and orchestrates the delivery of support service to farmer-beneficiaries in the KALAHI ARZones, expanded agrarian reform communities composed of cluster of contiguous land-reform barangays

Source: Philippine Water Supply Sector Roadmap, 2008-2010 Secretariat's Report to the INFRACOM such –Committee on Water Resources, November 2008, pp17-18

Annex-T L.1.2.2 Key Water Supply Sector Agencies: Delineated Roles and Responsibilities

Agency	Roles and Responsibility
NEDA	Coordinates the preparation of national development plan and investment programs: <ul style="list-style-type: none"> <li>• Formulation of sector policies and strategies</li> <li>• Monitoring implementation of policies, programs and projects</li> </ul>
NWRB	Regulation of WSPs including some (consenting) LGU- managed water utilities <ul style="list-style-type: none"> <li>• Traffic regulation</li> <li>• Coverage and service regulation</li> <li>• Management implementation of policies, program and projects</li> </ul>
LGUs	Based on the Local Government Code, LGUs bear multiple mandates in the sector such as resources regulation, water supply provision, economic regulation of their utilities, and planning and implementation of water supply and sanitation programs <ul style="list-style-type: none"> <li>• Preparation of water and sanitation master plans</li> <li>• Monitoring of local water and sanitation coverage and update of sector profile</li> <li>• Provision of support to water supply providers (WSPs) such as the RWSAs, BWSAs and cooperative including funding IRA</li> </ul>
LWUA	Capacity building support to WSPs <ul style="list-style-type: none"> <li>• Provision of technical advisory services and financial assistance to water districts</li> <li>• Provision of technical and institutional support to LGUs and WSPs</li> <li>• Setting design standards for water supplies operated by water districts and other WSPs</li> </ul>
DILG	Capacity building support to LGUs <ul style="list-style-type: none"> <li>• Provision of capacity building training to LGUs</li> <li>• Coordination of LGU master plan preparation</li> <li>• Provision of information to LGUs on available sector programs and financing</li> </ul>
DPWH	Provision of technical support to LGUs upon request including implementation of level I and level II projects
DOF/GFIs	Financing support for the water supply sector <ul style="list-style-type: none"> <li>• DOF oversees performance of GFIs like DBP, LBP and LWUA</li> <li>• GFIs (DBP, LBP and LWUA) provides funding for the water supply sector</li> </ul>
NAPC-WASCO	Coordinates the P3W water supply projects for the 432 municipalities outside of Metro where people's access to water supply is below 50 percent, 210 communities within Metro Manila and 201 municipalities in conflict zone covered by peace agreements with the RPMP/RPA/ABB (in 2000), CPLA (in 1986) and MNLF (in 1996).
DENR	Based on E.O 192 (1987), the DENR serves as lead agency in, among others, promulgating the (1) rules and regulations for the control of water, air and land pollution and (2) ambient and effluent standard for water and air quality.
MWSS	For water supply and sewerage services in Metro Manila through private water utilities. It is also serves as the economic regulatory agency in the national capital region.

Source: PWSS Roadmap Institutional Development Framework Validation Workshop, Richmond Plaza Ortigas Center, October 13, 2006

Annex-T L.1.2.3 Institutional Structure of Water Supply and Sanitation

Type of Service	DILG			DOH		DPWH		
(Central Agencies)	Water Supply & Sanitation PMO			LWUA	Hospital	MWSS	Metro Manila	PMO-RWS
	Regional Office							
(LGUs)	Government Owned and Controlled Corporation			Urban WS	CPSO		District Engineer's Office	
	Province	City/Municipal	Barangay					
Formal Level of WS Service	Rural			Urban WS	CPSO			
No Access	-		SSIP/SHH					
Level 1: Point Source	LGUs/CBOs							
Level 2: Fixed Communal Faucets	LGUs/CBOs							
Level 3: Piped Household Connections	LGUs/CBOs		POs	WDs		MWCI/MWSI		
Financing	○		○	○				
Technical Services to LGUs - Prioritization of Projects/Programs - Technical Standards & Guidelines - Construction, O&M	○			○			○	○

CBO = Community-Based Organization; PO= Private Operator; SSIP = Small-Scale Independent Provider; SHH = Self-provision by household  
 CPSO = Central Project Support Office for sewerage and sanitation projects

Annex-T L.1.2.4 Institutional Structure of National Government Agencies in Flood Mitigation

ROLES & RESPONSIBILITIES	AGENCY MANDATE / COVERAGE														REMARKS
	DENR	DPWH	OCD/NDCC	DA-NIA	DA-BSWM	DOST-PHIVOLCS	DOST-PAGASA	NPC	NWRB	NEDA	NHRC	DILG / LGU	NGO	DCC	
<b>A. Non-Structural Measures (Reducing Vulnerability)</b>															
Harmonization of Hazards / Vulnerability Maps	●					●	●								DENR - MGB
Watershed Management/Reforestation	●											●			DENR - FMB
Monitoring, Forecasting and Warning System							●							●	
Land Use Zoning and Regulations	●	●										●			
Information Education and Communication Programs	●	●	●			●	●					●		●	DECS
Evacuation Plan			●				●					●		●	
<b>B. Structural Measures (Reducing Hazard Magnitude)</b>															
Planning, Design, Construction and Maintenance of Flood Control, Sabo Structures, Dams, Small Water Impounding Projects & other mitigating structures incl. evacuation centers		● Major Flood Control Projects		● Dams 15m and above	● SWIP Dam for erosion control			● Multi-purpose Dam				● Local Drainage and river works			MMDA, DPWH-MFCP, FCSEC
Strengthening/Rehabilitation/Maintenance of Existing Structures		●		●	●			●				●			DPWH-MFCP RO/DEO
Updating of Master Plan of Major River Basins	●	●							●						DPWH-MFCP RO/DEO
Master Plan for Principal and Critical River Basins	●	●							●						DPWH-MFCP RO/DEO
<b>C. Response, Recovery and Development (Mitigating Impacts)</b>															
Damage and Needs Assessment		●	●									●			
Flood Fighting		●	●									●		●	
Rescue and Recovery Operations			●									●	●	●	
Evacuation and Relief Works			●									●	●	●	
Rehabilitation and Reconstruction Works															
-Psycho-social Programs			●									●	●		
-Livelihood Programs			●									●	●		
Resettlement												●	●		HLURB
<b>D. Institutional Strengthening</b>															
Capacity Building for Agencies and LGUs	●	●	●			●	●			●		●		●	
Technical Standards & Guidelines on Planning, Design, Construction and Maintenance	●	●		● Dams	● Dams			● Dams				●			
Research and Development	●	●									●				
Criteria on Prioritization of Projects / Programs	●	●								●					
Viable Financing Mechanism for Projects / Programs	●	●								●		●	●		
Linkages and Networking with Foreign Forecasting Institutions						●	●								
Rapid Media-Link System for Near Real Time Dissemination			●			●	●							●	
Databases on Natural Hazards to Identify Trends	●	●	●			●	●								

Source: DENR, River Basin Control Office, "Integrated River Basin Management and Development Master Plan, Executive Summary", 2006, p.77



Annex-T L.1.2.5 Institutional Structure of Watershed and Forest Management (Draft)

National Agencies	DENR				PAMB	Office of the President		DPWH		DA		DE
	FMB, FMS		RBCO	PAWD		NCIP	NDCC	PMO-MFC	FCSEC	BSWM	NIA	NPC
	PENRO/CENRO			PASU								
Local Government	LGUs, WDs											
Type of Service	Municipality	Province	City	RBO								
WATERSHED MANAGEMENT				⊙								
• Watershed Project				Rationalize								
• Protection of Soil and Water										⊙		
• Control of Illegal Logging, Kaingin Farming, Unsustainable Practices												
• Flood Control				National M/P	○		⊙	⊙	Planning			
• Protection of Project Area										○	○	
FOREST MANAGEMENT (CBFM)		⊙		Rationalize								
• Social Forestry	○		○									
• Community-based Forestry Project	○		○									
• Integrated Social Forestry Program	○	○	○									
• Community Forestry	○		○									
• Forest Fire Protection	○		○									
• Conservation of Mangrove	○		○		⊙/○	○						
PROTECTED AREA MANAGEMENT					⊙							
• Management of Conservation Areas							○					
TECHNICAL ASSISTANCE	DENR-FMS											
• Policies, Plans, Programs												
• Forest Protection and Maintenance												
• Community Involvement												

Notes: ⊙ Main national agency; ⊕ Regulatory function; ○ responsible organization

Source: JICA Study Team

Annex-T L.1.3.1 (1/2) NWRB 2005 Fees and Charges

Pursuant to Executive Order No. 197 series of 2000 and per NWRB Resolution No. 010-0305 dated March 2005, the National Water Resources Board on its 29<sup>th</sup> Meeting approved the following fees and charges:

NATURE OF SERVICE	APPROVED RATES* (in Pesos)
<b>A. Application/Filing Fee</b>	
<b>1. Water Permit</b>	
(a) Municipal	5,000
(b) Irrigation	
(1) National/Corporation	5,000
(2) Communal/Individual	500
(c) Power generation	5,000
(d) Fisheries	5,000
(e) Livestock Raising	
(1) Backyard	
(2) Commercial	1,000
(f) Industrial	3,000
(g) Recreational	5,000
(h) Other Purposes	5,000
	5,000
<b>2. Transfer of Water Permit</b>	
(a) Municipal	5,000
(b) Irrigation	
(1) Communal/Individual	3,000
(2) National Corporation	5,000
(c) Power Generation	5,000
(d) Fisheries	3,000
(e) Livestock Raising	
(1) Backyard	1,000
(2) Commercial	3,000
(f) Industrial	5,000
(g) Recreational	5,000
(h) Other Purposes	5,000
	5,000
<b>3. Registration for Domestic Use</b>	100
<b>4. Registration as Well Driller and Renewal</b>	(annual)
(a) Sole Proprietor	1,000
(b) Partnership or Corporation	2,000
<b>5. Certificate of Public Convenience (CPC)/certificate of Public Convenience and Necessity(CPCN)</b>	3,000
<b>6. Provisional Authority</b>	3,000
<b>7. Extension of CPC/CPCN Validity Renewal</b>	3,000
<b>8. Authority to Increase Capital Stock</b>	2,000
<b>9. Time Extension to Submit Annual Report of Operation</b>	1,500
<b>10. Authority to Charge Water Rate</b>	2,500
<b>11. Protests/Water Use Conflicts</b>	3,000
<b>12. Appeal Fee</b>	1,000
<b>13. Rate Adjustment/Increase</b>	3,000
<b>14. Sale/Transfer/Lease of Water System with CPC/CPCN</b>	2,000
<b>15. Donation of Water System with CPC/CPCN</b>	2,000
<b>16. Authority of Extension of Service</b>	2,000
<b>17. Re-Appraisal/Re-Evaluation of Assets</b>	5,000

Annex-T L.1.3.1 (2/2) NWRB 2005 Fees and Charges

<b>B. Annual Water Charge</b>		<b>WITHDRAWAL COST/LPS (In Php)</b>			
<b>CLASSIFICATION</b>		<b>Base Cost</b>	<b>Not more than 10 lps (liter / second)</b>	<b>More than 10 lps but not exceeding 50 lps</b>	<b>More than 50 lps</b>
a)	Municipal	5,000	5.50	8.50	11.00
b)	Fisheries	500	2.75	4.25	5.50
c)	Livestock (Backyard/Commercial)	500	2.75	4.25	5.50
d)	Irrigation (Communal/Individual)	500	2.75	4.25	5.50
	(National/Corporation)	5,000	5.50	8.50	11.00
e)	Power Generation	5,000	2.75	4.25	5.50
f)	Industrial	5,000	10.25	15.80	20.45
g)	Recreation	5,000	10.25	15.80	20.45
h)	Others	5,000	10.25	15.80	20.45
<b>NOTE:</b> For declared critical areas in Metro Manila, the following rates shall apply:					
a) In area adequately serviced by MWSS concessionaires:		100% of water tariff of the concessionaires			
b) In areas not adequately serviced by MWSS concessionaires:		35% of water tariff of the concessionaires			
i) Charge for over extraction for non-critical areas			P 3,000 for every 1 lps or fraction thereof over extracted		
j) Other Charges					
(j-1) Use of Water at its Natural Location for Fish Culture					
(j-1-a) For surface area < 15 has.		Base Cost of 500 + P110/ha.			
(j-1-b) For surface are > 15 has.		Base Cost of P500 + P 1,650 for 15 has. Plus P0.65/ha. in excess of 15 has.			
k) Waterworks Supervision					
(k-1) Supervising /Regulation Fee		P0.50 per P100 capital stock subscribed or paid or if no shares have been issued, of the capital invested, or of the property and equipment, whichever is higher.			
<b>C. Other Charges</b>		<b>Approve Rates (in Pesos)</b>			
1. Annual Report Form		200			
2 Certification Charge					
a) Certification for Memorial Parks		3,500			
b) Certificate of the Water Availability		1,500			
c) Other Technical Certification		1,000			
d) Certified photo copy.		50			
3. CPC/CPCN Certificate		500			
4. Certificate of Compliance		3,500			
5. Testing and Sealing Fee of Water Meters		50			
<b>D. Penalties</b>					
1. Owner					
(a) Operation of a system without a CPC/CPCN		P5,000 per year reckoned from date of operation or five years whichever comes first but not to exceed P25,000			
(b) Non-payment of Annual Water Charge		50% of due per year or fraction thereof plus additional interest for delinquency under Sec. 84 of Amended IRR.			
(c) Non-submission of Annual Report Form		P2,500 per year + P25/day of delay but not to exceed P5,000			
(d) Refusal to have meters and tested and sealed		Additional 20% of approved testing and sealing fee for water meter times total active connection per year.			
(e) Illegal extraction of groundwater		More than P800 but not exceeding P1,000 per day of violation			
2. Well Drillers					
(a) Drilling without Permit to Drill		20,000 (1 <sup>st</sup> offense) 30,000 (2 <sup>nd</sup> offense) Revocation and Registration (3 <sup>rd</sup> offense)			
(b) Non-registered well drillers		50,000			
<b>E. Penalty for Delinquency (Sec. 84 of the Amended IRR)</b>					
Where the penalty imposed is a fine, additional penalty interest equivalent to 2% per month of delay or a fraction thereof until fully paid shall be charged.					

UNANIMOUSLY ADOPTED AT THE 29<sup>TH</sup> MEETING OF THE NATIONAL WATER RESOURCES BOARD ON MARCH 21, 2005.

MICHAEL T. DEFENSOR, Chairman, National Water Resources Board, Republic of Philippines

### Annex-T L.3.3.1 Key Actions to Improve Water Code and Related Rules and Guidelines

Strategic Issue	Key Actions to Improve Water Code and Related Rules and Guidelines
Issue-1	<ul style="list-style-type: none"> <li>-Establish an effective period of the water permit for 5 to 10 years to allow the NWRB to review and enforce rational and effective use of water (Art.26 &amp; 28);</li> <li>-Establish a rule to enforce the concessionaire to take concrete water saving measures (Art.29 &amp; 30, IRR Section22);</li> <li>-Establish a penal rule to revoke the water permit if its concessionary executes no measures of effective use other than act of violation (Art.29 &amp; 30);</li> <li>-Provide Article to specify that the water code prevails over other law (the grid law) in case of water rights regulation;</li> <li>-Provide clear compensation rule for the loss due to the priority concessionaire in time of emergency (Art.22 &amp; 23);</li> <li>-Modify the condition of the amount of water permit to specify concrete seasonal water use schedule including non-consumptive use instead of only the maximum rate of diversion or withdrawal (seasonal quantity and rate ), (Art.18).</li> <li>-Establish institution to make a water resources basin development plan (the Basin Plan) to execute quantitative management of daily and/or seasonal variation of regional water budget (balance) for the economically important river basins including the Pampanga River; (same as Issue-2)</li> <li>-Link legally water rights and the Basin Plan; (same as Issue-2)</li> <li>-Establish planning technical standards for the Basin Plan; (same as Issue-2)</li> </ul>
Issue-2	<ul style="list-style-type: none"> <li>-Provide articles to link the water permit and the basin water resources development plan (Basic Plan) to enable short and long term quantitative water rights management with securing water supply reliability; (same as Issue-1)</li> <li>-Provide an article to establish relevant monitoring stations for transparent and equitable water rights regulation including daily discharge and water quality;</li> <li>-Establish planning standards for the Basic Plan to secure safe bulk water supply to various water uses with a reliable risk; (same as Issue-1)</li> <li>-Provide article to enable to reallocate the present water right title granted to the public entities such as NIA, MWSS and Bulacan Province to the water users such as irrigators and/or water supply companies;</li> <li>-Clarify risk of water supply failure of the conflicting water rights to enhance water rights transfer and trading; (same as Issue-1)</li> <li>-Change the present constant annual water charge system for water permit into different water charge for different supply reliability and seasonal variation; i.e., high charge for high reliability, high charge for high season, high charge for longer concession like in Australia;</li> <li>-Establish reliable assurance and compensation rule for water transfer and trading;</li> <li>-Establish IRR and technical guidelines for water transfer and trading;</li> </ul>
Issue-3	<ul style="list-style-type: none"> <li>-Review the overlapping provisions of the local government code with the water code (Art.3&amp;6, IRR Section8), etc;</li> <li>-Provide an Article in the water code not to allow duplicated layer of granting water permit to public entities;</li> <li>-The water rights granted to the public entities at present shall be independently transferred to the actual water users;</li> </ul>
Issue-4	<ul style="list-style-type: none"> <li>-Modify IRR Section 46(Requirement of Drilled Well), item d;</li> </ul>
Issue-5	<ul style="list-style-type: none"> <li>-Provide Article to link the Water Code and Specific Multipurpose Law if the new law is enacted;</li> </ul>
Issue-6	<ul style="list-style-type: none"> <li>-Provide concrete standard, enforcement measures and penalty to breakers in order to execute strict regulation of Art.66, and IRR Section 47;</li> <li>-Set up an institution to enforce and monitor all concessionaires to comply with requirement of the minimum stream flows for rivers and minimum water levels for lakes to ensure environmental conservation;</li> </ul>
Issue-7	<ul style="list-style-type: none"> <li>-Establish responsibility and role of water users on the water quality management in the Basin;</li> </ul>
Issue-8	<ul style="list-style-type: none"> <li>-Prepare the flood control basin plan (FCBP) for the severe flood prone areas based on Art.53. of the water code (promote, coordinate protection of flood plain lands, and flood plain management plan by the secretary of DPWH);</li> <li>-Establish IRR and planning standards for the FCBP;</li> <li>-Link legally the FCBP with reservoir operation rule of large dams concerned;</li> <li>-Improve IRR for the Right-of-way of the public domain of river regime;</li> </ul>

### Annex-T L.3.3.2 Key Actions to Introduce Specific Multipurpose Dam Law

Strategic Issues	Key Actions to Establish Specific Multipurpose Dam Law
Issue-5	<ul style="list-style-type: none"> <li>-Establish water account of flood control instead of incidental function for multipurpose dams;</li> <li>-Establish a specific law to define an equitable cost allocation rule among public (in particular flood control) and private beneficiaries for multi-purpose projects to reduce dam construction cost share among water users;</li> <li>-Link the reservoir operation rule with the cost share of reservoir volume allocation and the flood control basin plan;</li> <li>-Supplement article to define water permit as tradable property in the Civil Code in line with the specific multipurpose dam law;</li> </ul>

Source: JICA Study Team

#### Annex-T L.3.4.4 Key Actions to Strengthen Line Agencies and LGUs

Strategic Issues	Key Actions to Strengthen Line Agencies and LGUs
Issue-1	<ul style="list-style-type: none"> <li>-Establish NWRB owned reliable and accurate monitoring stations for discharge, ecological flow and water quality at key water conflict areas;</li> <li>-Strengthen the capacity of NWRB for monitoring and enforcing water rights;</li> </ul>
Issue-4	<ul style="list-style-type: none"> <li>-Empower the groundwater monitoring and enforcing function of the LGUs from the regional interests;</li> <li>-Establish a regional monitoring system to monitor regional groundwater level collaborated with EMB and LGUs including quantity and quality;</li> </ul>
Issue-7	<ul style="list-style-type: none"> <li>-Strengthening the capacity of RBCO, EMB, FMB and related LGUs to execute and enforce water quality management effectively;</li> <li>-Strengthen the water quality monitoring system;</li> </ul>
Issue-9	<ul style="list-style-type: none"> <li>-Monitor the progress and outcomes of the ongoing capacity development of the development projects and programs for forest and watershed management financed by JICA and other donors;</li> <li>-Conduct capacity assessment on the outcomes from the ongoing projects and programs;</li> <li>-Strengthen preventive measures of forest fire including capacity development;</li> <li>-Strengthen the execution capacity of the weak functions of FMB and LGUs still remained for watershed and forest management;</li> </ul>
Issue-10	<ul style="list-style-type: none"> <li>-Clarify the necessary functions and missing functions in the existing organizations for IWRM implementation;</li> <li>-Supplement the function to the line agency (NWRB, DENR) or RDC and execute capacity strengthening for monitoring and execution;</li> <li>-Set up an appropriate RBO for the Pampanga River based on the regional consensus;</li> <li>-Set up a water users association to advocate sustainable IWRM in PRB;</li> </ul>

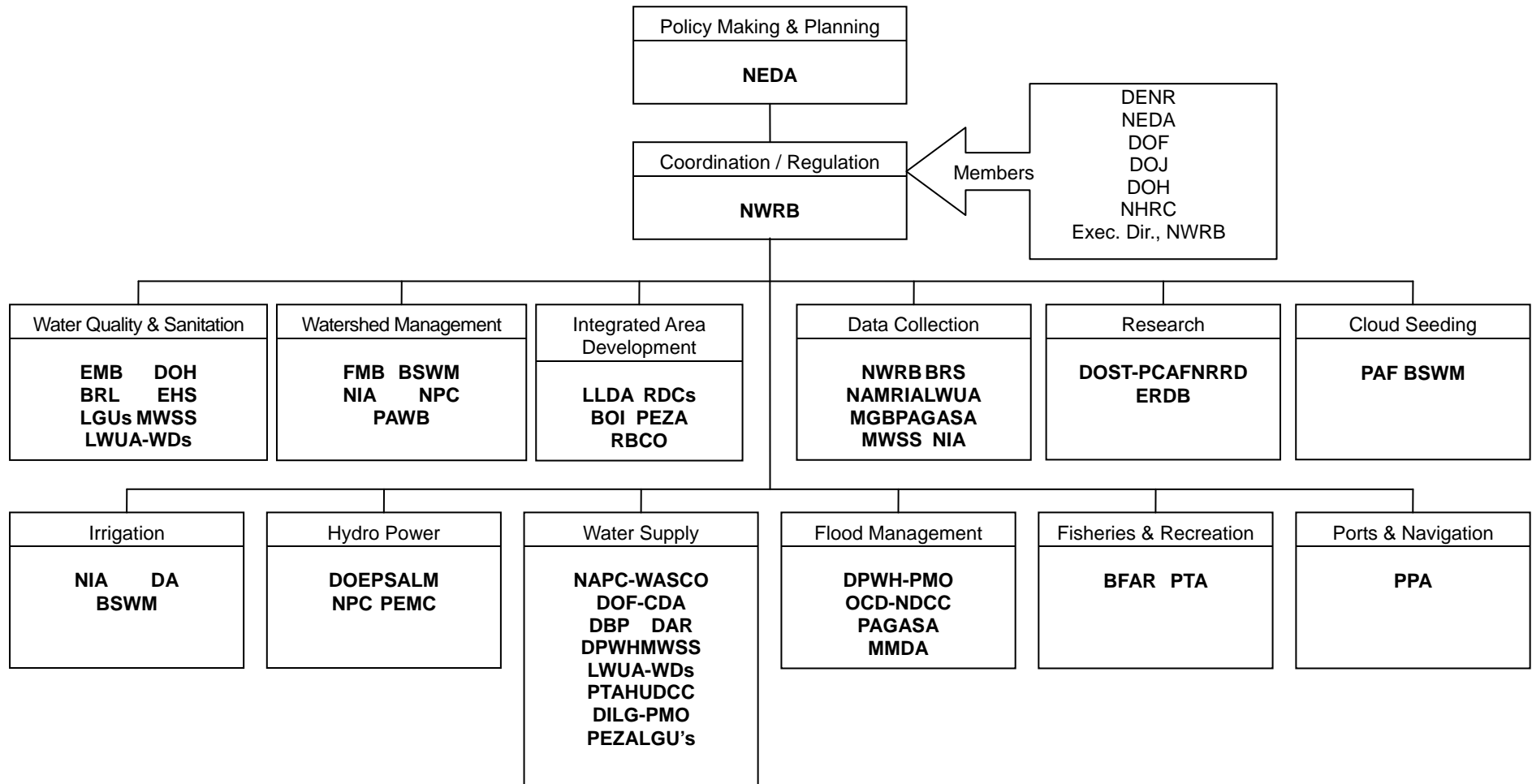
#### Annex-T L.3.5.1 Key Actions to Strengthen Financial Capacity for Sustainable IWRM

Strategic Issues	Key Actions to Strengthen Financial Capacity for Sustainable IWRM
Issue-1 Water Rights	<ul style="list-style-type: none"> <li>-Strengthen financial capacity of NWRB including annual water charge collection;</li> </ul>
Issue-7 Water Quality	<ul style="list-style-type: none"> <li>-Increase the fund of DENR for monitoring stations and O&amp;M of the monitoring systems;</li> <li>-Introduce the beneficiary's pay principle (BPP) for the cost of water quality management;</li> </ul>
Issue-11 Strengthen Execution Capacity and Sustainability	<ul style="list-style-type: none"> <li>-Increase the share of O&amp;M budget for the river facilities in both LGUs and LAs (DPWH);</li> <li>-Establish specific finances in LGUs for O&amp;M;</li> <li>-Set up a water users association to advocate sustainable IWRM and collect association fee for the O&amp;M of RBO and IWRM;</li> <li>-Set up special accounts for sustainable IWRM in the Basin;</li> <li>-Reconfirm the definition of the responsibility of O&amp;M of the flood control and river facilities after transfer of the facilities from DPWH to LGUs (MOA);</li> </ul>

# *Annex-Figures*

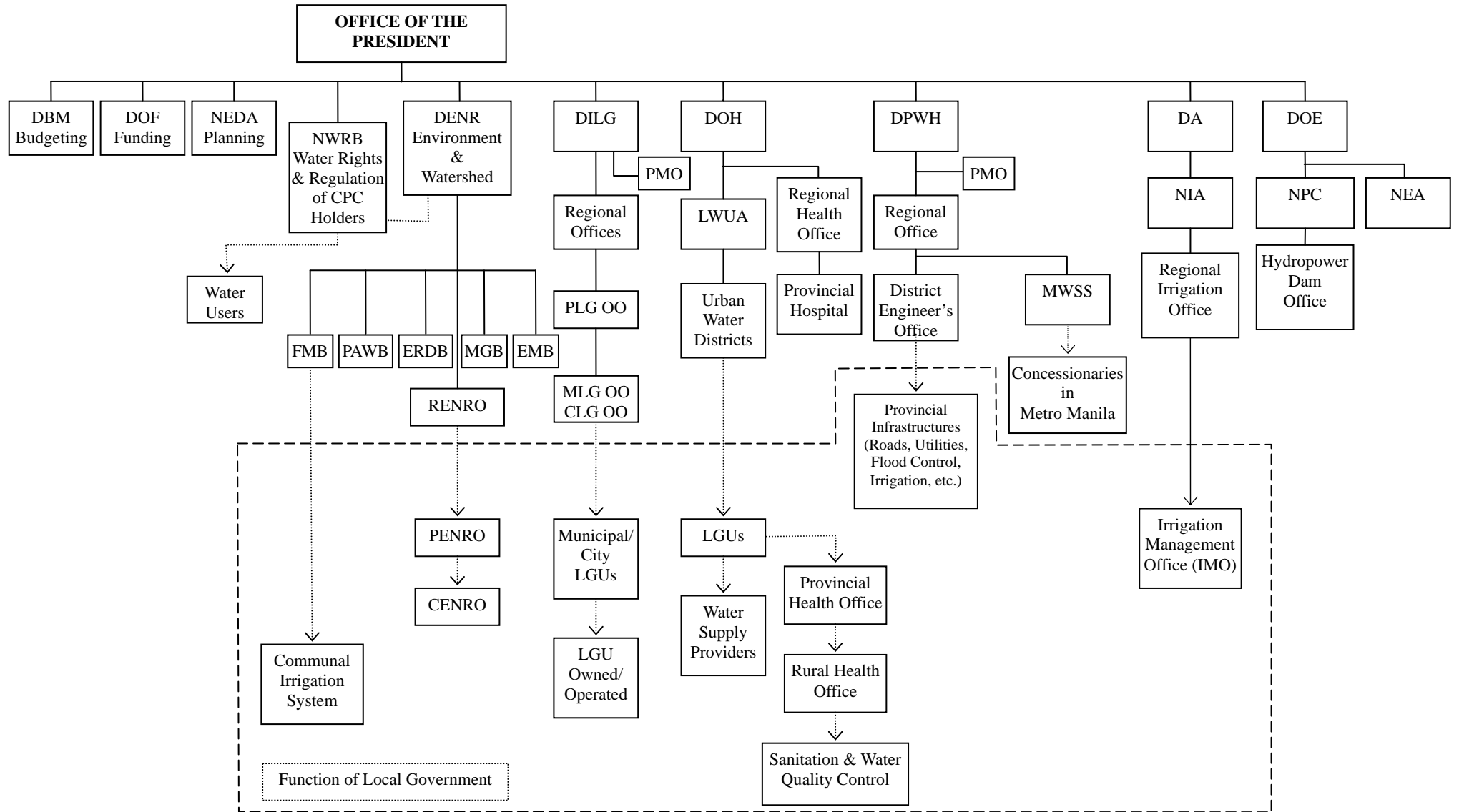






Source: Philippine Water Supply Sector Road Map, p.19, modified by JICA study

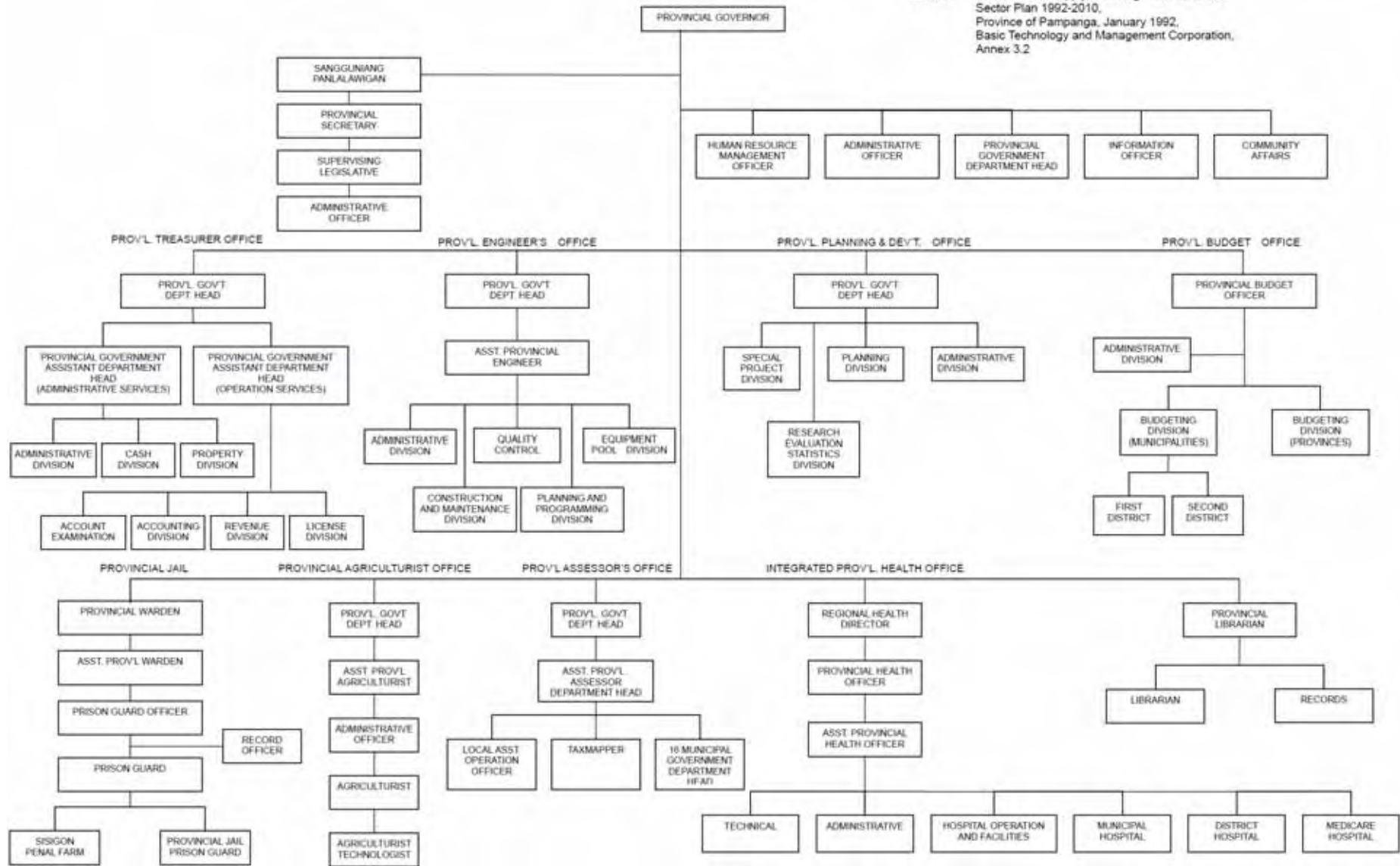
Annex-F L.1.2.1 Functional Chart of Water Related Agencies in the Philippines



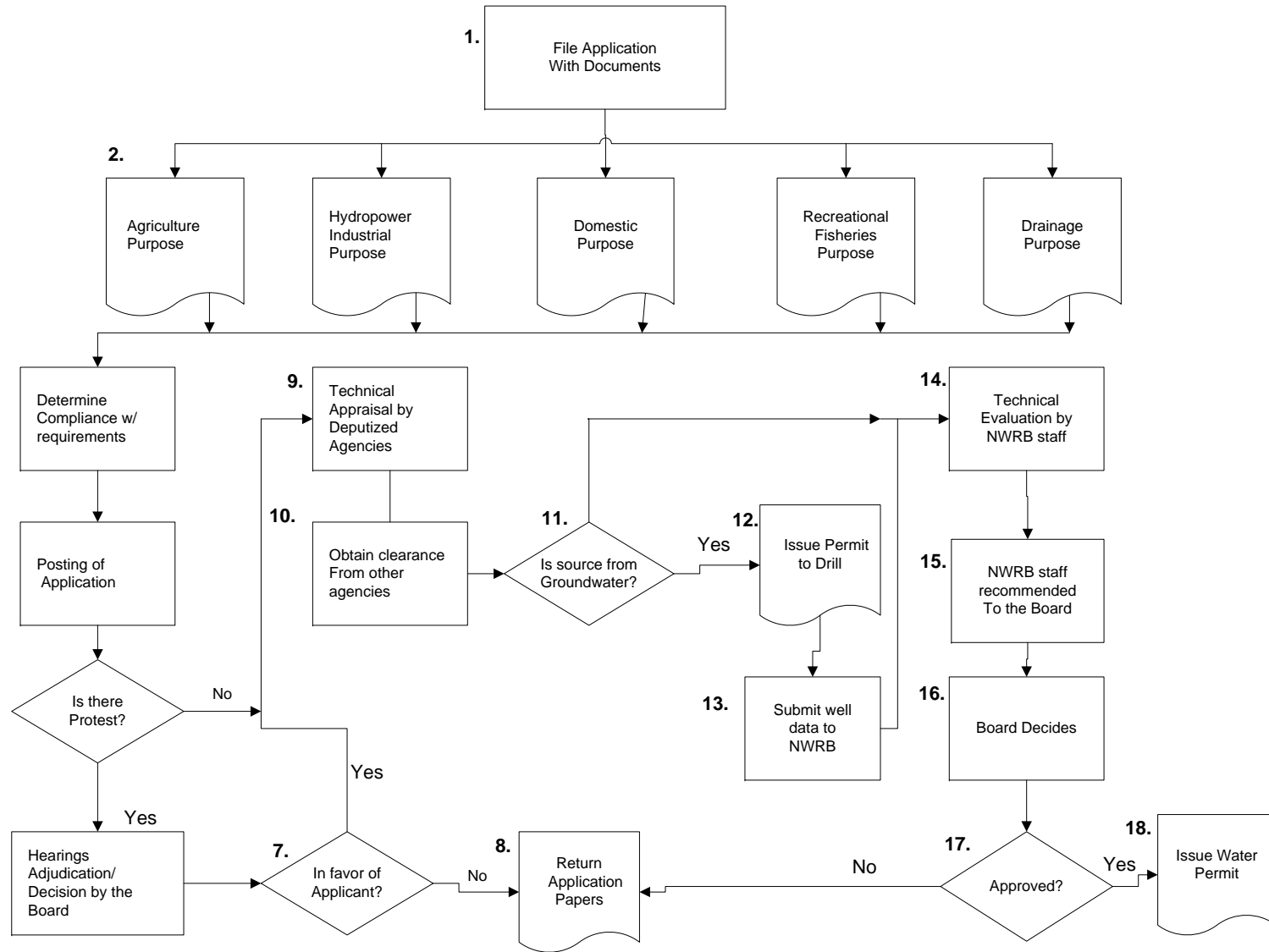
Source; JICA Study Team

Annex-F L.1.2.2 Functional Relationship among Central Government Agencies and Local Governments

Source: DPWH Water Supply, Sewerage and Sanitation Sector Plan 1992-2010, Province of Pampanga, January 1992, Basic Technology and Management Corporation, Annex 3.2

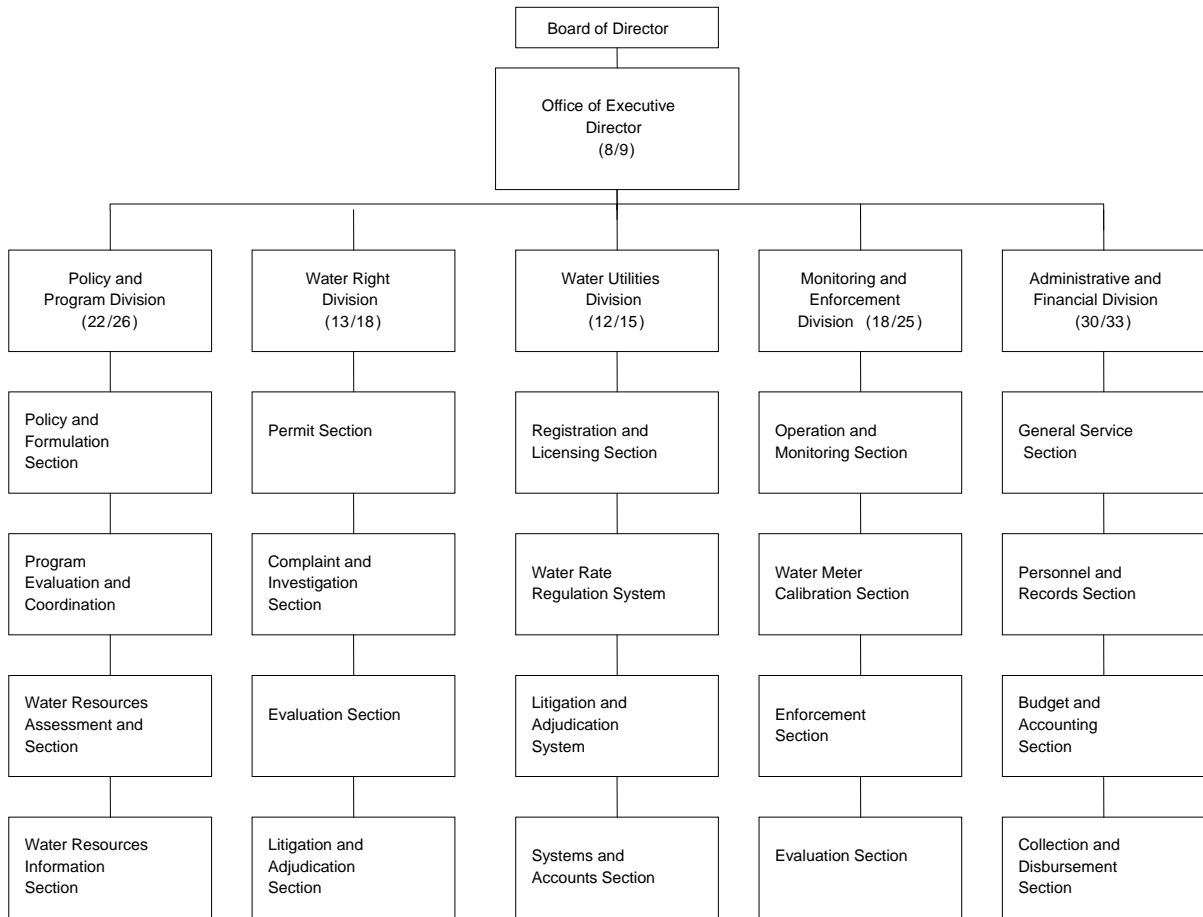


Annex-F L.1.2.3 Organizational Chart of Province of Pampanga



Source: NWRB

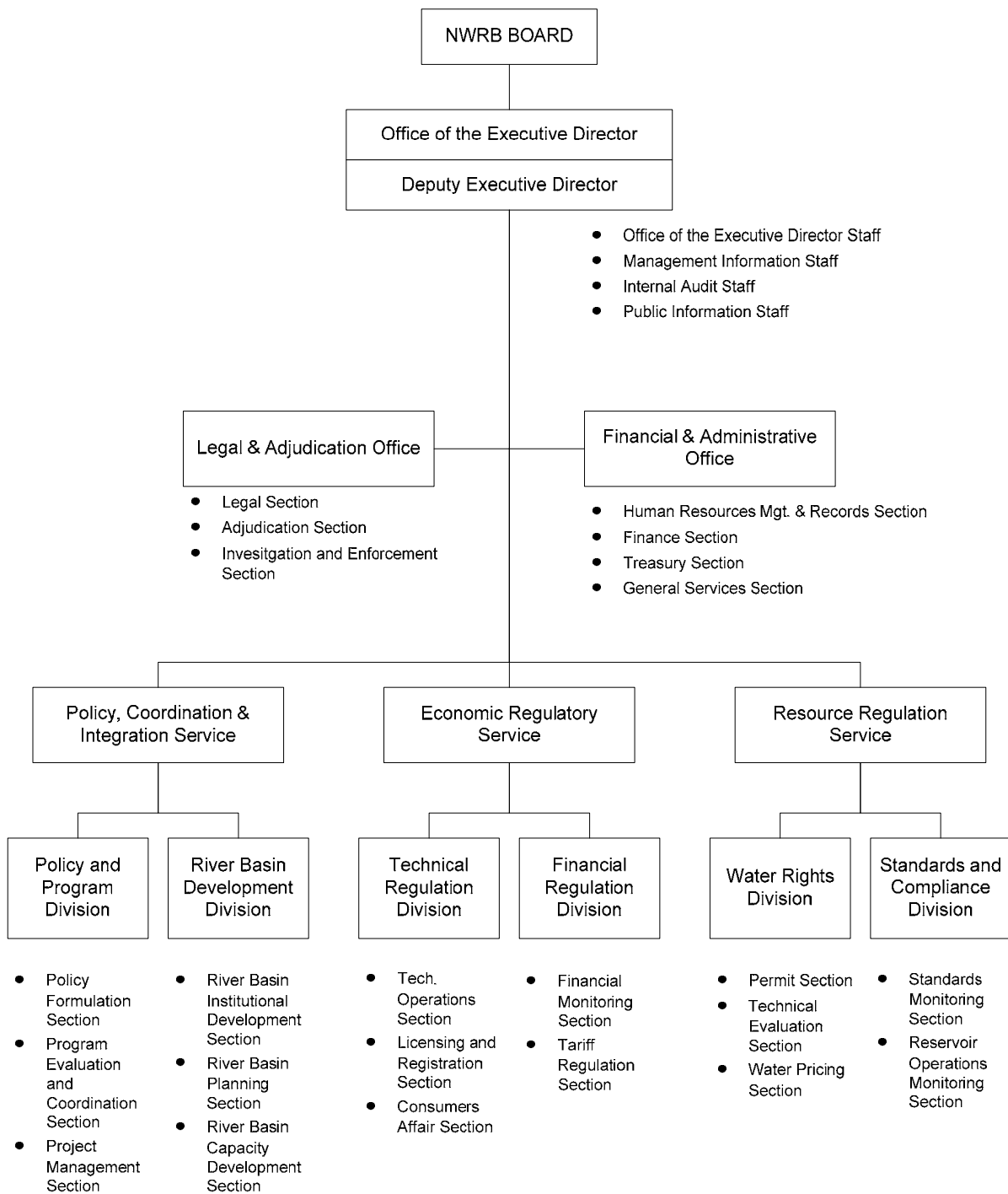
Annex-F L.1.3.1 Flowchart for Processing of Water Permit Application



Note: Values in ( ) indicate staff number/position.

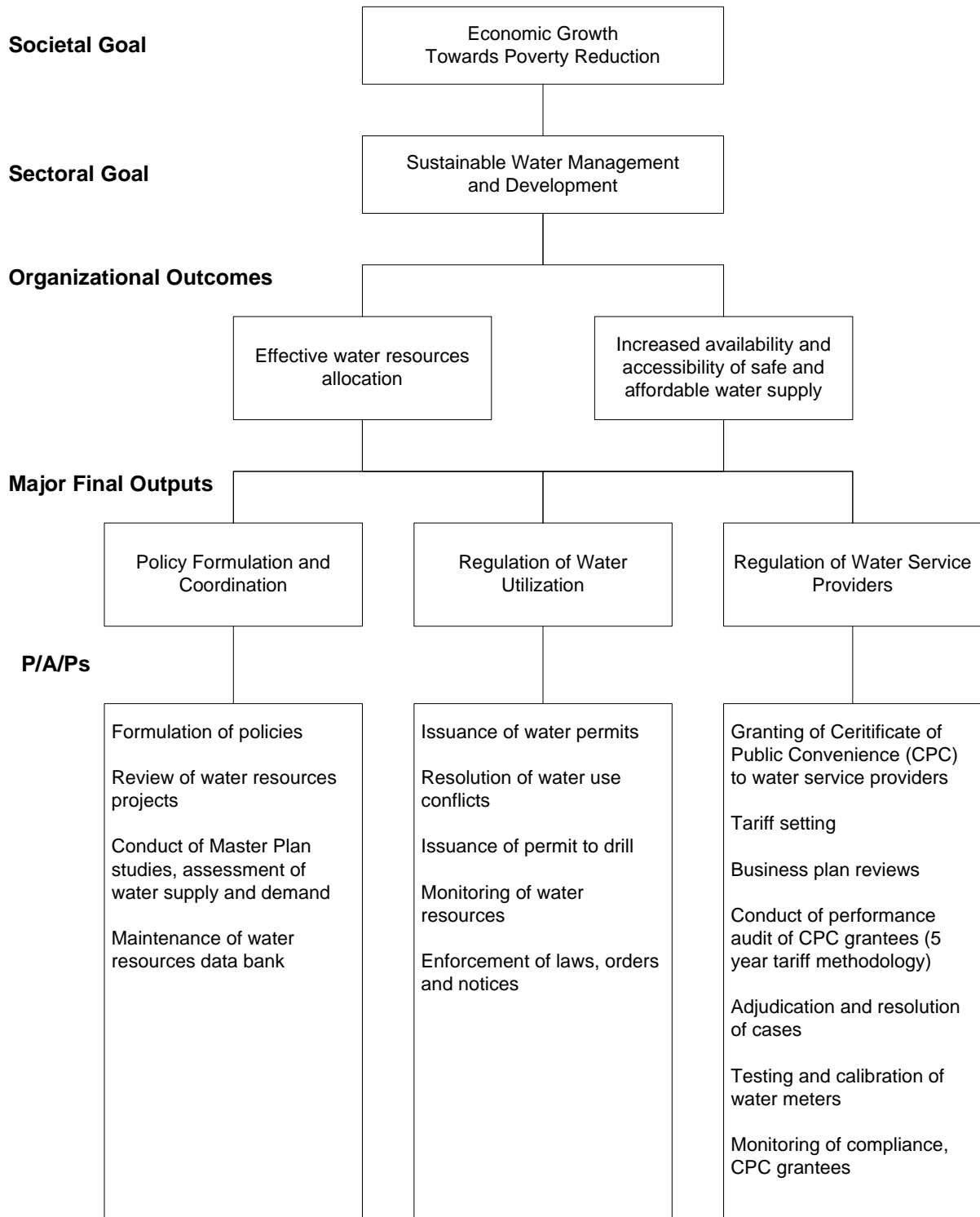
	Policy and Program	WaterRight	Water Utilities	Monitoring and Enforcement	Administrative and Financial
Engineer	10	4	-	11	-
Special investigator	-	5	-	-	-
Planning officer	1	-	-	-	-
Development management officer	-	-	-	2	-
Instrument technician	-	-	-	4	-
Information analyst	3	-	-	-	-
Statistician	1	-	-	-	-
Economist	3	-	-	-	-
Financial analyst	-	-	3	-	-
Regulation officer	-	-	7	-	-
Attorney	-	1	-	-	-
Administrative	4	3	2	1	30
Total (95+8=103)	22	13	12	18	30

Annex-F L.1.3.2 Organization Chart of Present NWRB as of March 2009 Source: NWRB



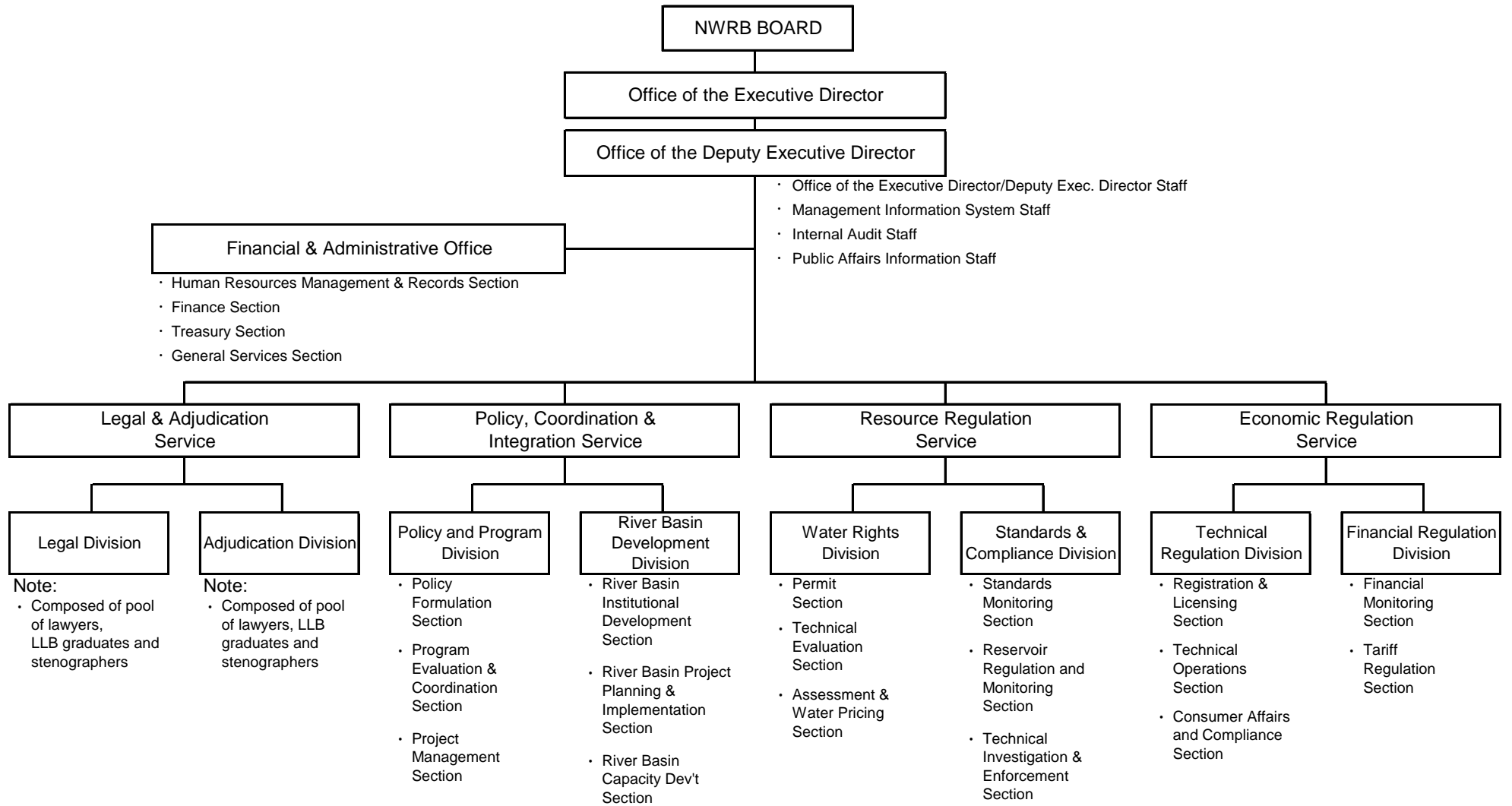
Source: Proposal to DBN, NWRB

Annex-F L.1.3.3 NWRB’s Proposed Organizational Structure as of March 2009



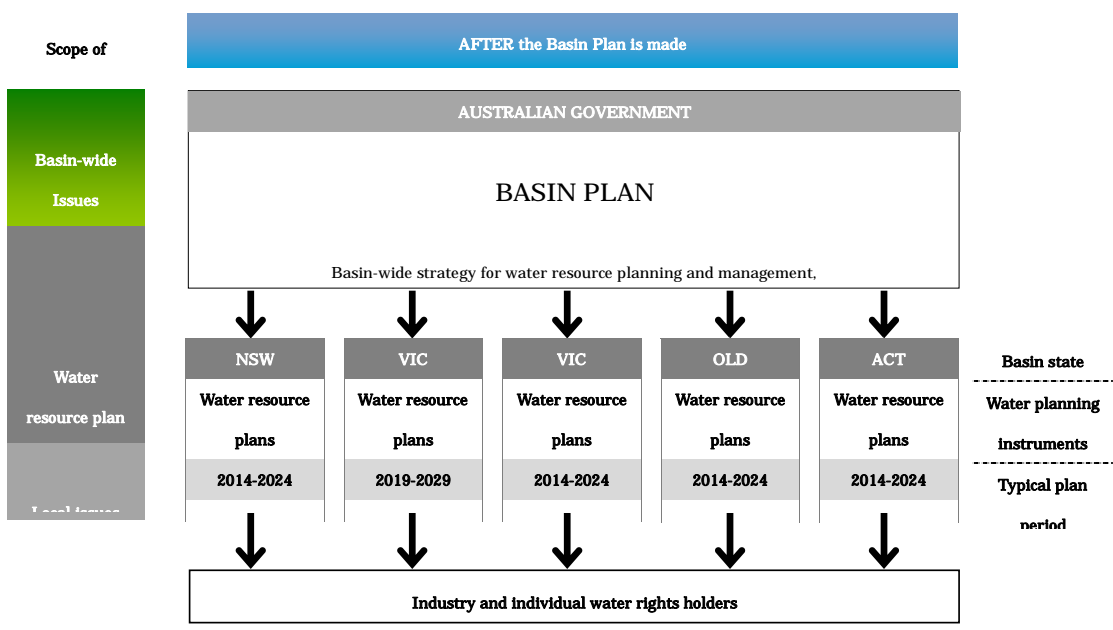
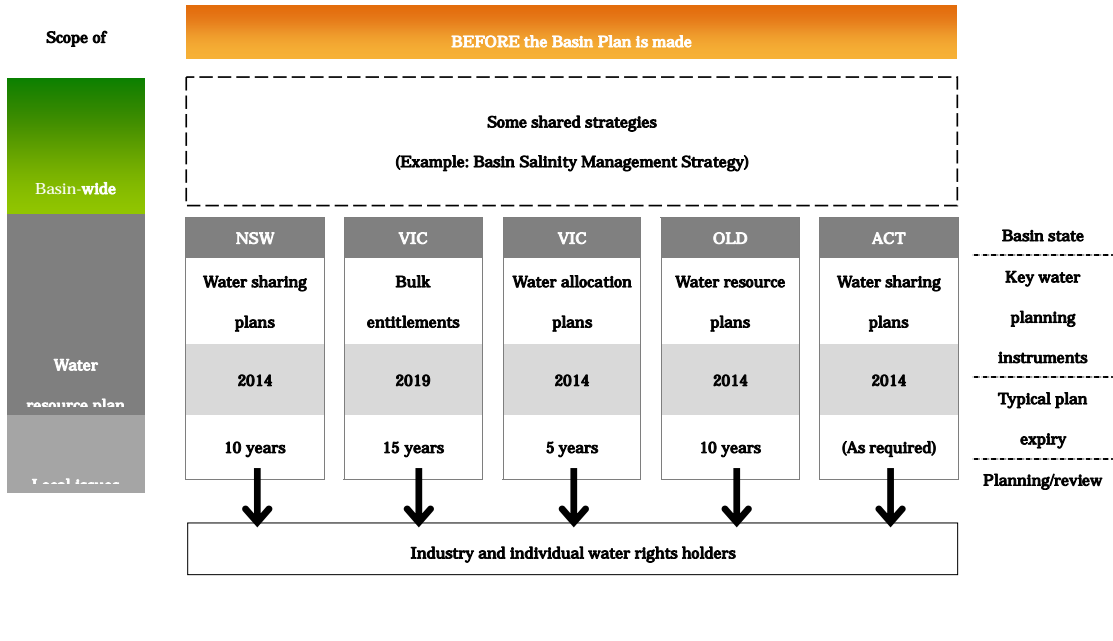
Source: Organizational Performance Indicator Framework, FY 2008 Performance Budget of Department/Agencies, Sustaining Philippine Expenditure Management Reform, Department of Budget and Management, Malacanang, Manila, December 2007, p668.

Annex-F L.1.3.4 Logical Framework for NWRB



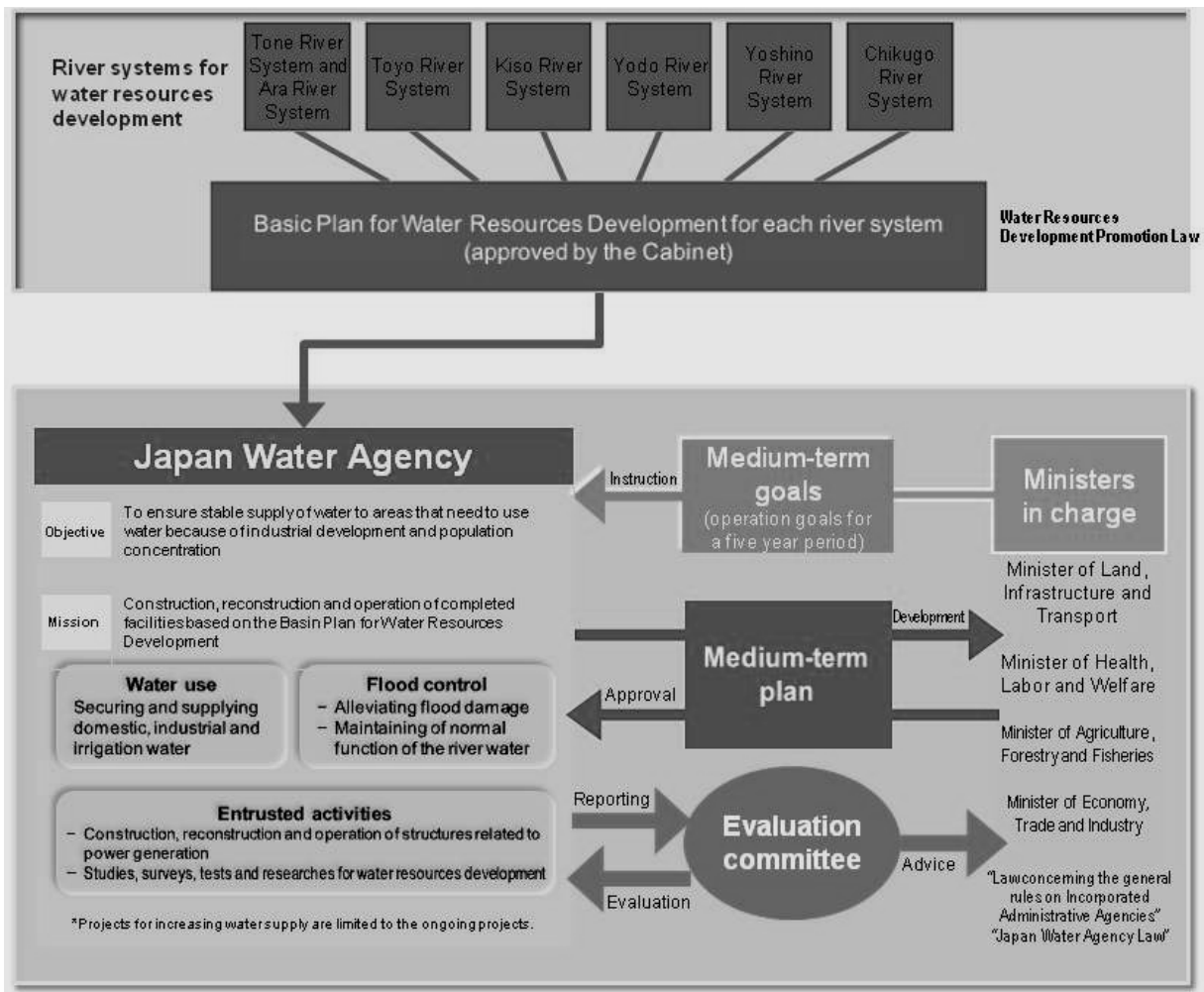
Annex-F L.1.3.5 NWRB's Proposed Organizational Structure, September 2010





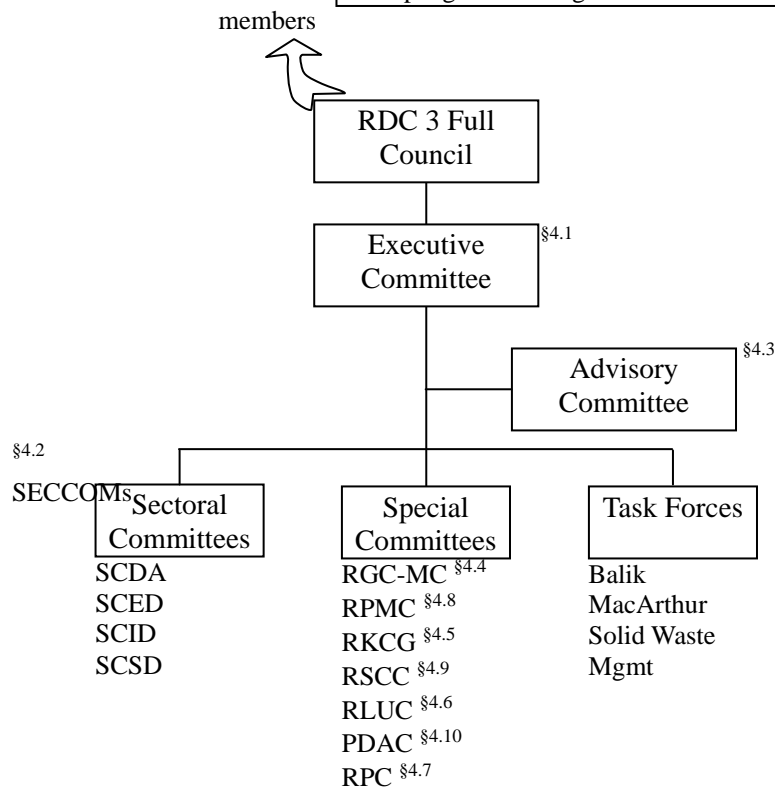
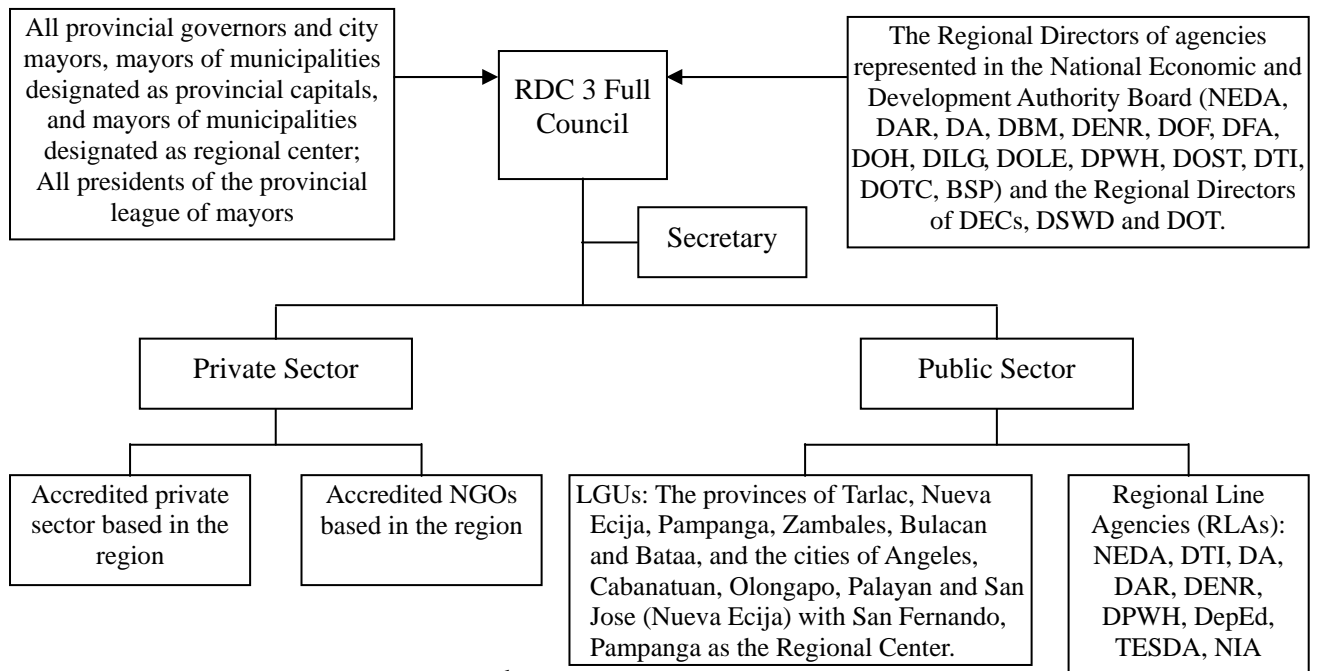
Source: web-site of Murray-Darling Basin Authority

### Annex-F L.2.2.1 General Relationship of State Water Resource Plans to the Basin Plan for the Murray-Darling River



Source: Japan Water Agency

### Annex-F L.2.2.2 Objective, Mission and Activities of Japan Water Agency

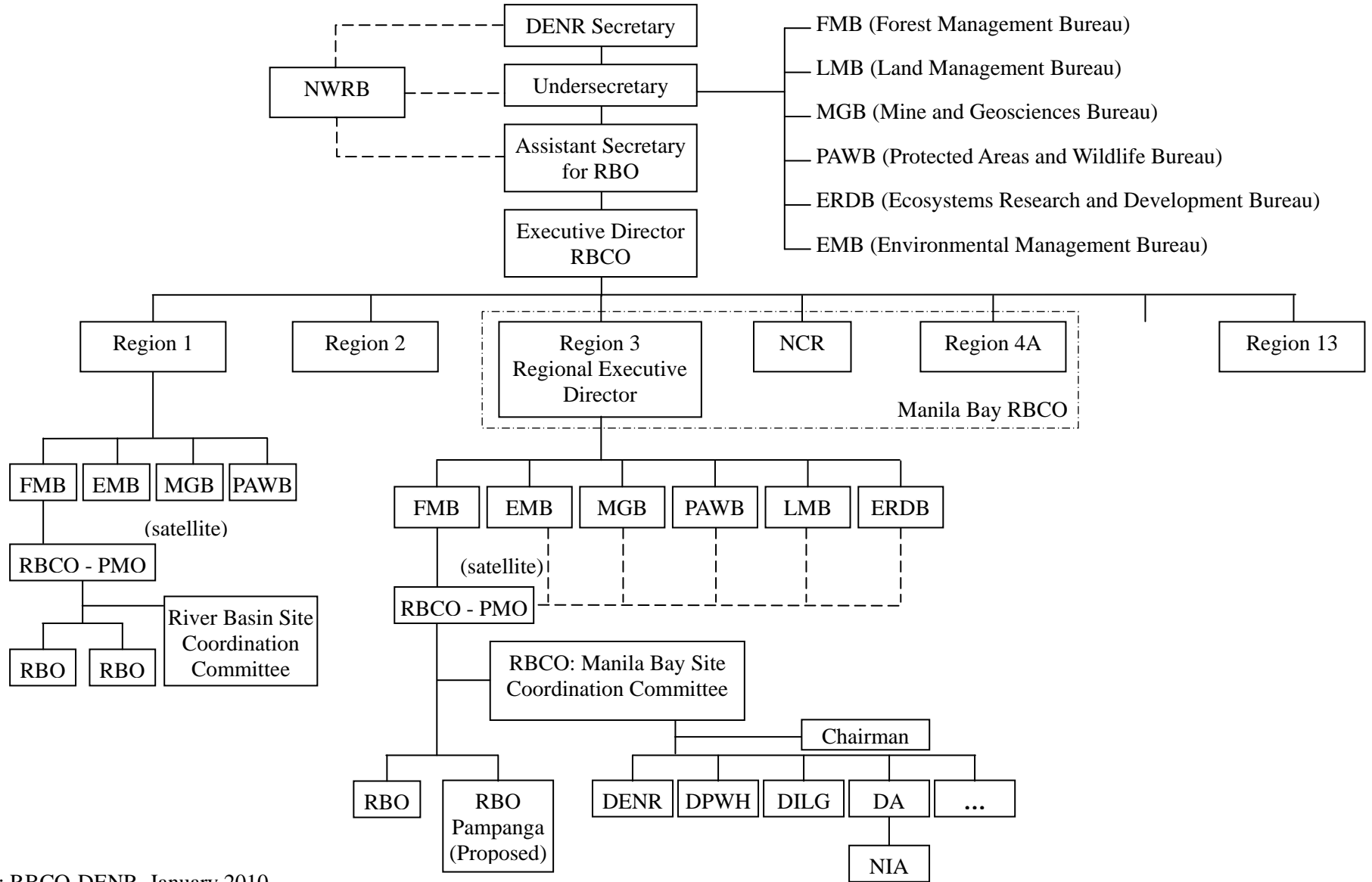


SC: Sectoral Committee  
 DA: Development Administration  
 ED: Economic Development  
 ID: Infrastructure Development  
 SD: Social Development

RGC-MC: Regional Government Center Management Committee  
 RKCG: Regional KALAH I Convergence Group  
 RLUC: Regional Land Use Committee  
 RPC: Regional Productivity Committee  
 RPMC: Regional Project Monitoring Committee  
 RSCC: Regional Statistical Coordination Committee  
 PDAC: Project Development Assistance Committee

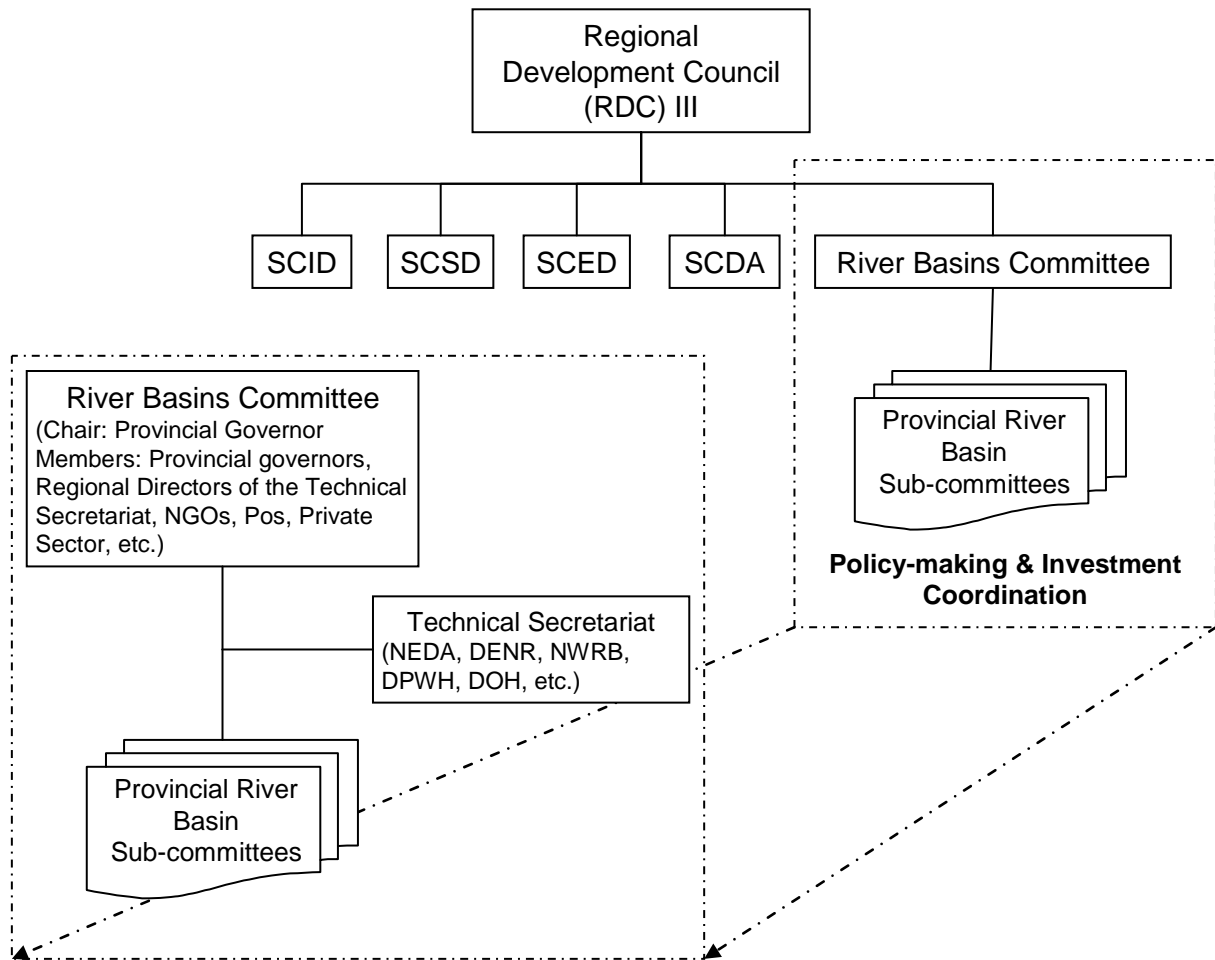
Source: Handbook of the Regional Development Council III (RDC III)  
 Central Luzon Region, Revised August 2006, p26 & pp. 1-25

Annex-F L.3.4.1 Organization Structure of Regional Development Council of Region III



Source: RBCO-DENR, January 2010

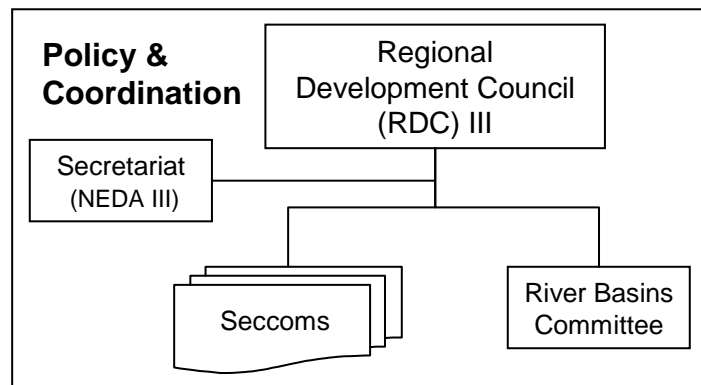
Annex-F L.3.4.2 RBO under of RBCO and Satellite RBCO, Manila Bay Site Coordination Committee



The relationship of the RDC III – RBC vis-à-vis the regular frontline agencies

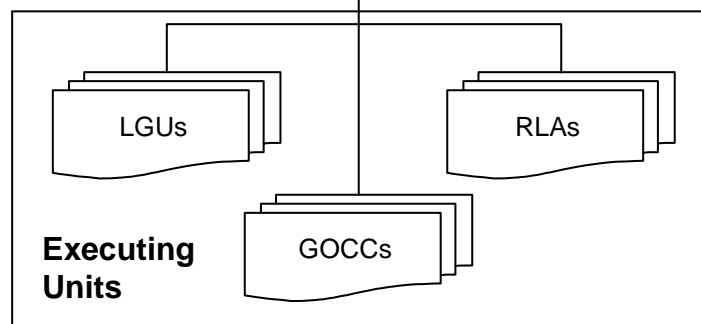
**Roles & Functions:**

Policy coordination & Decision-making body in the region;  
 Formulation of development plans & Investment Programs; Project monitoring;  
 Budgeting & investment programming

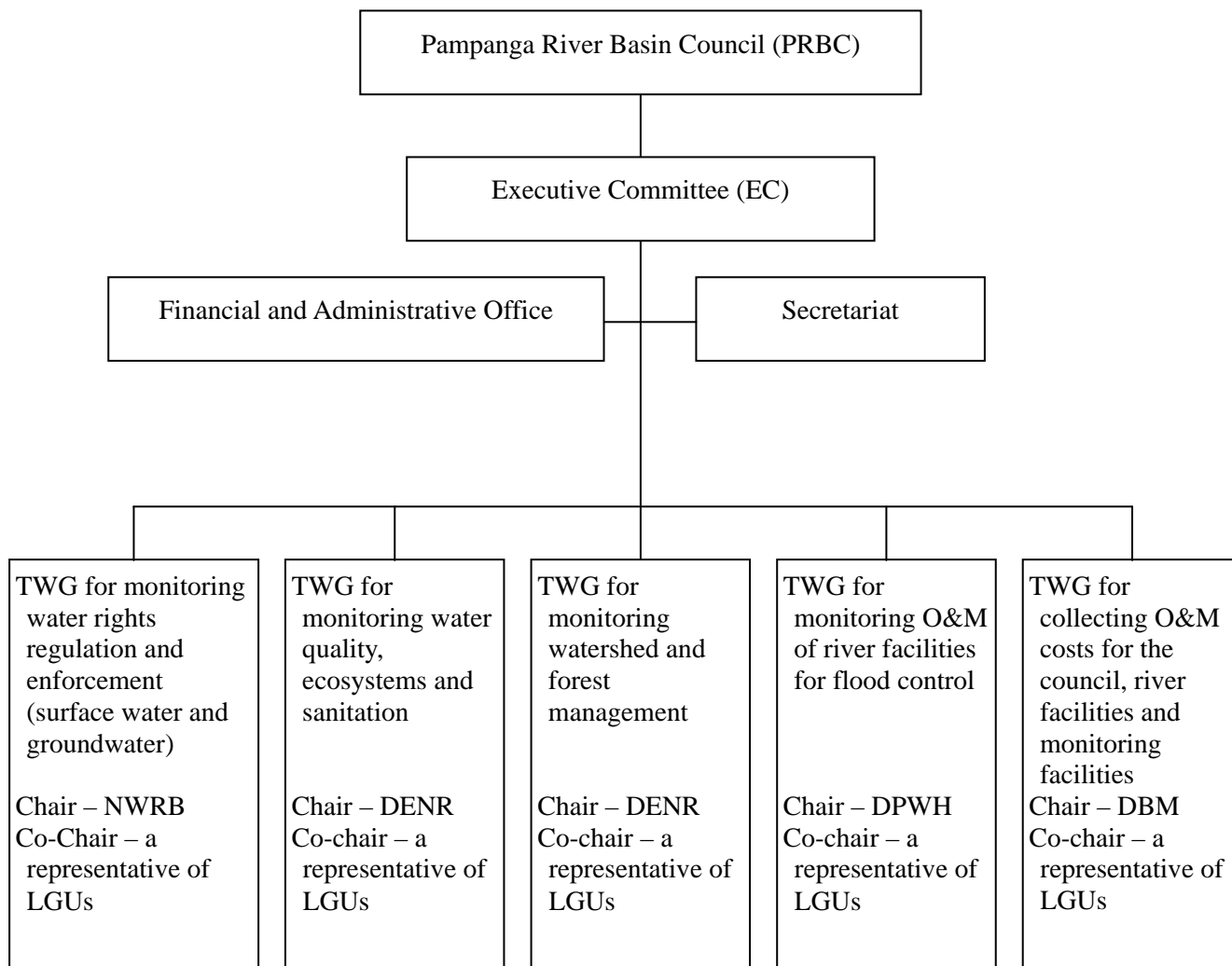


**Roles & Functions:**

Formulation of agency plans and programs;  
 Implementation of plans and programs



Annex-F L.3.4.3 Proposed creation of a Committee on River Basins under the Regional Development Council (RDC) III

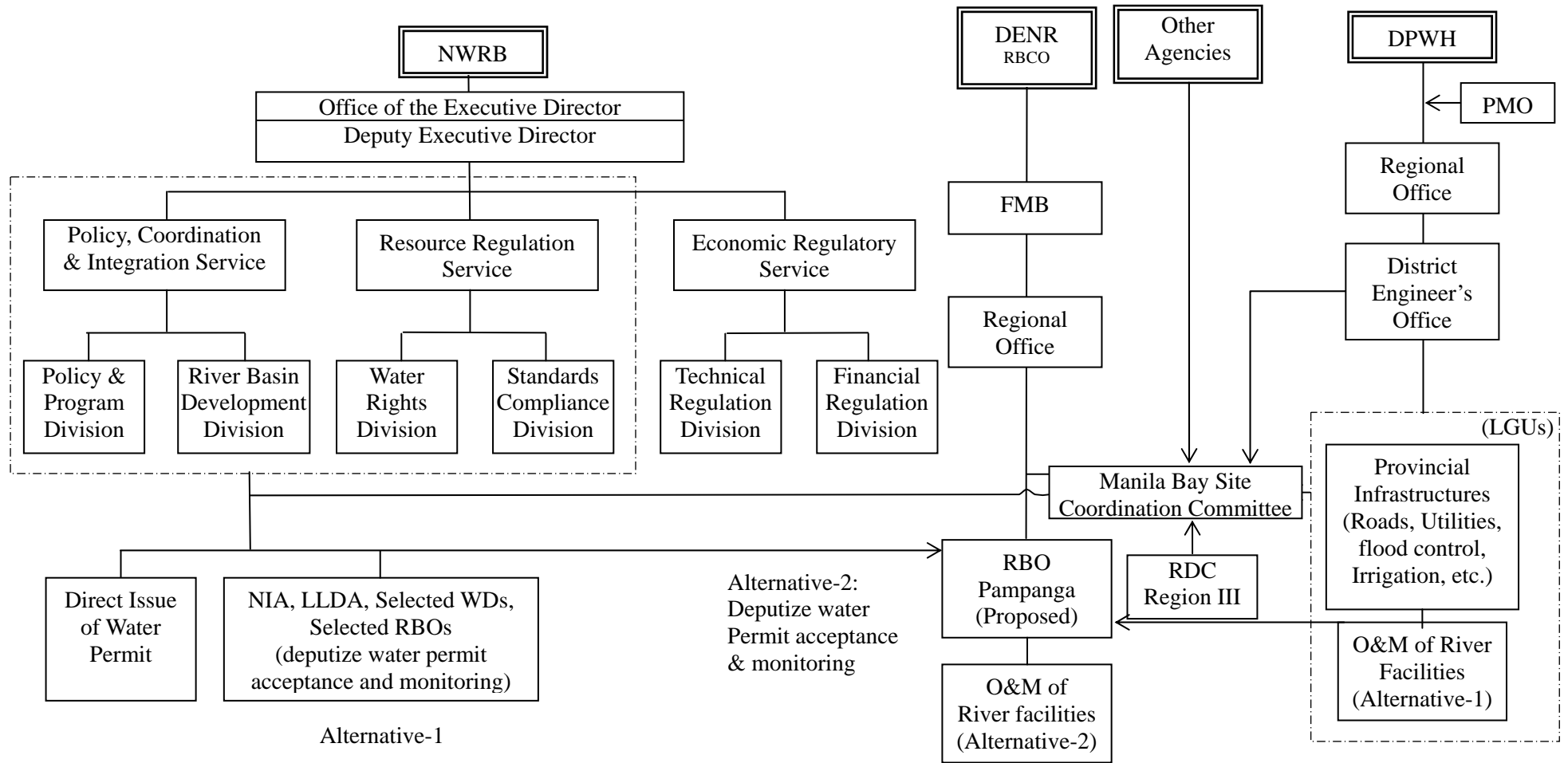


Note: PRBC and EC are multi-sectoral, led by the Chair, a representative of LGUs in Region 3.

A representative of PRBC or EC is elected by the member of PRBC and EC respectively

Source: JICA Study Team

Annex-F L.3.4.4 Independent Pampanga River Basin Council



Source: JICA Study Team

Annex-F L.3.4.5 Position of NWRB for Water Rights Regulation among RBCO and RBO





# *Appendix*



## APPENDIX L-1

### Related Articles of CHAPTER III APPROPRIATION OF WATERS, Water Code of the Philippines (1966)

**Art. 18** All water permits granted shall be subject to conditions of beneficial use, adequate standards of design and construction, and such other terms and conditions as may be imposed by the Council.

Such permits shall specify the maximum amount of water which may be delivered or withdrawn, the maximum rate of diversion or withdrawal, the time or times during the year when water may be diverted or withdrawn, the point or points of diversion or location of wells, the place of use, the purposes for which water may be used, and such other requirements the Council deems desire.

**Art.19.** Water wrights may be leased or transferred in whole or in part to another person with prior approval of the Council, after due notice and hearing.

**Art.20.** The measures and limit of appropriation of waters shall be for beneficial use.

**Beneficial use** of water is the utilization of water in the right amount during the period that the water is needed for producing the benefits for which the water is appropriated.

**Art. 21.** Standards of beneficial use shall be prescribed by the Council for the appropriator of water for different purposes and conditions, and the use of waters which are appropriated shall be measured and controlled in accordance therewith.

Excepting those for domestic use, every appropriator of water shall maintain water control and measuring devices, and keep records of water withdrawal. When required by the Council, all appropriators of water shall furnish information on water use.

**Art. 22.** Between two or more appropriators of water from the same source of supply, priority in time of appropriation shall give the better right, except in times of emergency the use of water for domestic and municipal purposes shall have a better right over al other uses; **Provided**, that where water shortage is recurrent and the appropriator for municipal use has a lower priority in time of appropriation, then it shall be his duty to find an alterative source of supply in accordance with conditions prescribed by the Council.

**Art.24.** A water right shall be exercised in such a manner that the rights of third persons or of other appropriators are not prejudiced thereby.

**Art.25.** A holder of a water permit may demand the establishment of easement necessary for the construction and maintenance of the works and facilities needed for the beneficial use of the waters to be appropriated, subject to the requirements of just compensation and to the following conditions:

- a. That he is the owner, lease, mortgagee or one having rental right over the land upon which he proposes to use water; and
- b. That the proposed easement is the most convenient and the least onerous to the servient estate.

Easement relating to the appropriation and use of water may be modified by the agreement of the contracting parties provided the same is not contrary to law or prejudicial to the third persons.

**Art.26.** Where water shortage is recurred, the use of water pursuant to a permit may, in the interest of equitable distribution of benefit among legal appropriators, be reduced after due notice and hearing.

**Art.27.** Water users shall bear the diminution of any water supply due to natural causes of force majeure.

**Art.28.** Water permits shall continue to be valid as long as water is beneficially used; however, it may be suspended on the grounds of non-compliance with approved plans and specifications or schedules of water distribution; use of water for a purpose other than that for which it was granted; non-payment of water charges; wastage; failure to keep records of water diversion, when required; and violation of any term or condition of any permit or of rules and regulation promulgated by the Council.

Temporary permits may be issued for the appropriation and use of water for short periods under special circumstances.

**Art.29.** Water permit may be revoked after due notice and hearing on grounds of non-use; gross violation of the conditions imposed in the permit; unauthorized scale of water; willful failure or refusal or to comply with rules and regulation or any lawful order; pollution, public nuisance or acts detrimental to public health and safety; when the appropriator is found to be disqualified under the law to exploit and develop natural resources of the Philippines; when, in the case of irrigation, the land is converted to non-agricultural purposes; and other similar grounds.

**Art.30.** All water permits are subject to modification or cancellation by the Council, after due notice and hearing, in favor of a project of greater beneficial use or for multi-purpose development, and a water permittee who suffers thereby shall be fully compensated by the entity or person in whose favor the cancellation was made.

*Sector M*

*Water-related Data Management*



# Sector M. Water-related Data Management

## Table of Contents

	<u>Pages</u>
<b>M.1 General .....</b>	<b>M-1</b>
M.1.1 Data Classification .....	M-1
M.1.2 Existing Data and Knowledge Management.....	M-2
M.1.3 Collected Data and Information.....	M-4
M.1.4 Major Concerns and Issues on Existing Condition of Water-related Data in the Study Area.....	M-5
<b>M.2 GIS Database Development .....</b>	<b>M-7</b>
M.2.1 Overview.....	M-7
M.2.2 Data Collection .....	M-7
M.2.3 GIS Database Build-up .....	M-8
M.2.3.1 Data Types .....	M-8
M.2.3.2 Coordinate System.....	M-9
M.2.3.3 Directory Structure .....	M-9
M.2.4 Technical Transfer.....	M-10
<b>M.3 Pampanga River Basin IWRM Study Website .....</b>	<b>M-11</b>
M.3.1 Objective .....	M-11
M.3.2 Administration and Hosting .....	M-11
M.3.3 Features/Sections .....	M-11
M.3.4 User Types .....	M-13
M.3.4.1 Access Restrictions.....	M-13

## List of Tables

### List of Tables in Report

Table M. 1.3.1	Number of Documents Collected in the Study .....	M-4
Table M. 1.3.2	Major Contents of Data/Information Collected.....	M-4
Table M. 3.4.1	User Accessibility .....	M-13

### List of Annex Tables

Annex-T M.1.3.1	List of Collected Documents .....	MT-1
Annex-T M.1.4.1	List of Spatial Data: Shapefiles .....	MT-21
Annex-T M.1.4.2	List of Spatial Data: Tables.....	MT-28
Annex-T M.1.4.3	Detailed Specifications Shapefile and Table Data .....	MT-30
Annex-T M.1.4.4	List of Spatial Data: Raster.....	MT-45

## **List of Figures**

### **List of Figures in Report**

Figure M. 1.2.1	Existing Official Data and Knowledge Management Options in NWRB....	M-2
Figure M. 2.2.1	Coverage of 2008 NAMRIA-JICA Mapping Study .....	M-7
Figure M. 2.3.1	Linking of Tables .....	M-8
Figure M. 2.3.2	Batch File Configuration .....	M-10

### **List of Annex Figures**

Annex-F M.1.2.1	NWRB Intranet Site.....	MF-1
Annex-F M.1.2.2	NWRB Official Website .....	MF-2
Annex-F M.1.2.3	PhilWATSAN Website .....	MF-2
Annex-F M.1.2.4	NWIN Website.....	MF-3
Annex-F M.3.1.1	Pampanga River Basin IWRM Study Website.....	MF-4



## **Sector M. Water-related Data Management**

### **M.1 General**

#### **M.1.1 Data Classification**

Data to be used for planning, monitoring and their management are key components for efficient and effective water resources management in a river basin. In general, the following categories of data are necessary to be collected and managed properly when water resources management is implemented.

(1) General data

The general data include fundamental information not only for water resources management but also other development and management activities in a region. The information extracted from a general topographic map, statistical information on demography, regional economy and so on, basic socio-natural condition such as land cover, land category, geology and hydrogeology are included in this category.

(2) Basic data for water resources management

The basic data for water resources management are specific for water resources management. The information on facilities related to water use such as storage dam, diversion dam, canal, irrigation area, production wells, as well as location of monitoring stations for stream flow (both for water quantity and quality) and climate condition, are included in this category. The delineated sub-basins and catchments are likewise grouped here.

(3) Monitoring/Permit data

The monitoring/permit data are further divided into the following categories.

- Monitoring data related to water resources such as observation record of quantity, quality and water level of stream flow, water level of monitoring wells and climatic conditions
- Operation record of storage dam and diversion dam
- Water use permit
- Waste water discharge permit
- Control monitoring record for water use permit and waste water discharge permit

(4) Analysis/Planning data

Various data categorized are used to develop data for planning and analysis such as surface water and groundwater availability. The information which shows future visions and projects in a river basin is also included in this category. The information would be utilized for decision support for water resources management in a river basin.

(5) Knowledge data

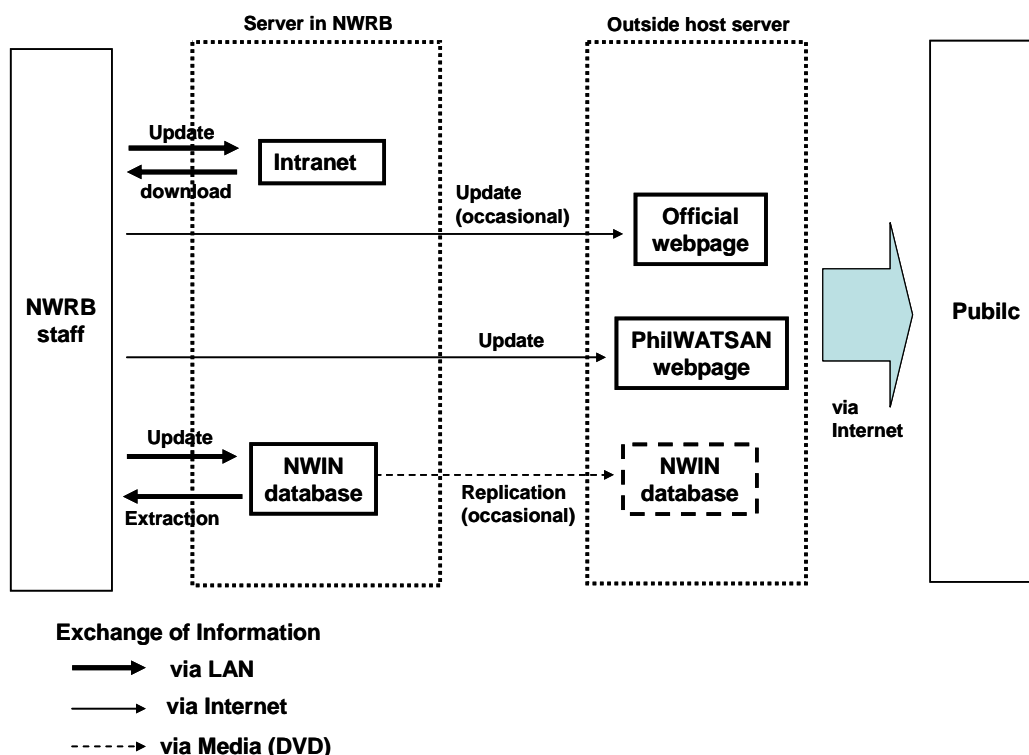
Any practical knowledge from previous experiences in activities related to water resources management in a river basin is also important and it should be accumulated for future use.

In this section, the existing data and knowledge management in NWRB is firstly described. Secondly, the existing condition of the water-related data and information in the study area is summarize with issues and concerns for their utilization.

### M.1.2 Existing Data and Knowledge Management

The NWRB currently maintains the following knowledge management portals: (see also Figure M.1.2.1).

- NWRB Intranet
- Official website of NWRB ([www.nwr.gov.ph](http://www.nwr.gov.ph))
- Philippine Water Supply and Sanitation Sector portal ([www.philwatsan.org.ph](http://www.philwatsan.org.ph))
- National Water Information Network website ([www.nwin.nwr.gov.ph](http://www.nwin.nwr.gov.ph))



Source: JICA Study Team

**Figure M. 1.2.1 Existing Official Data and Knowledge Management Options in NWRB**

#### (1) NWRB Intranet

The intranet started its operation in 2006. The main objectives are to facilitate knowledge sharing among divisions, ensure transparency, easy dissemination of information and improve the different business processes of NWRB. The wide use of intranet has improved the tracking of water permit applications, improved service delivery to clients both external and internal, improved our policy development and documentation and improved our organization and structure. The contents vary from press releases, policy resolutions, Memorandum of Agreement, minutes of meetings, pictures taken from different events, different NWRB forms such as leave forms and travel order forms and other NWRB related information. Update of the intranet is done monthly by the identified contributors in each division. A dedicated server for the portal is installed at NWRB.

Annex-F M.1.2.1 shows the main page of the NWRB intranet.

#### (2) Official website of NWRB ([www.nwr.gov.ph](http://www.nwr.gov.ph))

NWRB currently maintains its own official website. However, due to the transfer of the agency under the DENR, a new one is now being prepared for integration as a subdomain of the latter.

The current website of NWRB contains brief introduction of NWRB, mission, vision, organizational structure, accomplishments, profiles of different divisions, fees and charges and other NWRB water related information. The water permit application form can also be downloaded through this site. Update of the web is done occasionally by NWRB staff.. The website is hosted outside NWRB.

As detailed in the succeeding sections, a website was developed for purposes of this study. To access this, a link was created in NWRB's website.

Annex-F M.1.2.2 shows the main page of the official website of NWRB.

(3) Philippine Water Supply and Sanitation Sector Portal ([www.philwatsan.org.ph](http://www.philwatsan.org.ph))

The PhilWATSAN portal started as a project initiated by NWRB in 2006, in collaboration with other government agencies, with support from the German Technical Cooperation Agency (GTZ)- Water Sanitation Program. By 2007, it was institutionalized as a government program now being pursued by 10 collaborating agencies serving as the Technical Working Group (TWG) to the portal: National Water Resources Board, Department of Interior and Local Government- Water Supply and Sanitation Project Management Office (DILG-WSSPMO), Local Water Utilities Administration (LWUA), Department of Environment and Natural Resources (DENR), National Economic Development Authority (NEDA), National Anti-Poverty Commission – Water Supply and Sanitation Coordinating Office(NAPC-WASCO), Department of Agriculture- Bureau of Soils and Water Management (DA-BSWM), Department of Health (DOH), Metropolitan Waterworks and Sewerage System (MWSS), Department of Public Works and Highways (DPWH). The portal contains policies, projects/programs, research/publications and statistics related to water supply and sanitation sector. It is not just a repository of data and information. It is also a dynamic tool for monitoring the country's progress as currently pursued under the Philippine Water Supply Sector Roadmap. Update of information is done by member agencies through the internet.

Annex-F M.1.2.3 shows the main page of the PhilWATSAN portal.

(4) National Water Information Network (NWIN) website ([www.nwin.nwr.gov.ph](http://www.nwin.nwr.gov.ph))

The National Water Information Network (NWIN) 39 started in 2000 as a project to address the need to rationalize the collection of water related data. It is a computer-based system capable of electronically linking the databases of water resources data collection agencies and provide easy access to user agencies. NWRB acts as a central repository of data to which various participating agencies are linked such as National Water Resources Board (NWRB), Bureau of Research and Standards (BRS), Environmental Management Bureau (EMB), Mines and Geo-sciences Bureau (MGB), Local Water Utilities Administration (LWUA), National Irrigation Administration (NIA), National Economic Development Authority (NEDA), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and the Department of Interior and Local Government- Water Supply and Sanitation Management Office (WSSPMO-DILG). The NWIN website contains rainfall data, stream flow data, water quality data, dam inventory, groundwater data, list of rivers and water permits data. NWRB used to keep high speed cable connections among participating agencies and maintains the 24x7 website hosting but due to budget constraints the physical connections have been disconnected making it difficult for participating agencies to upload data directly to the servers. They were also restrained from publishing some information due to policy issues raised by other participating agencies. The website is now hosted outside NWRB. There was no significant update of data since 2004 except for water permit data being regularly updated by NWRB.

Annex-F M.1.2.4 shows the main page of the NWIN website.

NWRB plans to maintain a single website by integrating all the above mentioned websites to better serve the public.

## Sector M: Water-related Data Management

### M.1.3 Collected Data and Information

The documents related to the water resources management/development in the study area have been collected during the study period and listed in Annex-T M.1.3.1. The number of documents collected is shown below.

**Table M. 1.3.1 Number of Documents Collected in the Study**

Category	Number of Items Collected
00 IWRM General	42
01 Laws & Institution	33
03 Regional Development	26
04 Water Resources Management and Development	80
05 Domestic Water Supply	48
06 Irrigation	70
07 Groundwater	43
08 Dam	24
09 Flood and Sediment Disasters	54
10 Water Quality Management	40
11 Watershed Management	40
12 Development of Database	27
13 Guidelines	44
14 Environment	42
15 Fishery	8
<b>Total</b>	<b>621</b>

Source: JICA Study Team

A variety of relevant data and information were also collected. The major contents of the data/information are as listed in Table M. 1.3.2.

**Table M. 1.3.2 Major Contents of Data/Information Collected**

Category	Major Content	Data Source
Topographic Map	<ul style="list-style-type: none"> <li>Map with a scale of 1 to 50,000 developed from aerial photography taken in 2006</li> </ul>	JICA, NAMRIA
Socio Economy	<ul style="list-style-type: none"> <li>Present and projected Socio-economic profile</li> </ul>	Provinces of Pampanga, Bulacan, Nueva Ecija and Tarlac
Water District	<ul style="list-style-type: none"> <li>Inventory of the domestic water supply service</li> </ul>	Water districts in Provinces of Pampanga, Bulacan, Nueva Ecija and Tarlac
Watershed Management	<ul style="list-style-type: none"> <li>Forestry statistics</li> <li>List of watershed management project</li> <li>Land cover map</li> <li>Statistics of mangrove</li> </ul>	Cenro, DENR Region III
Water Quality	<ul style="list-style-type: none"> <li>Results of laboratory test on river water quality, sediment load, groundwater</li> </ul>	DENR Region III
Dam operation	<ul style="list-style-type: none"> <li>Operation Record of Pantabangan and Angat Dam Reservoir</li> </ul>	NIA and NPC Dam Offices
Irrigation	<ul style="list-style-type: none"> <li>Location map of irrigation area</li> <li>Recorded and projected irrigation schedule</li> <li>Diversion requirement of the major irrigation area</li> <li>Extent of irrigation area</li> </ul>	NIA HQ, NIA Region III, UPRIIS
Flood	<ul style="list-style-type: none"> <li>Flood damage record</li> <li>Actual extent of flood inundation area</li> </ul>	PDCC, RDCC Dartmouth Flood Observatory
Groundwater	<ul style="list-style-type: none"> <li>Features of existing wells</li> <li>Record of land subsidence</li> <li>Results of laboratory test on the groundwater, geological map</li> </ul>	NWRB, MGB
Meteorological and hydrology	<ul style="list-style-type: none"> <li>Climate, rainfall, river flow discharge, and tidal data</li> </ul>	PAGASA, BRS
National Statistic	<ul style="list-style-type: none"> <li>National Socio Economic Census</li> </ul>	NSO
Water Use Right	<ul style="list-style-type: none"> <li>Inventory of water use rights</li> </ul>	NWRB
Fishery	<ul style="list-style-type: none"> <li>Fishery statistics</li> </ul>	Bureau of Agricultural Statistics of Department of Agriculture

Source: JICA Study Team

#### **M.1.4 Major Concerns and Issues on Existing Condition of Water-related Data in the Study Area**

Based on the collected data and information described in the foregoing subsection, necessary spatial data for water resources management planning in the study area have been prepared as listed in Annex-T M.1.4.1, M.1.4.2, M.1.4.3 and M.1.4.4.

The major issues and concerns for the existing condition of water-related data in the study area are described below based on the experience on the data collection.

##### (1) General data

- Fortunately, new NAMRIA 1:50,000 topographic maps prepared in 2008 are available for most of the study area in vector format. This made the study team to utilize the most updated land condition in the study area.
- DENR Region III has prepared a lot of general data, most of which were extracted from the old NAMRIA topographic maps, that are available for the study and these were utilized. The agency, however, can't specifically identify which data were developed in-house and which were sourced from other government offices.
- Administrative boundary is different for many different data sources. It is difficult to fix the administrative boundary in the present study. NWRB and the study team agreed to use the administrative boundary given by the NAMRIA topographic maps.
- In many municipalities/cities, a landuse plan is still under preparation. Moreover, landuse type used by LGUs is different with each other. It is difficult to prepare an integrated landuse map for the provincial government.
- Some data for ancestral domains and protected areas only indicate a general description of the areas, such as the name of the municipality or barangay. Assumptions had to be made to approximate the locations of these features.
- Some data lack or have no information at all on the coordinate system. This affects the accuracy of their locations as assumptions had to be made on their geographic positions. This is also the case with other data classifications.

##### (2) Basic data for water resources management

- There is a database in NIA for irrigation related facilities in vector format. Part of this database is available for the study. Other information is basically available in non-vector format. A lot of basic data are created by the study team, refereeing the existing information and so on.
- To maintain consistency to the general data, it was sometimes necessary to adjust the data, especially in their location.
- The data and information of production wells are scattered in several agencies, although LWUA has solid database for production wells.

##### (3) Monitoring/permit data

- Monitoring and permit data are the most frequently changing. However, they are scattered among several different agencies. There is no integrated management of those data.
- Processed climatic data from PAGASA are not free in general.
- Some monitoring data for production wells are kept in water districts. It is necessary to collect the data one by one.
- There are limited data available for surface water quality in the study area.

## Sector M: Water-related Data Management

- Operation record of storage dam and diversion dam is available for NWRB by request basis. However, there is no direct and synchronized sharing of the information among the related agencies.
- The waster water discharge permit data are not well organized. It is difficult to extract necessary information for assessment of pollution load from the filed information for discharge permits.
- There is no solid database for control monitoring both for water use permit and waste water discharge permit. This may cause the difficulty for the monitoring activities to be reflected in the assessment and planning processes.

### (4) Analysis/Planning data

- The data were prepared during the course of the present study.

### (5) Knowledge data

- There is no database for integrating previously accumulated knowledge for the water resource management in the study area.

## M.2 GIS Database Development

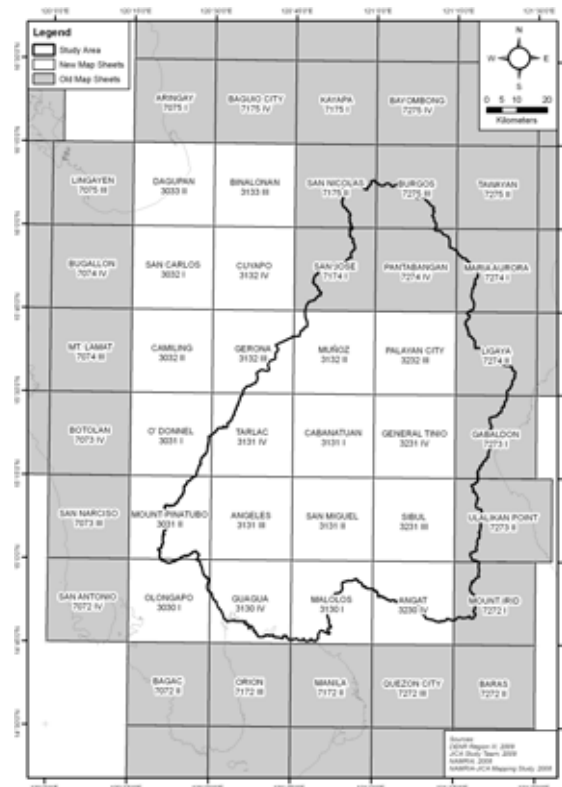
### M.2.1 Overview

The capability of Geographic Information System (GIS) to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information makes it a very powerful tool in making decisions. It is useful for natural resources management, disaster management, urban and regional planning, transportation studies, utilities management, etc.

The development of a comprehensive GIS database offered the study team a better insight of the conditions of the Pampanga River Basin and its surrounding areas. It provided support to the analyses made in the study.

### M.2.2 Data Collection

Majority of the base data came from The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines by NAMRIA-JICA on 2008 that updated several 1:50,000 topographic map sheets in Central Luzon. Figure M.2.2.1 shows its coverage which overlaps about 75% of the Pampanga River Basin. Additional base data were obtained from DENR Region III, which developed their own GIS database from old NAMRIA 1:50,000 maps.



**Figure M. 2.2.1 Coverage of 2008 NAMRIA-JICA Mapping Study**

The study team also collected specific data from various government agencies related to the offices' mandate (e.g. DENR-PAWB for protected areas, NCIP for indigenous peoples, NSO for population, etc.)

Relevant data that are freely distributed over the internet, such as the WorldClim and SRTM, were downloaded and used in the study.

The data were gathered in both hard and softcopy formats and required the necessary processing in order to be integrated into the GIS database. Generally, the collected raw data came in the following formats:

## Sector M: Water-related Data Management

- (1) ESRI Shapefile
- (2) ESRI ArcInfo Coverage
- (3) AutoCAD DWG/DXF
- (4) Microsoft Excel
- (5) Raster Images (JPG, TIFF, PDF, etc.)
- (6) Google Map KML/KMZ files
- (7) Lot Technical Descriptions
- (8) Text Descriptions
- (9) Harcopies

### M.2.3 GIS Database Build-up

After evaluating the collected data, they were integrated into the GIS database. It primarily involves the conversion of all data to digital format and making them conform to the adopted standards.

The quality of the data were checked and edited. Errors such as overlapping features, gaps, unclosed polygons and other inconsistencies were corrected and the final output were stored in the database.

Annex-T M.1.4.1, M.1.4.2, M.1.4.3 and M.1.4.4 list all the spatial data created and used in the study.

#### M.2.3.1 Data Types

- (1) ESRI Shapefile

The main GIS data format used in the study is the ESRI Shapefile.

- (2) Tables

Using a common attribute, a table maybe linked to a GIS database to provide additional information. Temporarily joining two or more tables minimizes the number of fields in the GIS data. Figure M.2.3.1 shows samples of simple linking of tables.

#### One-To-One

<i>Input Table</i>		<i>Join Table</i>		<i>Output Table</i>		
Province	CityMun	CityMun	CityMunAr	Province	CityMun	CityMunAr
Pampanga	San Fernando	San Fernando	68.6	Pampanga	San Fernando	68.6
Pampanga	Arayat	Arayat	176.7	Pampanga	Arayat	176.7
Pampanga	Candaba	Candaba	208.2	Pampanga	Candaba	208.2
Bulacan	Malolos	Malolos	72.6	Bulacan	Malolos	72.6
Bulacan	Bocaue	Bocaue	26.1	Bulacan	Bocaue	26.1

#### Many-To-One

<i>Input Table</i>		<i>Join Table</i>		<i>Output Table</i>		
Province	CityMun	Province	ProvPop	Province	CityMun	ProvPop
Pampanga	San Fernando	Pampanga	1,618,759	Pampanga	San Fernando	1,618,759
Pampanga	Arayat	Bulacan	2,234,088	Pampanga	Arayat	1,618,759
Pampanga	Candaba			Pampanga	Candaba	1,618,759
Bulacan	Malolos			Bulacan	Malolos	2,234,088
Bulacan	Bocaue			Bulacan	Bocaue	2,234,088

**Figure M. 2.3.1 Linking of Tables**

The list in Annex-T M.1.4.2 also indicates to which GIS data a particular table may be linked.

The data formats used are Microsoft Excel (.xls), dBase (.dbf), and comma-separated values (.csv).

- (3) Raster

The study used GeoTIFF and JPG (along with their corresponding world files) as raster data formats.



(4) Hyperlink

Incidentally, only Microsoft Excel files were used as hyperlinks for this study. But generally, any file format may be used.

### **M.2.3.2 Coordinate System**

The raw data collected came in different coordinate systems. Though, as mentioned in the previous sections, some lack or has no information at all so assumptions had to be made to process these data.

To maintain consistency with the NAMRIA 1:50,000 maps which were used as the basemap, the coordinate system used in the study is UTM Zone 51 N, Luzon 1911 datum.

### **M.2.3.3 Directory Structure**

The GIS data prepared in the study are stored in a directory named as “PRB-IWRM”. It is further organized into the following sub-directories:

(1) Database\_AV

This directory contains all the shapefiles, tables and hyperlinked data..

(2) Raster

This directory contains all the raster data.

(3) Maps

From the GIS database, various thematic maps were produced to support the analyses of the study team.

Selected from all the maps that were created throughout the study, a final set was made and grouped according to the following sectors:

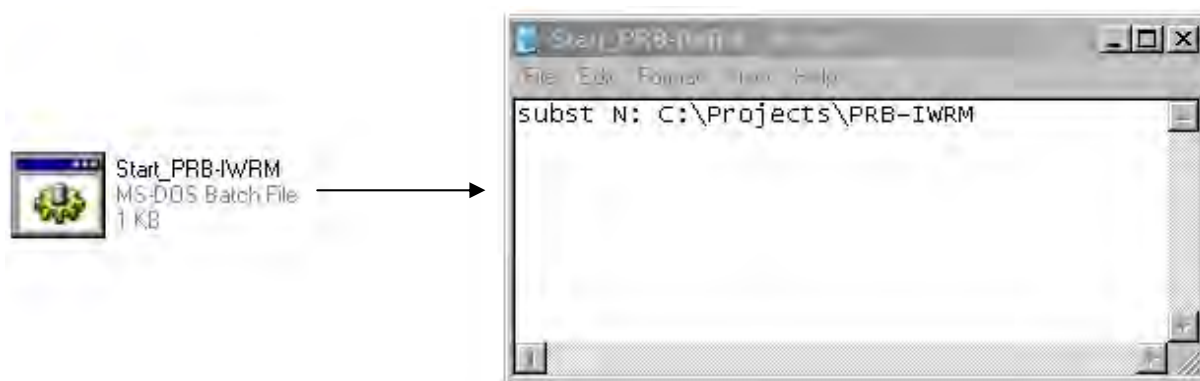
- (a) Agriculture / Irrigation and Fishery
- (b) Municipal Water Supply, Sanitation and Sewerage
- (c) Management of Flood and Sediment Disasters
- (d) Watershed Management
- (e) Water-related Environment Management
- (f) Others

The maps are in ESRI ArcGIS Map (.mxd), version 9.3. They are also exported to JPG format as found in the Quicklooks directory.

(4) Documentation

Information about GIS-related data are found in this directory.

The ArcGIS software requires the replication of directory structures when the files are transferred from one machine to another. For this study, the MXD files were routed to the N: drive. A batch file, Start\_PRB-IWRM.bat, containing a command that would substitute any directory to a temporary N: drive was created. This makes it easier for the data to be stored in the users' preferred location. Using any text file editor software, the file may be modified to configure the directory path. Figure M.2.3.2 shows the contents of the batch file when opened in Windows Notepad. When it is executed, the path C:¥Projects¥PRB-IWRM will be substituted as N: drive.



**Figure M. 2.3.2 Batch File Configuration**

### **M.2.4 Technical Transfer**

On March 2010, a three-day training on GIS was conducted by the JICA Study for the NWRB counterpart personnel. The first two days were focused on an overview of basic GIS concepts and an introduction to the functionalities of ESRI’s ArcGIS software. The third day, meanwhile, was held in preparation for another training involving Runoff Analysis Modeling. Using GIS, actual input data were prepared for use in the said training.

The training materials used in these activities are shown in Training Material and Manuals (separate volume in digital format).

When the study was already near its concluding stages, a presentation was also held to brief the NWRB staff on all the GIS data created and used for the project.

## **M.3 Pampanga River Basin IWRM Study Website**

### **M.3.1 Objective**

An open-source web application was developed to primarily serve as a tool for information sharing and coordination among the individuals and agencies involved in the study. This is likewise a repository of various data that are open for disclosure to all concerned parties.

Annex-F M.3.1.1 shows some samples of the website.

### **M.3.2 Administration and Hosting**

The administration of the website will be under NWRB, whose personnel were provided technical training for guidance in troubleshooting. The source codes and the documentations were likewise turned over to the agency. If necessary, this will also enable them to do further customizations in the website.

A copy of the documentation is found in Training Material and Manuals (separate volume in digital format).

The website is integrated to the official website of the NWRB as an additional link.

### **M.3.3 Features/Sections**

#### (1) User Login / Logout

The accessibility to some features was limited depending on the user browsing the website. Hence, a login/logout feature was added. Usernames and passwords were provided to select users.

Detailed information regarding user restrictions are discussed in the succeeding sections.

#### (2) Home

The Home page is comprised of four sub-menus:

- **Project Description:** This section contains some basic information about the study such as its background, the importance of the IWRM, etc.
- **Objectives:** The goals of the study are listed in this section.
- **Members:** The names and other useful information about the members of the Technical Working Group, Steering Committee, NWRB Counterpart Personnel and the JICA Study Team are found in this section. It likewise provides, if available, the logos and links to the websites of the participating agencies.
- **Study Area:** The characteristics of the study area are described in this section – its area, extents, affected local government units, etc.

#### (3) IWRM Plan Framework

The IWRM Plan Framework section is currently empty. This will be filled out upon the completion of the study.

#### (4) Lessons Learned

The Lessons Learned section contains uploaded information from the agencies regarding their experiences from the study that may be useful to other projects in the future.

#### (5) Minutes of Meetings

Minutes of meetings related to the study are stored in this section. These are made available in any file format, depending on the preference of the one uploading of the data.

#### (6) Downloadable Data

## Sector M: Water-related Data Management

Select users may upload relevant data which can be accessed by others. Restrictions may be set to limit the accessibility of some files only to certain users.

For easier browsing, the data may be grouped and filtered according to the following:

- By Agency (e.g. NWRB, JST, DENR, PAGASA, etc.)
- By File Extension (e.g. pdf, doc, xls, jpg, etc.)
- By Category (e.g. reports, maps, statistics, presentations, etc.)

### (7) Google Maps Interface

For sharing spatial information, the website was interfaced with the Google Maps application. It allows users not only to view map data that were created and utilized in the study, but also to make their own contributions to the datasets. However, restrictions were set on how these will be accepted to regulate and filter any irrelevant data.

The data may be represented as point, line or polygon features.

#### (a) Study Data

The GIS data used in the study were transformed to Geographic Coordinate System (WGS84 datum) and were converted to KML file format for Google Map compatibility. They are overlaid against the application as layers of information where display may be turned on/off using checkboxes.

#### (b) User-Contributed Data

Users may also contribute additional information through the following options:

- Digitizing: The user clicks on the map the corresponding location of the feature and then adds a description.
- Coordinate Input: The user inputs the geographic coordinates of the feature in Decimal Degrees or DMS (Degrees-Minutes-Seconds) format and then adds a description. For lines or polygons, these coordinates will be treated as vertices where the first and the last pairs correspond to the features' endpoints or the points of closure, respectively.
- Upload their own KML's

### (8) Forum

The website features pages where members may communicate with each other in a forum or message board style.

This section may be accessed by select members only.

### (9) Contact Us

For the people to send feedbacks, the website provides the contact details of NWRB. It contains the agency's mailing address, telephone and fax numbers, email address, and location map.

### (10) Search

A search engine was incorporated as a tool for easier browsing of the site.

### (11) Calendar

To keep track of important events, a web calendar application was added to the website. This may be viewed in calendar style in its main page or as a quick reminder, which is a frame visible in every page displaying all events set to occur within thirty days from the current date.

Event details such as the description, location, time, etc. may be indicated.

### (12) Hit Counter

The website is equipped with a hit counter that may be used in the monitoring and analysis of the number of visitors and other web statistics.

### M.3.4 User Types

The website has four levels of user access. Initially, the following groupings were been made.

- User 1: Website Administrator(s)
- User 2: Technical Working Group, JICA Study Team
- User 3: Steering Committee Members (who are not part of the Technical Working Group), Stakeholders and other concerned individuals/agencies
- User 4: Public

#### M.3.4.1 Access Restrictions

Not all information may be fully disclosed to anyone browsing the site so a restriction function was incorporated to limit the accessibility of some features. Usernames and passwords were provided to Users 1-3.

Table M.3.4.1 summarizes the key differences of user access for each section.

**Table M. 3.4.1 User Accessibility**

Feature	User 1 (Website Administrator)	User 2 (TWG, JST)	User 3 (SC, Stakeholders, others)	User 4 (Public)
Home	Full Control	Read-only	Read-only	Read-only
Lessons Learned	Full Control	Can upload and download	Can download	Can download
Minutes of Meetings	Full Control	Can upload and download	Can download	Can download
Downloadable Data	Full Control	Can only edit/delete the files that he/she uploaded	Can download	Can only download unrestricted files
		Can upload and set restrictions		
		Can download		
Google Maps Interface	Full Control	Can only edit/delete the files that he/she uploaded		
		Data used in the study can be viewed	Data used in the study can be viewed	Data used in the study can be viewed
		Can contribute information without restrictions	Can contribute information but it won't be displayed until approved by the Website Administrator	Can contribute information but it won't be displayed until approved by the Website Administrator
Forum	Full Control	With access	With access	No access
Contact Us	Full Control	Read-only	Read-only	Read-only
Search	Full Control	Can search	Can search	Can search
Calendar	Full Control	Can post events	Can post events	Cannot post events
Hit Counter	Full Control	Can only view number of hits	Can only view number of hits	Can only view number of hits



# *Annex-Tables*





## Annex-T M.1.3.1 (1/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
<b>00_IWRM General</b>							
00_01	Master Plan for the Agusan River Basin Project (Draft Final Report)	ADB/DENR	2005	√			E
00_02	Master Plan for the Agusan River Basin Project (Interim Report)	ADB/DENR	2006	√			E
00_03	Master Plan for the Agusan River Basin Project (Interim Report)	ADB/DENR	2006	√			E
00_04	Master Plan for the Agusan River Basin Project (Final Report), Vol.III(B)	ADB/DENR	2007		√		E
00_05	Master Plan for the Agusan River Basin Project (Draft Final Report), Vol.IV	ADB/DENR	2007		√		E
00_06	Master Plan for the Agusan River Basin Project (Draft Final Report), Vol.I Executive Summary	ADB/DENR	2007		√		E
00_07	Basic Survey for IWRM (Progress Report)	NWRB/JICA	2006	√			E
00_08	Basic Survey for IWRM (Final Report), Vol.IV-Databook	NWRB/JICA	2005	√			E
00_09	IWRM and the Role of NWRB	NWRB	2008			√	E
00_10	River Basin and Watershed Management Program. Bicol River Basin, Final Report	World Bank	2005			√	E
00_11	Integrated River Basin Management and Development Masterplan (Main Report)	DENR-RBCO	2005	√			E
00_12	Integrated River Basin Management and Development Masterplan (Executive Summary)	DENR-RBCO	2005	√			E
00_13	Integrated River Basin Management and Development Masterplan	DENR-RBCO	2005		√		E
00_14	IWRM Plan Framework in the Philippines-Working together to Secures Sustainable Water for All	NWRB	2006	√			E
00_15	IWRM Plan Framework in the Philippines Summary- Working together to Secures Sustainable Water for All	NWRB	2007	√			E
00_16	Inegrated Water Resources Management (is it working)	Mr.A.K.Biswas	2008	√			E
00_17	Bohol Integrated Water Resources Management Strategic & Operational Plan (2009-2020)	Bohol IWRM Borad	2007	√			E
00_18	IWRM Guidelines at River Basin Level (Presentation)	UNESCO	2009	√			E
00_19	IWRM Guidelines at River Basin Level (Part 1)	UNESCO	2009	√			E
00_20	IWRM Guidelines at River Basin Level (Part 2-1)	UNESCO	2009	√			E
00_21	IWRM Guidelines at River Basin Level (Part 2-2)	UNESCO	2009	√			E
00_22	IWRM Guidelines at River Basin Level (Part2-3)	UNESCO	2009	√			E
00_23	Executive Briefing on IWRM for Bohol IWRM Board	gtz	2008		√		E
00_24	Integrated Water and Soil Resources Management_IWSRM_and Advocacy Initiatives for Ground RawWater Pricing (LADCC mtg clarkfield)	NEDA-Region III		√	√		E
00_25	Philippine Progress on Implementing IWRM Reforms (mbcc final presentation)	NWRB	2007	√			E
00_26	Catalyzing_change-final	Global Water Partnership	2004	√			E
00_27	Study on IWRM for Poverty Alleviation and Economics Development in Pampanga River Basin (Pampanga RBstudy)	NWRB	2005	√			E
00_28	National Water Resource Board Presentation	NWRB	2008	√			E
00_29	Intengrated Water Resources Management (Presentation)	NWRB		√			E
00_30	IWRM Symposium PPT presentations	NWRB	2006		√		E
00_31	Basic Survey for IWRM (Final Report)	NWRB/JICA	2007		√		E
00_32	Central Luzon IWRM Summit	NEDA	2005	√			E
00_33	Central Luzon IWRM Summit	NEDA	2005		√		E
00_34	Central Luzon IWRM Summit Concept Paper	NEDA	2005		√		E
00_35	Central Luzon IWRM Summit WSG consolidated	NEDA	2005		√		E
00_36	Central Luzon IWRM Summit RESOLUTION	NEDA	2005	√			E

Annex-T M.1.3.1 (2/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
00_37	Philippine Water Resources Management and Development: A Situationer	NWRB	2006	√			E
00_38	UNEP Support for Achieving the IWRM 2005 Target, Philippines National Report	NWRB	2007	√			E
00_39	Complication of Papers Presented during the Philippines National Workshop on the Development of Effective Water management Institution	International Water Management Institute, Central Luzon University, NIA	2005	√			E
00_40	Memorandum Understanding Agusan River Basin	ADB	2008	√			E
00_41	TOR Agusan	ADB	2008	√			E
00_42	Central Luzon Water Summit	NEDA	2005	√			E
<b>01 Law&amp;Institution</b>							
01_01	Proposal for a Revised Organization and Staffing Structure for the NWRB		2005	√			E
01_02	Institutional Strengthening of NWRB through the Enhancement of the processing of water permit, application, billing and related information system and the creation/establishment of the water resources regional council secretariat (WRRCS) in Region 7		2005	√			E
01_03	Action plan for reforms relating to the national water resources board NWRB		1995	√			E
01_04	Water Code and Implementing Rules and Regulations		1979			√	E
01_05	Local Government Code		1991			√	E
01_06	Water Code and Amended Implementing Rules and Regulations		2005			√	E
01_07	RBO-Training Manual Final		2008		√		E
01_08	Compilation of Papers Presented during the Philippines National Workshop on the Development of Effective Water Management Institutions		2000			√	E
01_09	NWRB Organizational Chart					√	E
01_10	Constructive River Administrative in Japan		1996	√			E
01_11	Integrated Water Resources Management for River Basin Organizations	UNDP	2008			√	E
01_12	River Law in Japan	JICA		√			E
01_13	EO No. 318 Promoting Sustainable Forest Management in the Philippine	GOP	2004	√			E
01_14	Executive order No. 10 Series of 2007 (creating the Bohol Integrated Water Resources Management Board (BIWRM) Providing for its Functions and other Purposes	GOP	2007	√			E
01_15	Mines and Geosciences Bureau			√			E
01_16	Country Paper, National Water Sector Apex Body Philippines: National Water Resources Board	ADB		√			E
01_17	Organization Report on Agno River Basin Development Commission	ADB		√			E
01_18	Executive Order No. 359 (Creating the Bicol River Basin Project Management Office)	GOP	1989	√			E
01_19	Executive Order No. 774 (Reorganizing the Presidential Task Forces for Climate Change	GOP		√			E
01_20	National Water Resources Board (NWRB 2005 fees and Charges)	NWRB		√			E
01_21	NWRB (2007 Accomplishment Report)	NWRB	2007	√			E
01_22	Executive Order No. 123, Reconstituting the National Water Resources Board	GOP	2002	√			E
01_23	E.O. No. 366 "Rationalization"	GOP	2004	√			E
01_24	EO No. 510 (Creating the RBCO)	GOP	Jun-05	√			E
01_25	Manual on Maintenance of Flood Control and Drainage Structures" DPWH-JICA, April 2005 ( 水・河川関連法規部分のコピー )	FCSEC-DPWH	2005	√			J

## Annex-T M.1.3.1 (3/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
01_26	フィリピン国水資源・流域管理関連の組織及び法令の概要	公共事業道路省・JICA専門家 香川明人	2004	√			J
01_27	DO-2007-28-732_ManilaBayEnvironmental ManagementProject	DENR	2007	√			E
01_28	NWRB Proposed Organizational Structure	NWRB	2008	√			E
01_29	Functional Chart of Water Related Agencies	NWRB	Jun-05	√			E
01_30	活動報告書（統合水資源管理）、2006年3月神宮保（JICA短期専門家）	JICA	2006	√			J
01_31	EO 785 Mandating the Presidential Task Force on Climate Change to Develop the National Climate Change Framework, Directing the Task Group on Information to develop and Coordinate a National Information, Education and Communications Program, Directing the Presidential Adviser on Climate Change to Review Government Climate Change Programs and Official Development Assistance Project	GOP				√	E
01_32	Upper Pampanga River Basin Coordinating Council			√			E
01_33	Policies, Institution and Climate Risk Management in the Philippines	University of Philippines	2009	√			E
<b>03 Regional Development</b>							
03_01	Central Luzon Regional Development Investment Program, 2005-2010	NEDA	2004	√			E
03_02	Regional physical Framework Plan (Region III), 2004-2030	NEDA				√	E
03_03	Central Luzon Updated Development Plan, 2008-2010	NEDA	2004	√			E
03_04	Regional physical Framework Plan (Region III), 2005-2030	NEDA	2006	√			E
03_05	Updated Regional Development Plan, 1996-1998	NEDA		√			E
03_06	Regional Physical Framework Plan of the Central Luzon Region, 1999-2020	NEDA		√			E
03_07	Regional Development Council Central Luzon (Regional Physical Framework Plan, 1993-2023	NEDA		√			E
03_08	Regional Physical Framework Plan (Regional Land Use Committee), 1993-2022	NEDA		√			E
03_09	Midium-Term Philippine development Plan, 2004-2010	GOP	2004	√			E
03_10	Major Development Programs and Projects (NCR), 1986-1992					√	E
03_11	Major Development Programs and Projects (Rizal), 1986-1992					√	E
03_12	Major Development Programs and Projects (Laguna), 1986-1992					√	E
03_13	DPWH Medium Term Infrastructure Program	DPWH	1999- 2004	√			E
03_14	DPWH Medium Term Infrastructure Development Program	DPWH	2007	√			E
03_15	The Master Plan Study for Central Luzon Development Program (Japanese)	JICA	1995	√			J
03_16	The Master Plan Study for Central Luzon Development Program (Vol. I)	JICA	1995	√			E
03_17	The Master Plan Study for Central Luzon Development Program (Vol. II)	JICA	1995	√			E
03_18	The Master Plan Study for Central Luzon Development Program (Vol. III)	JICA	1995	√			E
03_19	The Master Plan Study for Central Luzon Development Program (Vol. IV)	JICA	1995	√			E
03_20	The Master Plan Study for Central Luzon Development Program (Vol. V)	JICA	1995	√			E
03_21	The Master Plan Study for Central Luzon Development Program (Vol. VI)	JICA	1995	√			E
03_22	The Master Plan Study for Central Luzon Development Program (Vol. VII)	JICA	1995	√			E
03_23	The Master Plan Study for Central Luzon Development Program (Vol. VIII)	JICA	1995	√			E
03_24	Bacolor_Final Report	U.P. PLANADES		√	√		E
03_25	Next frontier	CLARK FREEPORT	2008		√		E

Annex-T M.1.3.1 (4/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
03_26	Midiumterm Development Plan-2011-2013_N.E	PPDO-Nueva Ecija	2011-2013		√		E
<b>04 Water Resources&amp;Management</b>							
04_01	Technical Notes Part 1 (Hydrological Data Book)	DPWH	1989	√			E
04_02	The Small Water Impounding Management (SWIM) Project (Vol. III)	DPWH	1991	√			E
04_03	Updating on the Master Plan on Water Resources Mangement in Two Selected River Basins (Final Report)	DENR	2006		√		E
04_04	Workshop Towards a Sustainable Water Supply within the Framework of the Water Resources Management	NWRB	2001	√			E
04_05	Workshop on the Philippine Proigram Action in the Water Resources Sector	NWRB		√			E
04_06	Workshop in River Management in the Philippine	JICA	2000	√			E
04_07	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. I Executive Summary)	JICA	1998	√			E
04_08	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. II Master Plan Main Report)	JICA	2003	√			E
04_09	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. III Master Plan Supporting Report)	JICA	2003	√			E
04_10	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. IV Feasibility Study Main Report)	JICA	2003	√			E
04_11	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. V Feasibility Study Supporting Report)	JICA	2003	√			E
04_12	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. VI Feasibility Study Data book)	JICA	2003	√			E
04_13	Water Resources Development Project (WRDP) IBRD Loan No. 4110-PH Project Progress Report No.17	NIA	2005	√			E
04_14	Water Resources Development Project (WRDP) IBRD Loan No. 4110-PH	NIA	2001	√			E
04_15	Water Resources Development Project (WRDP) IBRD Loan No. 4110-PH Project Progress Report No.11	NIA	2002	√			E
04_16	Reference Materials on Water Use and Management in the Philippines	CALABARZON	1998			√	E
04_17	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. II Main Report)	JICA	1998	√			E
04_18	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. III-1 Supporting Report)	JICA	1998	√			E
04_19	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. III-2 Supporting Report)	JICA	1998	√			E
04_20	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. III-3 Supporting Report)	JICA	1998	√			E
04_21	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. IV Data Book)	JICA	1998	√			E
04_22	Pampanga River Basin (PRB) Rehabilitation Project Development Plan	DENR-Region3	2007		√		E
04_23	Final Report Clark Special Economic Zone Water Resources Study	CDC				√	E

MT-4

Annex-T M.1.3.1 (5/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
04_24	Philippine Water Resources Summary Data	NWRB				√	E
04_25	River in the Philippines	JICA	1997	√			E
04_26	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. I Executive Summary)	JICA	2003	√			E
04_27	Master Plan Study on Water Resources Management in the Republic of the Philippines (Interim Report Vol. II Supporting Report)	JICA	1998	√			E
04_28	Master Plan Study on Water Resources Management in the Republic of the Philippines (Final Report Vol. I Executive Summary)	JICA	1998	√			J
04_29	The Study on Water Resources Development for Metro Manila in the Republic of the Philippines (Final Report Vol. I Executive Summary)	JICA	2003	√			J
04_30	Pampanga River Basin Framework Plan	NWRC, UNDP	1983	√			E
04_31	BALINTINGON RESERVOIR MULTIPUPOSE PROJECT	NIA Region3		√			E
04_32	Final Report for the 300 MLD Bulk Water Supply Project	MWSS	1999	√			E
04_33	The Study of Engineering Alternatives for the 300 MLD Bulk Water Supply Project	MWSS	2000	√			E
04_34	Feasibility Study Agos Project, Main Report	NPC	1991	√			E
04_35	Feasibility Report on Agos River Hydropower Project, Main Report	NPC	1981	√			E
04_36	Laiban Dam Project, Summary	MWSS	2000	√			E
04_37	Final Report(Laiban Dam)						
04_38	Balintong Reservoir Multipurpose Project Feasibility Study	NIA	1983	√			E
04_39	Report for Study on Hydropower Potential in Luzon Island, Main Report	JICA/NPC	1987	√			E
04_40	Report for Study on Hydropower Potential in Luzon Island, Appendix A	JICA/NPC	1987	√			E
04_41	Report for Study on Hydropower Potential in Luzon Island, Appendix B	JICA/NPC	1987	√			E
04_42	Report for Study on Hydropower Potential in Luzon Island, Appendix C	JICA/NPC	1987	√			E
04_43	Water Supply, Swerage, and Sanitation Master Plan for Metro Manila, Final Report, Vol.1, Summary	MWSS	2005	√			E
04_44	Feasibility Study Report on Balingon Multipurpose Project. Main Report,	MWSS	2006	√			E
04_45	Umiray-Angat Transbasin Tunnel Rehabilitation Project, Phase II	MWSS		√			E
04_46	Umiray-Angat Transbasin Tunnel Rehabilitation Project, Phase II, Implementation Schedule and Cost	MWSS		√			E
04_47	Clark Special Economic Zone Water Resources Study	Clark Development Corporation	2000	√			E
04_48	Clark Special Economic Zone Hydrology and Hydraulics of Spang Cauyayan Lake	Clark Development Corporation	2000	√			E
04_49	Balintong Multipurpose Project					√	
04_50	Balog-Balog Multipurpose Project					√	
04_51	Survey-Inventory on Water Impounding Reservoir	NWRC				√	
04_52	Investigation to Interested Investor and Contractors	News Paper		√			
04_53	Masterplan Study on the Samll Impounding Management (SWIM) Project-Main ReportMasterplan Study on the Samll Impounding Management (SWIM) Project-Data Book	JICA	1988-1990	√			
04_54	Supplimental Report Balintong RMP-Nueva Ecija	Data	2008	√			
04_55	Masterplan Study on the Samll Impounding Management (SWIM) Project-Data Book	JICA	1990	√			
04_56	Reports on Effect of Eruption of Pinatubo in Balog Balog Project 1991		1991	√			
04_57	The Project for Balog Balog Multi Porpose Project-Implementation Program	NIA	1999	√			

MT-5

Annex-T M.1.3.1 (6/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
04_58	Balog Balog Multipurpose Project(Project Brifer as of September 30, 2009)	Vicente Vicmudo	2008	√			
04_59	General Layout 2008-BalogBalog Multi Purpose Project	NIA	2008	√			
04_60	BalintingonProjectOverview	Powerpoint presentation			√		
04_61	BBMP Briefer As of March 31, 09-final	Vicente Vicmudo			√		
04_62	bbmp-General layout 2009				√		
04_63	p1-01 Water Allocation Between Irrigation and Municipal Use	INWEPF		√			
04_64	Terminal Report (2000-2004) Establishment of Participatory Technology Demonstration farm for Marginal Uplands						
04_65	Rapid Assessment of Water Supply Sources (Prov. of Bukidnon)						
04_66	Rapid Assessment of Water Supply Sources (Prov. of Maguindanao)						
04_67	Rapid Assessment of Water Supply Sources (Prov. of North Cotabato)						
04_68	Rapid Assessment of Water Supply Sources (Prov. of South Cotabato)						
04_69	Rapid Assessment of Water Supply Sources (Prov. of Sultan Kudarat)						
04_70	Report on Demonstration Farm Component						
04_71	NIA'S Compensation Package						
04_72	Confirmation of MWSS Water Permit for this present withdrawal rate of 22 cms from the Angat Reservoir						
04_73	Memorandum of Agreement on the Angat Water Protocol						
04_74	Angat Reservoir Monthly Allocation with Optimization-Simulation Model and Autoregressive Model to Forecast Inflow						
04_75	Small Scale Technical Assistance Water Resources Management (Angat Reservoir)						
04_76	Comments on MWSS Water Rights Certification Issued by NWRB						
04_77	Central Mindanao-Mindanao Allah River Basin						
04_78	Western Mindanao-Pulangui River						
04_79	Methodology Manual for Feasibility Study of Interim Improvement Project						
04_80	Pre Feasiility Study Report of Water Impounding Projects_Prov. of N.E-1994	Prov. of N.E					
<b>05 Domestic Water Supply</b>							
05_01	Water Supply, Sewerage and Sanitation Sector Plan 1992-2010 (Prov. Of Pampanga)	DPWH	1992	√			E
05_02	Province of Tarlac Water Supply, Sewerage and Sanitation Development Plan 1992-2010	Prov. of Tarlac	1991	√			E
05_03	Study on the Provincial Water Supply, Sewerage and Sanitation Section Plan in the Republic of the Philippines (Progress report III)	JICA	1995	√			E
05_04	Province of Nueva Ecija Water Supply, Sewerage and Sanitation Development Plan 1992-2010	Prov. Of Nueva Ecija	1991	√			E
05_05	Water Supply and Sanitation Collaborative Council			√			E
05_06	Project Proposal Rural Water Supply & Sanitation Rehabilitation Project (RWSSRP)	DILG	1997	√			E
05_07	Philippine Association of Water District, Inc.		1997			√	E
05_08	Manila Water Supply (Project III)			√			E
05_09	Small Scale Independent Providers in Metro Manila and Vicinity: Responding to Customers Needs	WPEP	2002	√			E
05_10	Water Supply and Sanitation Performance Enhancement Project		2000	√			E
05_11	Water Supply, Sewerage and Sanitation Sector Plan 1992-2010 (Prov. Of Bulacan)	DPWH	1992	√			E

## Annex-T M.1.3.1 (7/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
05_12	Philippine Water Supply Sector Road Map	GTZ/NWRB	2008	√			E
05_13	Final Report Clark Special Economic Zone Hydrology and Hydraulics of Sapang Cauayan Lake					√	E
05_14	Angles Ciry Water disrict Water Safety Plans					√	E
05_15	An Inventory of Needs, Problems and Proposed Solution of Families affected by the Proposed Laiban Dam Project					√	E
05_16	Water Supply, Sewerage and Sanitation Sector Plan 1992-2010 (Province of Bataan)	DPWH	1992	√			E
05_17	フィリピン国における下水道セクターの現状	JBIC		√			J
05_18	ピナツボ被災民生活用水供給計画 基本設計調査報告書	JICA	1992	√			J
05_19	ピナトゥボ火山災害復旧機材整備計画 基本設計調査報告書	JICA	1991	√			J
05_20	Water Supply, Swerage, and Sanitation Master Plan for Metro Manila, Final Report, Vol.1, Summary	MWSS	2005	√			E
05_21	Sewerage Treatment Plant for Cabanatuan City, Design Report, Vol.1, Main Report	Cabanatuan City	2003	√			E
05_22	Cabanatuan City Comprehensive Drainage System, Supplimental Study on Hydrology and Water Quality	Cabanatuan City	2003	√			E
05_23	Reply from MWSS on Water Demand in MetroManika and Bulacan	MWSS	2009	√			E
05_24	LWUA Proposed Project of the WATER District in the Province	LWUA		√			
05_25	Prov. of Nueva Ecija Water Supply, Sewerage and Sanitation Development Plan 1992-2010			√			
05_26	World Health Organization			√			
05_27	Population and Housing-Angeles City	NSO		√			
05_28	Population and Housing-Aurora	NSO		√			
05_29	Population and Housing-Bataan	NSO		√			
05_30	Population and Housing-Bulacan	NSO		√			
05_31	Population and Housing-Bulacan-II.	NSO		√			
05_32	Population and Housing-Nueva Ecija	NSO		√			
05_33	Population and Housing-Nueva Vizcaya	NSO		√			
05_34	Population and Housing-Pampanga	NSO		√			
05_35	Population and Housing-Pangasinan	NSO		√			
05_36	Population and Housing-Quezon	NSO		√			
05_37	Population and Housing-Rizal	NSO		√			
05_38	Population and Housing-Tarlac	NSO		√			
05_39	Population and Housing-Zambales	NSO		√			
05_40	Philippine Roadmap	NEDA	2009	√			
05_41	Supply Sewerage and Sanition Sector Plan-1992-2010_Pampanga	DPWH	1992	√			
05_42	Water Supply and Sanitation Tool box	Data		√			
05_43	AWUAIP	MWSS Presentation		√			
05_44	Laiban	MWSS Presentation		√			
05_45	MWSS_Data	MWSS		√			
05_46	Amendment to Consession Agreement			√			
05_47	LWUA_Manual on Water Rates and Related Practise	LWUA		√			
05_48	Local Water Utilities Administration_Annual Report 2008	LWUA		√			

Annex-T M.1.3.1 (8/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
<b>06 Irrigation Development</b>							
Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
06_01	A Report of Final / Definitive Development Plan Tarlac Groundwater Irrigation Systems Reactivation Project (TGISRP) under the Central Luzon Irrigation Project (CLIP) Main Report	NIA	2000	√			E
06_02	Definitive Development Plan (Appendix-VIII Project Evaluation)	NIA	2000			√	E
06_03	SWIM Project (Inception Report)	DPWH	1990			√	
06_04	The Study on Strengthening of NIA's Management System, Final Report, Vol.1, Main Report	NIA, JICA	2001	√			E
06_05	The Study on Strengthening of NIA's Management System, Final Report, Vol.2, Appendix	NIA, JICA	2001	√			E
06_06	The Study on Strengthening of NIA's Management System, Final Report, Vol.1, Main Report	NIA, JICA	2001	√			J
06_07	The Study on the Irrigators Association Strengthening in National Irrigation Systems, Summary	NIA, JICA	2003	√			J
06_08	The Study on the Irrigators Association Strengthening in National Irrigation Systems, Main Report	NIA, JICA	2003	√			E
06_09	The Study on the Irrigators Association Strengthening in National Irrigation Systems, Annex	NIA, JICA	2003	√			E
06_10	Introduction of NIA-UPRIIS	NIA-UPRIIS		√			E
06_11	Feasibility Report on the Pampanga Delta Development Project, Main Text	DPWH, NIA, JICA	1982	√			E
06_12	Feasibility Report on the Pampanga Delta Development Project, Main Text	DPWH, NIA, JICA	1982	√			E
06_13	Feasibility Report on the Pampanga Delta Development Project, Annex, Vol-I	DPWH, NIA, JICA	1982	√			E
06_14	Feasibility Report on the Pampanga Delta Development Project, Annex, Vol-II	DPWH, NIA, JICA	1982	√			E
06_15	Feasibility Report on the Pampanga Delta Development Project, Annex, Vol-III	DPWH, NIA, JICA	1982	√			E
06_16	Definitive Development Plan Irrigation Component of the Casencan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Main report	NIA	2000	√			E
06_17	Definitive Development Plan Irrigation Component of the Casencan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Appendix-I Meteorology and Hydrology	NIA	2000	√			E
06_18	Definitive Development Plan Irrigation Component of the Casencan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Appendix VIII, Project Evaluation	NIA	2000	√			E
06_19	Mapping and Agricultural Potential for the Integrated Rural Development in Pampanga, Main Report	JICA/DAF	1992	√			E
06_20	Mapping and Agricultural Potential for the Integrated Rural Development in Pampanga, Annex-I	JICA/DAF	1992	√			E
06_21	Mapping and Agricultural Potential for the Integrated Rural Development in Pampanga, Annex-II	JICA/DAF	1992	√			E
06_22	General Operation & Maintenance Manual, Final Report, Excutive Summary	NIA	1991	√			E
06_23	Fisheries Development Study, Pampanga Delta/Candaba Swamp Area Development Project			√			E
06_24	National Irrigation Administration Corporate Plan:2008-2017	NIA	2009	√			E
06_25	Provincial Irrigation Profile, Bulacan	NIA	1989	√			E
06_26	Provincial Irrigation Profile, Nueva Ecija	NIA	1989	√			E
06_27	Provincial Irrigation Profile, Pampanga	NIA	1989	√			E
06_28	Provincial Irrigation Profile, Tarlac	NIA	1989	√			E



Annex-T M.1.3.1 (9/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
06_29	NIA Organizational Structure 2008	NIA				√	
06_30	NIS MAP					√	
06_31	Memorandum Circular					√	
06_32	Gumain FS	JICA	1985	√			
06_33	PIDP report	Euroestudios	2006	√			
06_34	Communal System IA Operatiopn and Maintenance Performance	NIA-BANEMO	2008-2009	√			
06_35	Ginintuang Masaganang Ani Program (Prov. Nueva Ecija)	Data Provincial Agriculture	2008-2009	√			
06_36	Summary Evaluation Report	Data	2009	√			
06_37	Japanese Report		2006	√			
06_38	Japanese Report-final		2006	√			
06_39	Project Completion Report_(IASS)-Angat Maasim River Irrigation System	NIA - Region III	2005-2006	√			
06_40	Loan Agreement		2009	√			
06_41	System of Rice Intensification	Phil Rice	2009	√			
06_42	Indicative Irrigation Development Program (2009-2020)	Data from NIA	2009-2020	√			
06_43	List of Priority Small Scale Irrigation System	Data		√			
06_44	Small Water Impounding Project	Data from BSWM	2008	√			
06_45	Statement of Allotment and Obligation and Balances	Data	2009	√			
06_46	Nueva Ecija	Data from PPDC Nueva Ecija		√			
06_47	AMRISbrief-basic-Ver.97-2003	Presentation		√			
06_48	IndicativeIrrigationDevelopmentPlan_Nov09	Data			√		
06_49	37mrs copy for jica				√		
06_50	RegIrrDevProg_Reg3		2010-2019		√		
06_51	RegIrrDevProg_UPRIIS	UPRIIS	2010-2019		√		
06_52	WB Appraisal Report (PIDP)	Philippine Sustainable Development Unit	2009	√			
06_53	Map						
06_54	Updated Feasibility Study for the Casecanan Project						
06_55	Balog-Balog Multipurpose Project Feasibility Updating Study-2.						
06_56	Balog-Balog Multipurpose Project Feasibility Updating Study						
06_57	Guidelines for the Adoption of Water Saving Technologies in Integrated Rice Production system in the Phil						
06_58	Agrarian Reform Infrastructure Support Project Phase II(ARISP-II)						
06_59	Agrarian reform Structure Support Project-III						
06_60	Baling-Tulay Irrigation Association INC.						
06_61	Central Luzon Fisheries Situation (Presentation)						

Annex-T M.1.3.1 (10/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
06_62	Republic Act No. 3601 an Act Creating the NIA						
06_63	Republic Act(RA) No. 8435-Agriculture and Fishery Modernization Act of 1997						
06_64	Republic of the Philippines Congress of the Philippines Metro Manila						
06_65	Strategic Agriculture & Fishery Development Convergence Zone						
06_66	System Rice Intensification(SRI)						
06_67	Scaling Up Poverty Reduction - Shanghai Conference						
06_68	Agrarian Reform Fund Project						
06_69	Agrarian Reform Infrastructure Support Project-I						
06_70	Agrarian Reform Infrastructure Support Project-II						
<b>07_Ground Water</b>							
07_01	Geo-Resistivity survey in Angeles City	NIA	2008	√			E
07_02	PAGF-Activity 025 Strenthening Management of Ground Water Resources with LGUs	PAGF	2001	√			E
07_03	Strenthening Management of Ground Water Resources with LGUs (Draft Guidelines and Operating Procedure Report)	NWRB	2002	√			E
07_04	Ground Water Resources Development Planning	NWRB	1998			√	E
07_05	LGU- Training-Workshop on Groundwater Permit Processing and Monitoring		2001	√			E
07_06	Cavite Water Supply Development Study in the Republic of the Philippines (Vol. 4) Data Book		1995	√			E
07_07	Draft Institutional Framework Report			√			E
07_08	Strenthening Management of Ground Water Resources with LGUs (Institutional Framework Report)	NWRB	2001	√			E
07_09	Water Balance Study and Ground Water Modeling Report (Metro Manila)	NWRB	2004	√			E
07_10	Study on the Groundwater Development in Metro Manila (Vol. I Summary Report)	MWSS				√	E
07_11	Study on the Groundwater Development in Metro Manila (Vol. II Main Report)	MWSS				√	E
07_12	Study on the Groundwater Development in Metro Manila (Vol. III Supporting Report)	MWSS				√	E
07_13	Study on the Groundwater Development in Metro Manila (Vol. III Supporting 2 Report)	MWSS				√	E
07_14	Ground Water Resources Development Plan 1998-2030	LWUA		√			E
07_15	Groundwater Overuse, Land Subsidence, and Enhanced Flooding in Southern Central Luzon	U.P. Center for Integrative and Developmental Studies	2005		√		E
07_16	Baseline Survey on Nationwide Groundwater Quality Monitoring in the Philippines	JICA	2000	√			E
07_17	Groundwater Data Banking Report Concepcion Water District	Concepcion Water District	2007	√			E
07_19	A Report of Final / Definitive Development Plan Tarlac Groundwater Irrigation Systems Reactivation Project (TGISRP) under the Central Luzon Irrigation Project (CLIP) Main Report	NIA	2000	√			E
07_20	Geo-Resistivity Survey in Angeles City (Oct. 2008)	NWRB		√			E
07_21	Geological of the Philippines		2008	√			E
07_22	Well Registered in Pampanga River Basin			√			E
07_23	Relative Sea Level Changes and Worsening Floods in the Western Pampanga Delta: Causes and Some Possible Mitigation Measures					√	

Annex-T M.1.3.1 (11/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
07_24	Preliminary Groundwater Resource Survey in Brgys. San Marcos and Pio Cruzcoza, Calumpit, Bulacan			√			E
07_25	Groundwater Data Province of Bulacan			√			E
07_26	NIA Shallow Groundwater Irrigation Project (Spanish Grant_Technical Evaluation) Pampanga			√			E
07_27	Cabanatuan Pumping Water Fluctuation, Nueva Ecija			√			E
07_28	Groundwater Resources Evaluation and Well Inventory of Concepcion, Tarlac	Rick Rodel C. Luis		√			E
07_29	Geological and Mineral Resources of Nueva Ecija		1976	√			E
07_30	Geological and Mineral Resources of Pampanga Province			√			E
07_31	Report on the Groundwater Resouces Survey of Brgy. San Jose de Orquico and Vicinity in Tarlac City		2004	√			E
07_32	Characterization of San Marcois Aquifer and Adjoining Areas in Calumpit, Bulacan			√			
07_33	Preliminary Hydrogeological Assesment of Mt. Arayat National Park, Pampanga Province			√			
07_34	Hydrogeological Survey of the Resettlement Areas for the Evacuess Affected by Mount Pinatubo Eruption in Pampanga and Tarlac Provinces			√			
07_35	Report on the Hydrogeological Survey of Brgy. Margot and Vicinity, Angeles City			√			
07_36	Hydrogeological Survey of Brgy. Camias, Porac, Pampanga		1996	√			
07_37	Groundwater Evaluation and Well inventory of Concepcion, Tarlac			√			
07_38	Water Resources Survey of Barangay Balaong San Miguel Bulacan			√			
07_39	Groundwater Resources Investigation Bulacan			√			
07_40	Groundwater Resources Investigation Pampanga			√			
07_41	Groundwater Resources Investigation Tarlac			√			
07_42	Groundwater Resources Investigation Nueva Ecija			√			
07_43	Metro Manila Groundwater Areas			√			
<b>08 Dam</b>							
08_01	Pantabangan Dam Public Information Drive Briefing Kit	Pantabangan Dam		√			E
08_02	Angat Water Supply Optimization Project Distribution Phase (AWSOP-OFCE) Technical Report	MWSS	1991			√	E
08_03	Casecnan Trans-Bsin Diversion Project (Feasibility Study Vol 5 Appendix M&N)	NIA				√	E
08_04	Report for Study on Hydropower Potentials in Luzon Island (Main Report)	JICA	1987	√			E
08_05	Umiray - Angat Transbasin Study (Feasibility Study_Appendix A Hydrology)	ADB	1992			√	E
08_06	Umiray - Angat Transbasin Study (Feasibility Study Appendix B - Reservoir Operation)	ADB	1992	√			E
08_07	Umiray - Angat Transbasin Study (Feasibility Study_Appendix E EIA)	ADB	1992			√	E
08_08	Umiray - Angat Transbasin Study (feasibility Study Main Report Vol.I)	ADB	1992	√			E
08_09	Angat Hydro Electric Power Plant	NPC	2008		√	√	E
08_10	Water Resources Development Project Final Report (Task 5 Main Report)	World Bank	1994			√	E
08_11	Water Resources Development Project Final Report (Task 5 Vol. II Annexes)	World Bank	1994			√	E
08_12	Workshop EPP (Angat Dam Ipo Dam)	BNPP	2008	√			E
08_13	Dams in the Philippines	NWRB	2000	√			E
08_14	Pantabangan Dam and its Appurtenant Structures	NIA-UPRIIS		√			E

MT-11

Annex-T M.1.3.1 (12/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
08_15	Definitive Development Plan Irrigation Component of the Casecnan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Main report	NIA	2000	√			E
08_16	Definitive Development Plan Irrigation Component of the Casecnan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Appendix-I Meteorology and Hydrology	NIA	2000	√			E
08_17	Definitive Development Plan Irrigation Component of the Casecnan Multipurpose Irrigation and Power Project (CMIPP-IC) under the Central Luzon Irrigation Project (CLIP), Appendix VIII, Project Evaluation	NIA	2000	√			E
08_18	Introduction of Angat dam	NPC		√			E
08_20	Angat Dam FFWSDO	NPC	2008		√		E
08_21	SchematicDraw_AngatSystem	NPC		√			E
08_22	首都圏で一時配電停止 2007年6月26日新聞記事コピー (The Dail Manila shinbun)	Daily Mania Nwes paper	2007	√			E
08_23	Flood Forecasting Office. Instrumentation & Flood Forecasting & Warning System for Dam Operation (IFFWSDO)	NIA-UPRIIS			√		E
08_24	Pantabangan Dam	NIA-UPRISS-DRD			√		E
08_25	Water Code of the Philippines_Implementing Rules and Regulation						
<b>09 Flood Management</b>							
09_01	Overall Network System of FFWSDO	Angat Dam				√	E
09_02	The Study on Flood Control Project Implementation System for Principal Rivers in the Philippines (Main Report)	CTI Engineering Int'l Co., Ltd	2004				E
09_03	Community Based Flood Early Warning System	PAGASA	2007			√	E
09_04	Basin Mean Probable Rainfall					√	E
09_05	Flowchart of Sediment Analysis					√	E
09_06	The Study on the Nationwide Flood Risk Assessment and the Mitigation Plan for the Selected Area in the Republic of the Philippines (Progress Report)	JICA/DPWH	2006			√	E
09_07	Specific Discharge Curve Rainfall Intensity Duration Curve Isoyet of Probable 1-day Rainfall	DPWH	2003			√	E
09_08	Meteorological Data					√	E
09_09	Integrated Plan for the Mount Pinatubo Affected Areas	PHIVOC'S	1994			√	E
09_10	Nationwide Flood Control Plan and River Dredging Program	NIPPON KOEI	1982			√	E
09_11	Study for the Preparation of Flood Control Manual for Department of Public Works and Highways Technical Standards and Guidelines (Final Report_Main Report Vol.I)	JICA	2003			√	E
09_12	Philippine Flood Control 1977	NWRC	1977			√	E
09_13	The Study on Drainage Improvement in the Core Area of Metropolitan Manila Republic of the Philippines (Final Report Summary)	JICA	2005			√	E
09_14	San Fernando River	DPWH			√		E
09_15	San Fernando River - II	DPWH			√		E
09_16	Ready Project Hazard Mapping and Assessment for effective Community-Based Disaster Risk Management	OCD			√		E
09_17	Manual on Maintenance of Flood Control and drainage Structures	DPWH	2005			√	E
09_18	PDDP - Phase 1	DPWH	2002		√		E

Annex-T M.1.3.1 (13/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
09_19	Basic Design Study Report on the Project for the Upgrading of Flood Forecasting and Warning System in the Pampanga and Agno River Basin in the Republic of the Philippines	JICA	2007	√			E
09_20	Pinatubo Hazard Urgent Mitigation Project Phase III (Main Report)	NIPPON KOEI	2009		√		E
09_21	Pinatubo Hazard Urgent Mitigation Project Phase III (Executive Summary)	NIPPON KOEI	2009		√		E
09_22	Briefing Materials (Pinatubo Hazard Urgent Mitigation Project (PHUMP) Province of Pampanga and Tarlac	DPWH		√			E
09_23	Basic Design Study Report on the Project for the Upgrading of Flood Forecasting and Warning System in the Pampanga and Agno River Basin in the Republic of the Philippines	JICA	2007	√			J
09_24	Rivers in the Philippines	DPWH,JICA	1997	√			E
09_25	Water & Flood	DPWH,JICA	2004	√			E
09_26	PRCS-PMO Pampanga River Control System - Project Management Offic, DPWH	DPWH,JICA		√			E
09_27	PAMPANGA DELTA DEVELOPMENT PROJECT FLOOD CONTROL COMPONENT	DPWH	2007	√			E
09_28	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, Summary	DPWH, JICA	1996	√			J
09_29	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, Summary	DPWH, JICA	1996	√			E
09_30	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, Main Report	DPWH, JICA	1996	√			E
09_31	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, Appendix 1	DPWH, JICA	1996	√			E
09_32	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, Appendix 2	DPWH, JICA	1996	√			E
09_33	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, O&M	DPWH, JICA	1996	√			E
09_34	The Study on Flood and Mudflow Control for Sacobia-Bamban/Abacan River Draining from Mt.Pinatubo, Databook	DPWH, JICA	1996	√			E
09_35	Digmara River Flood Control	DPWH-FCSEC		√			E
09_36	Project Template - Pampanga Delta	DPWH	2006		√		E
09_37	Project Template - DigmalaRiver	DPWH	2006		√		E
09_38	OCD- DisastreManagement Education Material	OCD	2007		√		E
09_39	Pinatubo PhaseII Final report	DPWH, NK			√		E
09_40	Pinatubo PhaseII RAP	DPWH, NK			√		E
09_41	Pinatubo PhaseII Final IP	DPWH, NK			√		E
09_42	Pinatubo PhaseII ICC-PE	DPWH, NK			√		E
09_43	Pinatubo PhaseII Presentation	DPWH, NK			√		E
09_44	Feasibility Report on the Pampanga Delta Dvelopment Project, Main Text	DPWH, NIA, JCA	1982	√			E
09_45	Feasibility Report on the Pampanga Delta Dvelopment Project, Main Text	DPWH, NIA, JCA	1982	√			E
09_46	Feasibility Report on the Pampanga Delta Dvelopment Project, Annex, Vol-I	DPWH, NIA, JCA	1982	√			E
09_47	Feasibility Report on the Pampanga Delta Dvelopment Project, Annex, Vol-II	DPWH, NIA, JCA	1982	√			E
09_48	Feasibility Report on the Pampanga Delta Dvelopment Project, Annex, Vol-III	DPWH, NIA, JCA	1982	√			E
09_49	Flood Mitigation Framework Plan_June2006	DPWH	2006		√		E

Annex-T M.1.3.1 (14/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
09_50	Groundwater Overuse, Land Subsidence, and Enhanced Flooding in Southern Central Luzon	U.P. Center for Integrative and Developmental Studies	2005	√			E
09_51	Updates on Various Critical Projects undertaken along RIVERBANKS 4th District of Pampanga	DPWH Region Iii 4th District Office			√		E
09_52	Pinatubo Hazard Urgent Mitigation Project Phase III-Interim Report	NIPPON KOEI	2009	√			E
09_53	Pinatubo Hazard Urgent Mitigation Project Phase III-Main Report	NIPPON KOEI		√			
09_54	Ondoy-pepeng floods2009-2	INTERNET		√			
<b>10 Water Quality Management</b>							
10_01	Final Report Data Base Development for Water Quality Management (Phase 1)	JICA	2007	√			E
10_02	Review of the Draft Guidelines and Manual on the Protection and Rehabilitation of Conataminted Rivers					√	E
10_03	Manila Bay Refined Risk Assessment	PEMSEA - DENR	2004			√	E
10_04	Philippines Water Resources Development Project	URBAS				√	E
10_05	Manila Bay Integrated Environment Monitoring Program	GEF-UNDP-IMO	2006			√	E
10_06	Analysis and Design of Water Quality Database System (Draft Final Report)		2001			√	E
10_07	Ecosystem and People the Philippine MA Sub-Global Assessment	MEA				√	E
10_08	Manila Bay Coastal Strategy	DENR	2003	√			E
10_09	The Philippine Environmental Quality report					√	E
10_10	Philippines Environment Monitor 2003	World Bank	2003			√	E
10_11	The Manila Bay Issues, Concern, Challenges and Need for Immediate Action	DENR	2008		√		E
10_12	Manila Bay Environmental Management Project: Challenges and Achievements	PERSEA		√			J
10_13	OPERATIONAL PLAN FOR THE MANILA BAY COASTAL STRATEGY	DENR	2006		√		E
10_14	The Study on the Effect of Sea Water Intrusion on Agriculture and Fishery Industry, Main Report	DPWH	1998	√			E
10_15	The Study on the Effect of Sea Water Intrusion on Agriculture and Fishery Industry, Appendix	DPWH	1998	√			E
10_16	The Study on the Effect of Sea Water Intrusion on Agriculture and Fishery Industry, Tables	DPWH	1998	√			E
10_17	The Study on the Effect of Sea Water Intrusion on Agriculture and Fishery Industry, Figures	DPWH	1998	√			E
10_18	ManilaBayEnvironmentalAtlas	PEMSEA			√		E
10_19	EnvMonitor 2003 water quality	DENR	2003	√			E
10_20	DEVELOPMENT OF DATABASE FOR WATER QUALITY MANAGEMENT	DENR	2006		√		E
10_21	Region 3 Water Quality Status Report	DENR-EMB, JICA	2007	√			E
10_22	DENR Administrative Order No.2005-10, Implementing Rules and Regulations of the Philippines Clean Water Act of 2004 (Republic Act No.9275)	EMB-DENR	2005	√			E
10_23	Philippines Environment Monitor 2003	DENR	2003	√			E
10_24	Philippines Environment Monitor 2005	DENR	2005	√			E
10_25	Clark Special Economic Zone Water Resources Study	Clark Development Corporation	2000	√			E
10_26	Angels City Water District, Water Safty Plans	Angels City		√			E
10_27	Extent of Groundwater amd Tailwater Reuse Contamination with Agricultural Chemical in UPRISS	I.C.Agulto, E.B.Sibayan, N. A.Candelara and A.R.E.Agulto	2008	√			E
10_28	Water Quality Assessment of Selected Barangays of Malolos and Guiguinto, Bulacan	Carolyn V. Sacdalan				√	E
10_29	Report on the Saltwater Intrusion Survey in the Municipalities of Calumpit, Hagonoy amd Paombong Bulacan					√	E

Annex-T M.1.3.1 (15/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
10_30	Bulacan State University-DOST					√	E
10_31	Mecauayan City Physical Chemical Analysis					√	E
10_32	Maycauayan City Bacteriological Test Result					√	E
10_33	Maycauayan Water Quality Analysis					√	E
10_34	Operational Plan for the Manila bay Coastal Strategy	MBEMP	2005	√			E
10_35	Ecological Sanitation Factsheet		2007	√			
10_36	MMO RS-WQMA Initial AP	JICA & EMB	2009	√			
10_37	Solid_WasteManagement For MetroManila JICAMP	JICA					
10_38	Solid_WasteManagement For MetroManila JICAMPsummary_J	JICA					
10_39	SWM Boracay&MOM_NK_MPSummary	NIPPON KOEI & JICA					
10_40	SWM Boracay&MOM_NK Chap II-09 Cost Estimate and Financial Aspect	NIPPON KOEI & JICA					
<b>11 Watershed Management</b>							
11_01	Master Plan for Forestry Developoment	DENR	1990	√			E
11_02	2004 Philippine forestry Statistics	DENR	2004			√	E
11_03	Agos River Watershed Management	Engr. Wilson Tagbo	2008			√	E
11_04	Regional Watershed Conference	NWRB	2008			√	E
11_05	Forestation and Re-Vegetation	NEDA-Region III			√		E
11_06	Integrated Water and Soil Resources Management_IWSRM_and Advocacy Initiatives for Ground RawWater Pricing (LADCC mtg clarkfield)	NEDA-Region III		√	√		E
11_07	Watershed Management Section Activities					√	E
11_08	DENR-PENRO Nueva Ecija					√	E
11_09	Charactization Report of the 8th Critical Watersheds (NIPAS Initial Components Supporting the NIA'S					√	E
11_10	Primaer on the Revised Master Plan for Forestry Development	DENR-FMB	2003	√			E
11_11	Recommended Species for Various Uses	DENR-FMB	2003	√			E
11_12	TECHNICAL REPORT WATERSHED DATABASE PROJECT	DENR-FMB, JICA		√			E
11_13	Community Participation and Involvement in Natural Resources Management	LLDA/Community Development Division			√		E
11_14	LIST OF PROCLAIMED WATERSHED FOREST RESERVES	DENR-FMB		√			E
11_15	Presentation DENR Region III Forest Management	DENR Region III			√		E
11_16	Watershed Management of Pantabangan Dam	NIA-UPRISS-DRD			√		E
11_17	DENR PENRO-Nueva Ecija Programs and Activities	DENR PENRO Nueva Ecija			√		E
11_18	Highlight of DENR PENRO-Nueva Ecija	DENR PENRO Nueva Ecija			√		E
11_19	Watershed Management - Pantabangan Dam	NIA-UPRIIS		√			E
11_20	Watershed Presentation-Pantabangan	NIA-UPRIIS		√	√		E
11_21	Initial Protected Area Plan of the Carranglan-Pantabanga Watershed	DENR-Region III		√			E
11_22	Project Evaluation of Technical Cooperation Project -CBFMP	JICA/DENR	2008	√			E
11_23	Final List of Watershed supporting 140 River Irrigation Systems of NIA	NIA		√			E
11_24	Guideline in the Preparation of Watershed Management Plan	DENR		√			E
11_25	Maasim Integrated Watershed Management Plan	DENR	2009	√			E

Annex-T M.1.3.1 (16/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
11_26	Profile of Pampanga River Basin	DENR		√			E
11_27	Porac -Gumain Watershed Charactererization	DENR		√			E
11_28	Six-Year Work and Financila Plan for Reforestation for Pampanga River Basin	DENR		√			E
11_29	Update on Watershed Management Initiatives	FMB, DENR		√			E
11_30	Angat IPO Dam-Data	Data		√			E
11_31	CBFM collected Data	Data	2000	√			E
11_32	Solid Waste Management of Bulacan-Data	Data	2009	√			
11_33	Philippines Forestry Statistic-1980	Philippine Forestry Statistic	1980	√			
11_34	Philippines Forestry Statistic-1988	Philippine Forestry Statistic	1988	√			
11_35	Philippines Forestry Statistic-1990	Philippine Forestry Statistic	1990	√			
11_36	Philippines Forestry Statistic-1995	Philippine Forestry Statistic	1995	√			
11_37	Philippines Forestry Statistic-2000	Philippine Forestry Statistic	2000	√			
11_38	Philippines Forestry Statistic-2007	Philippine Forestry Statistic	2007	√			
11_39	Pre-Feasibility Study on Holistic Water Catchment Project_N.E	Orient Integrated Development Consultant Inc.	1997				
11_40	Sustainable Agri-Ecozone Development Program Feasibility Study_N.E-1999	Prov. Of Nueva Ecija	1999				
<b>12 Development Database</b>							
12_01	Policy Guidelines and Technical Criteria for Data Collection	NWRB	2001	√			E
12_02	Improvement on Groundwater Data Collection Network (draft Data Base Report)	NWRB	2001			√	E
12_03	Improvement on Groundwater Data Collection Network (draft Analysis/evaluation of Groundwater Availability)		2001			√	E
12_04	Draft Design Report		2001			√	E
12_05	Improvement of National Water Data Collection Network Streamflow Monitoring (Draft Report)	NWRB	2001			√	E
12_06	Improvement of National Water Data Collection Network Streamflow Monitoring (Draft Final Report Vol.I)	NWRB	2001			√	E
12_07	Improvement of National Water Data Collection Network Streamflow Monitoring (Draft Final Report Vol.II)	NWRB	2001			√	E
12_08	Improvement of National Water Data Collection Network Streamflow Monitoring (Draft Final Report Vol.III)	NWRB	2001			√	E
12_09	Improvement of National Water Data Collection Network Streamflow Monitoring (Draft Final Report Vol.IV)	NWRB	2001			√	E
12_10	Improvement of National Water Data Collection Network Streamflow Monitoring (Draft Final Report Vol.V)	NWRB	2001			√	E
12_11	Improvement of National Water Data Collection Network for Ground water Monitoring (Final Report Vol. I Executive Summary)	NWRB	2002			√	E
12_12	Improvement of National Water Data Collection Network for Ground water Monitoring (Final Report Vol. II Policy Guidelines and Technical Criteria)	NWRB	2002			√	E
12_13	Improvement of National Water Data Collection Network for Ground water Monitoring (Final Report Vol. III Design Report)	NWRB	2002			√	E
12_14	Improvement of National Water Data Collection Network for Ground water Monitoring (Final Report Vol. III Database Analysis of Groundwater Availability)	NWRB	2002			√	E



## Annex-T M.1.3.1 (17/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
12_15	Integration of National Water Data Collection Networks for Streamflow, Groundwater and Water Quality Monitoring (Final Report)	NWRB	2003			√	E
12_16	National Water Information Network (Vol. II Main Report)	NWRB	2003			√	E
12_17	National Water Information Network (Vol. II Main Report)	NWRB	2003			√	E
12_18	National Water Information Network (Monthly Progress Report)	NWRB	2001			√	E
12_19	National Water Information Network (Draft Network Design Layout Report)	NWRB	2001			√	E
12_20	WRDP (Improvement of National Network of Streamflow Monitoring)	NWRB	2001			√	E
12_21	Policy Guidelines and Technical Criteria for Data Collection (Draft Report)	NWRB	2001			√	E
12_22	Improvement of National Water Data Collection Network Streamflow Monitoring (Final Report Vol. II, Vol. III Vol. IV)	NWRB				√	E
12_23	The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of the Philippines, Final Report, Vol I, Summary	JICA/NAMRIA	2008	√			E
12_24	The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of the Philippines, Final Report, Vol I, Summary	JICA/NAMRIA	2008	√			J
12_25	The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of the Philippines, Final Report, Vol II, Main Report	JICA/NAMRIA	2008	√			E
12_26	フィリピン国国土総合開発計画促進に関する地図政策支援行政整備調査	株式会社パスコ, 株式会社野村 総合研究所	2008	√			J
12_27	Integrated Information Management System for Coastal and Marine Environment	IIMS		√			E
<b>13 Other Data (Guidelines)</b>							
13_01	Handbook on Philippine Government Procurement	GPPB	2007	√			E
13_02	Planning Strategically	HLURB	2001			√	E
13_03	Standard Specifications for Public Works and Highways	DPWH				√	E
13_04	CLUP Guide Book	HLURB	2006			√	E
13_05	Revised Implementing Rules and Regulations for PD 957	HLURB	2001			√	E
13_06	Water Philippines 2003 (Technical Papers)		2003			√	E
13_07	Philippines Water Data	NWRB	1970			√	E
13_08	Japanese Book					√	E
13_09	Local Water Utilities Administration (List of Water District Per Area)					√	E
13_10	Information Kit MWSS Regulatory Office	MWSS				√	E
13_11	Principal River Basins of the Philippines					√	E
13_12	A Worldwide Surface Water Classification System					√	E
13_13	Power Inventory	NWRB	1977			√	E
13_14	Tide and Current Tables	NMRIA	2007			√	E
13_15	Manual for Estimation of Probable Maximum Precipitation	WMO	1986			√	E
13_16	Population Dimension of Planning	NEDA	1975			√	E
13_17	National Physical Framework Plan	NEDA	1992			√	E
13_18	Water Advocates Resources Book (Water as Natural Resource_Book I)					√	E
13_19	Water Advocates Resources Book (Understanding the Water Sector_Book II)					√	E
13_20	Water Advocates Resources Book (Planning for Community-Based Integrated Water Resource Management_Book III)					√	E

Annex-T M.1.3.1 (18/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
13_21	Water and Floods a Look at Philippine River and Flood Mitigation Efforts		2004			√	E
13_22	Country Assistance Strategy	World Bank	1999- 2002			√	E
13_23	The 2000 Philippine Human Development Index	NSCB	2002			√	E
13_24	2000 Philippine Provincial Poverty Statistics	NSCB	2003			√	E
13_25	2001 Food Balance Sheets of the Philippines	NSCB	2004			√	E
13_26	National Education Expenditure Accounts 1991-1998	NSCB	2002			√	E
13_27	Poverty Assessment in the Philippines	NSCB				√	E
13_28	Gross Regional Domestic Product (Base Year: 1985-2005-2007)	NSCB	2008			√	E
13_29	2006 Compendium of the Philippine Environment Statistics	NSCB	2006			√	E
13_30	Quarterly Economic Indices of the Philippines (1st Quarter 2005- 4th Quarter 2008 (1978-100)	NSCB	2009			√	E
13_31	2006 Official Poverty Statistic of the Philippines	NSCB	2008			√	E
13_32	2000 Input-Output Accounts of the Philippines	NSCB	2006			√	E
13_33	Philippine National Health Accounts 2005	NSCB	2008			√	E
13_34	Foreign Direct Investments (Third Quarter 2008)	NSCB	2008			√	E
13_35	National Accounts of the Philippines	NSCB	2009			√	E
13_36	Preliminary Assessment of Water Resources of the Philippines	Tambuyong Development Center	2000	√			E
13_37	SAE of poverty (Full Report)	NSCB	2009	√			E
13_38	Sustainable Livelihood Option for the Philippines-Coastal Ecosystem	DENR-MBEMP-PMO	1997	√			E
13_39	Sustainable Livelihood Option for the Philippines-Urban Lowland Ecosystem	DENR-MBEMP-PMO	1997	√			E
13_40	Sustainable Livelihood Option for the Philippines-Upland Ecosystem	DENR-MBEMP-PMO	1997	√			E
13_41	Comparative income Statement	Data from NIA	2004- 2008	√			E
13_42	Estimation of Local Poverty in the Philippine-Nov. 2005	NSCB		√			E
13_43	Guideline in Municipal Comprehensive Land Use Planning-1996	NIA-Reg III	1996	√			E
13_44	Official Gazette		2009	√			E
<b>14 Environment</b>							
14_01	CANDABA	Candaba Presentation			√	√	E
14_02	EAST ASIA-AUSTRALIAN FLYWAY NETWORK				√	√	E
14_03	Revised Procedure Manual for Environmental Impact Assessment (EIA)	EIAMD	2007	√		√	E
14_04	Summary of Status of Ad Al Delineation and Titling as of March 31, 2009	Data	2009	√		√	E
14_05	Instituting the National Drive to Suppress and Eradicate Professional Squatters	E.O 153		√		√	E
14_06	National Commission on Indigenous Peoples	Data NCIP		√		√	E
14_07	Republic Act 8371		1997	√		√	E
14_08	RA 6389_1971-Files				√	√	E
14_09	RA_6389_1971_CARP Law	Internet Sources			√	√	E
14_10	Land Acquisition, Resettlement, Rehabilitation and Indigenous Peoples Policy	DPWH	2007	√		√	E
14_11	Land Acquisition and Resettlement Plan for Can-Asujan		2003	√		√	E
14_12	Land Acquisition and Resettlement Plan		2007	√		√	E

Annex-T M.1.3.1 (19/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
14_13	Resettlement Policy and Program Framework for NAI and PGAN	Hassall & Associates International	2003	√		√	E
14_14	Instituting the National Drive to Suppress and Eradicate Professional Squaters			√		√	E
14_15	DOF Local Finance Circular 1-97_Guidelines_Inventory of Lands		1997	√		√	E
14_16	DOF Local Finance Circular 3-92_Valuation of Lands for Socialized Housing		1992	√		√	E
14_17	PD 772_1975_Anti-squatting Law_files	Internet Sources		√		√	E
14_18	Executive Order_No_1035	Internet Sources		√		√	E
14_19	Implementing Rules And Regulations Governing Summary Eviction	Law Data		√		√	E
14_20	IRR_Acquisition Valuation Disposition		Act of 1992	√		√	E
14_21	IRR_Beneficiary Registration			√		√	E
14_22	IRR_Proper and Humane Relocation Procedures		Act of 1992	√			E
14_23	PHILIPPINE LAWS, STATUTES AND CODES - CHAN ROBLES VIRTUAL LAW LIBRARY	Internet Sources				√	E
14_24	Republic Act7835 - CISFA, 1994	Law Data	1994			√	E
14_25	Republic Act8368 - Repeal of PD 772, 1997	Law Data	1997	√		√	E
14_26	Republic Act7279	Law Data	1991	√		√	E
14_27	Republic Act7279_IRR_sec.18	Law Data	Act of 1992			√	E
14_28	Republic Act 9397	Law Data	2006	√		√	E
14_29	2004 Statistics on Philippine Protected Areas and Wildlife Resources	DENR	2004	√		√	E
14_30	20090427_Annual Water Fowl Census for Candaba Swamp	Data from Candaba Pampanga	2004- 2008	√		√	E
14_31	20090427_Asian Water Fall Site-2			√		√	E
14_32	20090427_Asian Water Fall Site.			√		√	E
14_33	Preliminary Compalation of Information on Wetlands of the Philippines (excerpt from Directory of Phil Wetlands 1990)	Asian Wetland Bureau Philippine Foundation Inc.		√		√	E
14_34	Revised Implementing Rules and Regulation of republic Act 7586 or the National Irrigated Protected Areas System(dao-2008-26_114).			√		√	E
14_35	Hotspots	Data Notepad			√	√	E
14_36	IBA, Ramsar sites in Philippine			√			E
14_37	National Wetland Action Plan_Ph			√			E
14_38	National_Red_List_Wild_Fauna			√			E
14_39	Status of the Philippines Fresh Water Wetlands and Recomend Conservation Management Strategies	Presentation Laguna Lake Development Authority		√			E
14_40	National Report on Wet Lands	DENR-PAWB	2005	√			E
14_41	Review_of_Legislation_and_Policies_on_Phil_Wetlands	DENR-PAWB	2005	√			E
14_42	Bird Watchin in the Philippines	Wild Bird Club of the Philippines					E

Annex-T M.1.3.1 (20/20) List of Collected Documents

Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
<b>15 Fishery</b>							
Code	Title	Author	Year	PDF	Word/ PPT	Hard Copy	Language
15_01	3rd Quarter Report BFAR	Data from BFAR	2009	√		√	E
15_02	BFAR Central Luzon Pampanga Priority Plans and Program 2009	Presentation from BFAR	2009	√		√	E
15_03	BFAR Premier Fisheries Management Agency	Data from BFAR		√		√	E
15_04	Brief Profile of Manilabay Coastline in Bulacan			√		√	E
15_05	Fisheries Resource Management for Improve and Sustainable Harvest			√		√	E
15_06	Fisheries Resource Management for Improve and Sustainable Harvest-Brochure			√		√	E
15_07	Fisheries Resource Management for Improve and Sustainable Harvest-Presentation			√		√	E
15_08	Bulacan Fish Market Study	Provincial Agriculture office of Bulacan			√	√	E

### Annex-T M.1.4.1 (1/7) List of Spatial Data: Shapefiles

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Administrative	A_CandSwampWildlifeSanct_Lot	Candaba Wildlife Sanctuary (lot)	General	polygon	DENR-PAWCZM	2009	lot area	<ul style="list-style-type: none"> <li>Technical Description (TD) and Map was provided to the JST</li> <li>Error in the TD was discovered and (approximate) correction was made by JST in plotting the lot</li> </ul>
	A_CityMun	City / Municipal boundary	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	Region III and vicinity	<ul style="list-style-type: none"> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, NAMRIA 1:250,000 Topographic Map Digital Vector Data was used.</li> <li>The NAMRIA 1:250,000 Data was provided by NWRB.</li> <li>There is no indication on the actual source date for the NAMRIA 1:250,000 Data, but it was turned over to NWRB early 2008.</li> </ul>
					NAMRIA 1:250,000 Topographic Map Digital Vector Data	2008		
	A_CityMun_SA	City / Municipal boundary inside Study Area only	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	Region III and vicinity	<ul style="list-style-type: none"> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, NAMRIA 1:250,000 Topographic Map Digital Vector Data was used.</li> <li>The NAMRIA 1:250,000 Data was provided by NWRB.</li> <li>There is no indication on the actual source date for the NAMRIA 1:250,000 Data, but it was turned over to NWRB early 2008.</li> </ul>
					NAMRIA 1:250,000 Topographic Map Digital Vector Data	2008		
	A_CityMun_Main	Selected City/Municipality	General	point	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	Study Area	<ul style="list-style-type: none"> <li>Generated from centroid of A_CityMun.shp</li> </ul>
					NAMRIA 1:250,000 Topographic Map Digital Vector Data	2008		
	A_Philippines	Philippine Coastline	General	polygon	DENR Region III	2009	Philippines	<ul style="list-style-type: none"> <li>Merged data of Land Cover Map (2005)</li> </ul>
A_Province	Provincial Boundary	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	Region III and vicinity	<ul style="list-style-type: none"> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, NAMRIA 1:250,000 Topographic Map Digital Vector Data was used.</li> <li>The NAMRIA 1:250,000 Data was provided by NWRB.</li> <li>There is no indication on the actual source date for the NAMRIA 1:250,000 Data, but it was turned over to NWRB early 2008.</li> </ul>	
				NAMRIA 1:250,000 Topographic Map Digital Vector Data	2008			
A_StudyArea	Study Area	Basic	polygon	JICA Study Team	2009	Study Area		
Transportation	Tr_Road	Road	General	line	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	Study Area and vicinity	<ul style="list-style-type: none"> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, GIS data obtained from DENR Region III was used.</li> <li>Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study.</li> </ul>
					DENR Region III	2009		
Infrastructure	L_StrucFloodMitProj	Completed Major Structural Flood Mitigation Project	General	line	DPWH-JICA-NIA, Feasibility Report on the Pampanga Delta Development Project	1982	Study Area	<ul style="list-style-type: none"> <li>Features were roughly digitized only</li> </ul>
	JICA Study Team	2009						
	L_PDPP_FC	Pampanga Delta Devt Project, Flod Component	General	line	DPWH-JICA-NIA, Feasibility Report on the Pampanga Delta Development Project	1982	Study Area	<ul style="list-style-type: none"> <li>Features were roughly digitized only</li> </ul>
					JICA Study Team	2009		
Buildings	B_CityMunHall	City / Municipal Hall	General	point	JICA Study Team	2009	Study Area and vicinity	<ul style="list-style-type: none"> <li>Around 70% were plotted with the internet (e.g. Google Earth, Wikimapia, etc.) as source</li> <li>Around 30% were assumed</li> </ul>

MT-21

**Annex-T M.1.4.1 (2/7) List of Spatial Data: Shapefiles**

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Hydrology	Hy_Canal	Canal	Basic	line	NIA, Definitive Development Plan, Irrigation Component of the Casecanan Multipurpose Irrigation and Power Project (CMIPP-IC)	2000	UPRIIS (Districts 1-5), Casecanan (Phase 2)	• Source where data was digitized from may be geographically inaccurate
	Hy_CandabaDrChan	Proposed Drainage Channel in Flood Retarding Basin in Candaba Swamp	Basic	line	JICA Study Team	2009	Candaba	
	Hy_CandabaEmSpill	Proposed Emergency Spillway in Flood Retarding Basin in Candaba Swamp	Basic	polygon	JICA Study Team	2009	Candaba	
	Hy_CandabaOutletChGate	Proposed Outlet Channel with Gate in Flood Retarding Basin in Candaba Swamp	Basic	line	JICA Study Team	2009	Candaba	
	Hy_CandabaFlapDrGate	Proposed Flap Drainage Gate in Flood Retarding Basin in Candaba Swamp	Basic	point	JICA Study Team	2009	Candaba	
	Hy_CandabaRBDike	Proposed Surrounding Dike in Flood Retarding Basin in Candaba Swamp	Basic	polygon	JICA Study Team	2009	Candaba	
	Hy_CatchmentPasac	Pasac Catchment	Basic	polygon	JICA Study Team	2009	Study Area	
	Hy_CatchmentProposedDam	Proposed Dam Catchment	Basic	polygon	JICA Study Team	2009	Study Area and vicinity	
	Hy_CatchmentRiversMain	Main Catchment	Basic	polygon	JICA Study Team	2009	Study Area	
	Hy_CatchmentSubBasin	Sub-Basin Catchment	Basic	polygon	JICA Study Team	2009	Study Area	
	Hy_CatchmentSubBasinTransBasin2	Sub-Basin Catchment + Simplified Trans-Basin Catchment	Basic	polygon	JICA Study Team	2009	Study Area and vicinity	Tarlac and Umiray Trans-Basin Catchments were simplified.
	Hy_CatchmentSubBasin_3Main	3 Main Sub-Basin Catchment	Basic	polygon	JICA Study Team	2009	Study Area	
	Hy_CatchmentTransBasin	Trans-Basin Catchment	Basic	polygon	JICA Study Team	2009	Study Area and vicinity	
	Hy_CatchmentWaterBal	Water Balance Catchment	Basic	polygon	JICA Study Team	2009	Study Area and vicinity	
	Hy_CIS	Communal Irrigation System	Basic	point	NIA	2006	Region III	
	Hy_CPWaterBal	Water Balance Control Points	Basic	point	JICA Study Team	2010	Study Area and vicinity	
	Hy_DamIntakePointsNIS	Intake Points for Existing & Future NIS	Basic	point	JICA Study Team	2009	Study Area and vicinity	
	Hy_DamMain	Main Dam	Basic	point	JICA Study Team	2009	Study Area	
	Hy_DamProp	Proposed Dam	Basic	point	JICA Study Team	2009	Study Area and vicinity	
	Hy_DamSiteIdentifiedPossible	Identified Possible Dam Site	Basic	point	NWRB-DPWH-JICA Master Plan Study on Water Resources Management in the Republic of the Philippines NWRB, Survey/Inventory on Water Impounding Reservoirs Pre-Feasibility Study Report on Water Impounding Projects in the Province of Nueva Ecija	1998 1978 1994	Study Area and vicinity	
	Hy_DivDamMain	Main Diversion Dam	Basic	point	JICA Study Team	2009	Study Area	
	Hy_DivDamTransBasin	Main Trans-Basin Dam	Basic	point	JICA Study Team	2009	Study Area and vicinity	
	Hy_GWAvail	Groundwater Availability	Analysis	polygon	NWRC	1982	Tarlac, Nueva Ecija, Pampanga, Bulacan	• Unpublished data
	Hy_LakeMain	Main Lake	General	polygon	JICA Study Team	2009	Study Area and vicinity	
	Hy_NIP	National Irrigation Project	Basic	polygon	NIA	2004-2006	Region III	
	Hy_NIS	National Irrigation System	Basic	polygon	NIA JICA Study Team	2006 2009	Region III	• Edited by the JICA Study Team upon consultation with NIA
	Hy_PIA	Potential Irrigation Area	Basic	polygon	NIA	1994	Region III	
	Hy_ReservoirMain	Main Reservoir	Basic	polygon	JICA Study Team NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines DENR Region III	2009 2008 2009	Study Area	• Necessary features were selected by JICA Study Team • If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, GIS data obtained from DENR Region III was used. • Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study.

**Annex-T M.1.4.1 (3/7) List of Spatial Data: Shapefiles**

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Hydrology	Hy_RiversMain	Main River	Basic	line	JICA Study Team NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2009 2008	Study Area and vicinity	<ul style="list-style-type: none"> <li>Necessary features were selected by JICA Study Team</li> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, GIS data obtained from DENR Region III was used.</li> <li>Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study.</li> <li>Water Usage Classes are from EMB</li> </ul>
	Hy_RiversMain_GuguCrSupData	Gugu Creek Supplementary Data for Main River	Basic	line	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	Gugu Creek and Vicinity	
	Hy_SurfWater	Surface Water based on the Normal Operation Level of Proposed Dams	Basic	polygon	JICA Study Team	2009	Study Area and vicinity	
	Hy_S RIP	Small River Irrigation Project	Basic	polygon	JICA Study Team	2009	Study Area	<ul style="list-style-type: none"> <li>Location was assumed</li> </ul>
	Hy_SWIP	Small Water Impounding Project	Basic	point	BSWM	2009	Study Area	<ul style="list-style-type: none"> <li>Contains the following, aside from SWIP: (1) Diversion Dam, (2) Farm Reservoir, (3) Water Impounding Project</li> </ul>
	Hy_WaterBodies_Line	All line-feature Water Bodies from raw data	General	line	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines DENR Region III JICA Study Team	2008 2009 2009	Study Area	<ul style="list-style-type: none"> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, GIS data obtained from DENR Region III was used.</li> <li>Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study.</li> <li>Unverified names and features</li> </ul>
	Hy_WaterBodies_Polygon	All polygon-feature Water Bodies from raw data	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines DENR Region III JICA Study Team	2008 2009 2009	Study Area	<ul style="list-style-type: none"> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, GIS data obtained from DENR Region III was used.</li> <li>Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study.</li> <li>Unverified names and features</li> </ul>
	Hy_WatershedHMS	Selected Hydrometric Stations Watersheds	Basic	polygon	JICA Study Team	2009	Study Area	
Land Condition	L_LaharDeposit	Lahar Deposit	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	NAMRIA-JICA Project Study Pilot Area	<ul style="list-style-type: none"> <li>Extracted from the "gravelly sand" layer which is labeled as "lahar" in the printed version of the topographic map.</li> </ul>
	L_LandClassification	Land Classification	General	polygon	DENR Region III JICA Study Team	2009 2009	Study Area	<ul style="list-style-type: none"> <li>Conflicting with official statistical data (FMB)</li> <li>Reclass field by JST</li> </ul>
	L_LandCover_DENR	Land Cover from DENR Region III	General	polygon	DENR Region III	2009	Study Area	<ul style="list-style-type: none"> <li>Original source is NAMRIA, 2005</li> </ul>
	L_LandCover_JST	Land Cover by JICA Study Team	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines DENR Region III JICA Study Team	2008 2009 2009	Study Area	<ul style="list-style-type: none"> <li>For the DENR Region III data, unconfirmed information states that it was based on 2002-2003 satellite images but report was released on 2005</li> <li>Combination of reclassified data (by JICA Study Team) of L_LandCover_DENR and L_LandCover_NAMRIAJICA</li> <li>If available, information from the NAMRIA-JICA Mapping Study was used. For other areas, GIS data obtained from DENR Region III was used.</li> <li>This data was officially adapted as the Land Cover Data for purposes of this study.</li> </ul>
	L_LandCover_NAMRIAJICA	Land Cover from NAMRIA-JICA Project	General	polygon	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	NAMRIA-JICA Project Study Pilot Area	<ul style="list-style-type: none"> <li>Compiled from different layers of the NAMRIA-JICA Project</li> </ul>

**Annex-T M.1.4.1 (4/7) List of Spatial Data: Shapefiles**

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Land Condition	L_LandSub	Inferred Land Subsidence	General	line	DPWH-NK, Pinatubo Hazard Urgent Rehabilitation Project, Monitoring and Planning of Flood Control Works on the Pasac Delta (inc. the Porac-Gumain River) and Third River Channel, Final Report	2002	Study Area	
	L_SAFDZ	SAFDZ	General	polygon	BSWM JICA Study Team	2009 2009	Study Area	• Features were roughly digitized only
Natural Condition	N_Climate	Climate	General	polygon	DENR Region III PAGASA	2009 2007	Philippines	• Code of PAGASA is different from DENR
	N_Contours_50K	Contour	General	line	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines DENR Region III JICA Study Team	2008 2009 2009	Region III and vicinity	• If available, information from the NAMRIA-JICA Mapping Study (~20 m interval) was used. For other areas, GIS data obtained from DENR Region III (100 m interval) was used. • Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study. • Down to 5 meter contour intervals in some areas.
	N_Contours_50K_PrePinatubo	Contour prior to Mt. Pinatubo eruption	General	line	DENR Region III	2009	Mt. Pinatubo and vicinity	• Data from DENR Region III was created in-house - digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study. • In 100 meter contour intervals.
	N_Contours_CandabaRBDike	Contour inside the surrounding dike in flood retarding basin in Candaba Area	General	line	DPWH-JICA-NIA, Feasibility Report on the Pampanga Delta Development Project	1982	Surrounding Dike in Flood Retarding Basin in Candaba Area	• In 1 meter contour intervals.
	N_Elevation	Elevation ranges classified by JICA Study Team	Analysis	polygon	JICA Study Team	2009	Study Area	• Based on N_Contours_50K
	N_Elevation_CandabaRBDike	Elevation ranges classified by JICA Study Team inside the surrounding dike in flood retarding basin in Candaba Area	Analysis	polygon	JICA Study Team	2009	Candaba	• Based on N_Contours_CandabaRBDike • A few ranges were assumed
	N_Geology1	Geology (1st set provided by DENR Region III)	General	polygon	DENR Region III JICA Study Team	2009	Study Area	• Recoding by JICA Study Team • Information from MGB indicates that it could have been from a 1963 Geological
	N_Geology2	Geology (2nd set provided by DENR Region III)	General	polygon	DENR Region III	2009	Study Area	
	N_Hydrogeology	Hydrogeology	General	polygon	JICA Study Team	2009	Study Area	• Classified by JICA Study Team with N_Geology1 as the base
	N_Mangrove	Mangrove	General	polygon	PAWCZMS Region III JICA Study Team	2009	Pampanga & Bulacan	• Digitized by JICA Study Team from provided image files
	N_MountainsHills	Mountains and Hills	General	point	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	NAMRIA-JICA Project Study Pilot Area	
	N_PAnnual_Contour	Contour of Annual Total Precipitation	Analysis	line	JICA Study Team	2009	Study Area and vicinity	• Derived from WorldClim precipitation data, modified with smoothing
	N_PDry_Contour	Contour of Dry Season (November-April) Average Monthly Precipitation	Analysis	line	JICA Study Team	2009	Study Area and vicinity	• Derived from WorldClim precipitation data, modified with smoothing
	N_PETAnnual_Contour	Contour of Annual Potential Evapotranspiration	Analysis	line	JICA Study Team	2009	Study Area and vicinity	• Derived from WorldClim PET data, modified with smoothing
	N_PWet_Contour	Contour of Wet Season (May-October) Average Monthly Precipitation	Analysis	line	JICA Study Team	2009	Study Area and vicinity	• Derived from WorldClim precipitation data, modified with smoothing
N_SlopePercent	Slope (in percent) in standard ranges	General	polygon	JICA Study Team	2009	Study Area	• Derived from N_Contours_50K using 100 m contour intervals	
N_Soil	Soil	General	polygon	DENR Region III	2009	Study Area		

MT-24



**Annex-T M.1.4.1 (5/7) List of Spatial Data: Shapefiles**

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Natural Condition	N_SpotHt	Spot Height	General	point	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines DENR Region III JICA Study Team	2008 2009 2009	Study Area and vicinity	
	N_SpotHt_PrePinatubo	Spot Height prior to Mt. Pinatubo eruption	General	point	NAMRIA 1:50,000 Topographic Maps JICA Study Team	2009	Mt. Pinatubo and vicinity	• Digitized from NAMRIA 1:50,000 topographic maps with different dates but prior to the 2008 NAMRIA-JICA Mapping Study.
	N_TAnnual_Contour	Contour of Annual Temperature	Analysis	line	JICA Study Team	2009	Study Area and vicinity	• Derived from WorldClim precipitation data, modified with smoothing
	N_WaterSurfElev	Water Surface Elevation	General	point	NAMRIA-JICA, The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of Philippines	2008	NAMRIA-JICA Project Study Pilot Area	
	N_WorldClim_Point	WorldClim data link shapefile (point format)	General	point	WorldClim JICA Study Team	2006 2009	Study Area and vicinity	
	N_WorldClim_Polygon	WorldClim data link shapefile (polygon format)	General	point	WorldClim JICA Study Team	2006 2009	Study Area and vicinity	
Hazard	Ha_ActVolcano	Active Volcano	General	point	PHIVOLCS	2006	Philippines	
	Ha_Earthquake	Earthquake	General	point	USGS	2009	Philippines	• Downloaded from USGS website on 26 April 2009
	Ha_Erosion	Erosion	General	polygon	DENR Region III JICA Study Team	2009 2009	Study Area Study Area	• Edited by the JICA Study Team for data consistency
	Ha_Faultlines_DENR	Faultline from DENR Region III	General	line	DENR Region III	2009	Study Area	
	Ha_Faultlines_JST	Faultline by JICA Study Team	General	line	DENR Region III MGB Geological Map JICA Study Team	2009 1963 2009	Study Area	• Filtered information from Ha_Faultlines_DENR with reference from MGB Geological Map
	Ha_FIFloodExitPt	Flash Flood Exit Points	General	point	MGB		Philippines	
	Ha_FloodedAreas_DFO	Flooded Areas from Dartmouth Flood Observatory	General	polygon	JICA Study Team	2009	Study Area and vicinity	• Extracted by JICA Study Team from image downloaded from Dartmouth Flood Observatory website • Period covers 2001-2004 and August 2004
Ha_FloodProneAreas_MGB	Flood Prone Areas from MGB	General	polygon	MGB		Philippines		
Monitoring	M_DischGaugSta_Prop	Proposed location of Discharge Gauging Stations	Basic	point	JICA Study Team	2010	Study Area	
	M_HMS	Hydrometric Station	Basic	point	NWRC, Philippine Water Resources Summary Data Vol. 1 BRS	1980	Study Area and vicinity	• Original coordinates were adjusted by the JICA Study Team
					NWRC, Pampanga River Basins Framework Plan	1983		
					DPWH-JICA, The Study on Flood Control Project Implementation System for Principal Rivers in the Philippines, Annex 3	2004		
					NIA, Definitive Development Plan, Irrigation Component of the Casecan Multipurpose Irrigation and Power Project (CMIPP-IC), Appendix 1 JICA Study Team	2000 2009		
M_IntakeFlowMeas	Intake Flow Measurement	Basic	point	JICA Study Team	2010	Study Area		
M_PumpingStation	Pumping Station	Basic	point	LWUA-JICA Baseline Survey on Nationwide Ground Water Quality Monitoring in the Philippines	2003	Study Area		
				MGB	1998, 2000			
				JICA Study Team	2009			

MT-25

**Annex-T M.1.4.1 (6/7) List of Spatial Data: Shapefiles**

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Monitoring	M_RainfallStation	Rainfall Station	Basic	point	NWIN, http://www.nwin.nwrp.gov.ph	1980	Study Area and vicinity	• Locations of features with no coordinates were estimated by the JICA Study Team
					PAGASA-JICA, Basic Design Study Report on the Project for Upgrading of Flood Forecasting and Warning System in Pampanga and Agno River and Basins in Republic of the Philippines	2007		
					NIA, Definitive Development Plan, Irrigation Component of the Casecnan Multipurpose Irrigation and Power Project (CMIPP-IC), Appendix 1	2000		
					DPWH-NK, Pinatubo Hazard Urgent Rehabilitation Project, Monitoring and Planning of Flood Control Works on the Pasac Delta (inc. the Porac-Gumain River) and Third River Channel, Final Report, Appendix No. 2, Meteorology and Hydrology	2002		
					JICA-NWRB, The Study on Water Resources Development for Metro Manila in the Republic of the Philippines, Final Report, Vol. III, Master Plan Study, Supporting Report	2003		
M_Thiessen	Thiessen Polygon	Analysis	polygon	JICA Study Team	2009	Study Area and vicinity		
M_WLRR	Water Level / Rainfall Station	Basic	point	PAGASA-JICA, Basic Design Study Report on the Project for Upgrading of Flood Forecasting and Warning System in Pampanga and Agno River and Basins in Republic of the Philippines	2007	Study Area	• Locations of features with no coordinates were estimated by the JICA Study Team	
				JICA Study Team	2009			
				JICA Study Team	2009			
M_WQMonStation_Prop	Water Quality Monitoring Station proposed by JST	Basic	point	JICA Study Team	2010	Study Area		
Socio-Economic	S_AD_AppCADT	Ancestral Domain with Approved CADT	General	polygon	NCIP	2010	Study Area and vicinity	• Actual coordinates in PRS92 Zone 3 were provide by NCIP and were just transformed by JST
	S_AD_SocPrep	Ancestral Domain with On-Going Social Preparation	General	polygon	NCIP	2010	Study Area and vicinity	• Location were estimated by the JICA Study Team based on the information provided by NCIP • Area/size of features more or less correspond to the approximated area provided by NCIP
					JICA Study Team	2010		
	S_AD_SunComp	Ancestral Domain with Completed Survey	General	polygon	NCIP	2010	Study Area and vicinity	• Location were estimated by the JICA Study Team based on the information provided by NCIP • Area/size of features more or less correspond to the approximated area provided by NCIP
					JICA Study Team	2010		
	S_AD_SunOnGoing	Ancestral Domain with On-Going Survey	General	polygon	NCIP	2010	Study Area and vicinity	• Location were estimated by the JICA Study Team based on the information provided by NCIP • Area/size of features more or less correspond to the approximated area provided by NCIP
					JICA Study Team	2010		
S_HistCulSite	Historical and Cultural Sites	General	point	PEMSEA, Manila Bay Area Environmental Atlas	2007	Study Area	• Rough digitization of features only	
S_NatTour	Nature-Based Tourism Sites	General	point	PEMSEA, Manila Bay Area Environmental Atlas	2007	Study Area	• Rough digitization of features only	

### Annex-T M.1.4.1 (7/7) List of Spatial Data: Shapefiles

Category	Layer	Description	Data Classification	Geometry	Sources	Year	Coverage	Remarks
Socio-Economic	S_ProtAr_Init	Initial Component of NIPAS proposed for establishment	General	polygon	PAWB	2004	Region III and vicinity	<ul style="list-style-type: none"> <li>Some areas unlocated by PAWB were assumed by the JICA Study Team based on location descriptions and raw GIS data</li> <li>Large discrepancies were observed for some features between the official area and those obtained via GIS</li> <li>Some features were edited by JICA Study Team to maintain consistency with existing coastline and administrative data.</li> <li>Shapes of those belonging to the initial component that were later proclaimed maybe the same.</li> </ul>
					JICA Study Team	2009		
	S_ProtAr_Proc	Proclaimed/Declared Protected Areas	General	polygon	PAWB	2004	Region III and vicinity	
					JICA Study Team	2009		
Others	O_701Index	Map sheet index for the NAMRIA topographic map, 701 series	General	polygon	JICA Study Team	2009	Study Area and vicinity	
	O_AnnualIrrigationPrograms	Annual Irrigation Programs	Basic	point	NIA, Indicative Irrigation Development Program 2010-2019	2009	Study Area and vicinity	<ul style="list-style-type: none"> <li>Not all programs listed in the original source were plotted</li> <li>Plotting was estimated based on rough locations of barangays</li> </ul>
	O_DischargePermittees	Location of Discharge Permittees	Basic	point	EMB Region III JICA Study Team	2003-2008 2009	Tarlac, Nueva Ecija, Pampanga, Bulacan	<ul style="list-style-type: none"> <li>Location of discharge permittees were plotted approximately by the JICA Study Team based on barangay</li> </ul>
	O_Industry	Industries operating in Region III	Basic	point	EMB Region III	2009	Region III	
	O_JicaNamriaPilotArea	Pilot Area of the NAMRIA-JICA Mapping Study	Basic	polygon	JICA Study Team	2009	NAMRIA-JICA Project Study Pilot Area	
	O_MinesQuarries	Location of Mining and Quarrying area	Basic	point	MGB Region III JICA Study Team	2003-2008 2009	Study Area and vicinity	<ul style="list-style-type: none"> <li>Location of discharge permittees were plotted approximately by the JICA Study Team based on the barangay as provided in the addresses</li> </ul>
	O_NAMRIATopoLabel	Label for combined old and new NAMRIA topographic maps	General	point	JICA Study Team	2009	Study Area and vicinity	<ul style="list-style-type: none"> <li>For use in one particular map</li> </ul>
	O_NorthArrow	North Arrow	General	polygon	JICA Study Team	2009	Mt. Pinatubo and vicinity	<ul style="list-style-type: none"> <li>For use in one particular map</li> </ul>
	O_Projects	Projects	General	polygon	JICA Study Team	2010	Study Area and vicinity	<ul style="list-style-type: none"> <li>Features are just indicative locations of project areas and does not reflect the actual extents</li> </ul>
	O_TenurialInst	Tenurial Instruments	General	polygon	DENR Region III PAWB	2009 2004	Study Area	<ul style="list-style-type: none"> <li>Combination of selected data Tree Plantations and Protected Areas (Initial)</li> </ul>
	O_WaterRights	Location of Water Abstractions	Basic	point	NWRB JICA Study Team	2007 2009	Study Area and vicinity	<ul style="list-style-type: none"> <li>Some coordinates were adjusted by the JICA Study Team</li> <li>Locations of features with no coordinates were estimated by the JICA Study</li> </ul>

## Annex-T M.1.4.2 (1/2) List of Spatial Data: Tables

Category	Layer	Description	Link To	Link Field	Data Classification	Format	Sources	Year	Coverage	Remarks
Administrative										
Transportation										
Infrastructure	I_ESWMCmp08	Status of compliance with ESWM as of 2008	\\00_Administrative\A_CityMun	PSGC	General	XLS	various PPDO's various PG-ENRO's	2009 2009		
Buildings										
Hydrology	Hy_DivWatDemExistCISST_Maj	Estimated Diversion Water Demands for Existing CISs and Small Scale Irrigation For Major Rivers	\\04_Hydrology\Hy_CatchmentWaterBal	Code	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_DivWatDemExistCISST_Oth	Estimated Diversion Water Demands for Existing CISs and Small Scale Irrigation for Other Rivers	\\04_Hydrology\Hy_CatchmentWaterBal	Code	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_DivWatDemExistNIS	Estimated Diversion Water Demands for Existing NIS	\\04_Hydrology\Hy_DamIntakePointsNIS	Name	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_DivWatDemExistNIS_Net	Estimated Net Diversion Water Demands for Existing NIS	\\04_Hydrology\Hy_DamIntakePointsNIS	Name	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_DivWatDemFutureNIS	Estimated Diversion Water Demands for Future NIS	\\04_Hydrology\Hy_DamIntakePointsNIS	Name	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_DivWatDemFutureNIS_Net	Estimated Net Diversion Water Demands for Future NIS	\\04_Hydrology\Hy_DamIntakePointsNIS	Name	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_MinStrFlowReq	Estimated Minimum Stream Flow Requirement	\\00_Administrative\Hy_CPWaterBal	CP_ID	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_SurfWatResPot_Dams	Surface Water Resource Potential (Equivalent to 80% Reliability) with Existing and Proposed Stored Dams at Control Points	\\00_Administrative\Hy_CPWaterBal	CP_ID	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_SurfWatResPot_QuasiNat	Surface Water Resource Potential in Quasi-Natural Condition	\\00_Administrative\Hy_CPWaterBal	CP_ID	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandFish	Estimated Fisheries Water Demand by Water Balance Catchment	\\04_Hydrology\Hy_CatchmentWaterBal	Code	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandIrrig_GW	Estimated Irrigation Water Demand for Groundwater Source by City/Municipality	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandInd_SW	Present and Projected Industrial Water Demand for Surface Water Source	\\04_Hydrology\Hy_CatchmentWaterBal	Code	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandLiv	Estimated Livestock Water Demand by City Municipality	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandMun_CityMun_OutA	Present and Projected Municipal Water Demand by City/Municipality outside Study Area	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandMun_CityMun_SA	Present and Projected Municipal Water Demand by City/Municipality in Study Area	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterDemandMun_Prov_SA	Present and Projected Municipal Water Demand by Province in Study Area	\\00_Administrative\A_Province	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterPermit_CityMun_GW	Water Permits for Each City/Municipality: Ground Water	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterPermit_CityMun_SW	Water Permits for Each City/Municipality: Surface Water	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterPermit_SB_GW	Water Permits for Each Sub-Basin: Ground Water	\\04_Hydrology\Hy_CatchmentSubBasin	Code	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	Hy_WaterPermit_SB_SW	Water Permits for Each Sub-Basin: Surface Water	\\04_Hydrology\Hy_CatchmentSubBasinTransBasin2	Code	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
Hy_WaterSupplyCov	Water Supply Coverage	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	various Provincial Health Offices JICA Study Team	2009 2009	Study Area and vicinity		
Hy_WaterUsageCondGW	Evaluation of Water Usage Condition for Ground Water Source	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity		
Land Condition										
Natural Condition	N_WcElev	Elevation based on WorldClim Data	\\06_NaturalCondition\N_WorldClim_Point	POINTID	General	DBF	WorldClim	2006	Study Area and vicinity	
			\\06_NaturalCondition\N_WorldClim_Polygon	POINTID			JICA Study Team	2009		
	N_WcPET	Potential Evapotranspiration based on WorldClim Data	\\06_NaturalCondition\N_WorldClim_Point	POINTID	General	DBF	JICA Study Team	2009	Study Area and vicinity	
			\\06_NaturalCondition\N_WorldClim_Polygon	POINTID						
	N_WcPrec	Precipitation based on WorldClim Data	\\06_NaturalCondition\N_WorldClim_Point	POINTID	General	DBF	JICA Study Team	2009	Study Area and vicinity	
		\\06_NaturalCondition\N_WorldClim_Polygon	POINTID							
N_WcTemp	Temperature based on WorldClim Data	\\06_NaturalCondition\N_WorldClim_Point	POINTID	General	DBF	WorldClim	2006	Study Area and vicinity		
		\\06_NaturalCondition\N_WorldClim_Polygon	POINTID			JICA Study Team	2009			

## Annex-T M.1.4.2 (2/2) List of Spatial Data: Tables

Category	Layer	Description	Link To	Link Field	Data Classification	Format	Sources	Year	Coverage	Remarks
Hazard	Ha_Cyclone	Tropical Cyclone frequency	\\00_Administrative\A_Province	PSGC	General	XLS	PAGASA	2006	Philippines	* Frequency of Tropical Cyclone calculated by using Record Year 1948-2000
	Ha_GWBalace	Groundwater Balance Risk	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2009	Study Area and vicinity	
	Ha_PollLoadDom_CatchSB	Domestic Pollution Load for Sub-Basin Catchment	\\04_Hydrology\Hy_CatchmentSubBasin	Code	Analysis/Planning	XLS	JICA Study Team	2009	Study Area	
	Ha_PollLoadDom_CatchWB	Domestic Pollution Load for Water Balance Catchment	\\04_Hydrology\Hy_CatchmentWaterBal	Code	Analysis/Planning	XLS	JICA Study Team	2009	Study Area	
	Ha_PollLoadTot_CatchSB	Total Pollution Load for Sub-Basin Catchment	\\04_Hydrology\Hy_CatchmentSubBasin	Code	Analysis/Planning	XLS	JICA Study Team	2009	Study Area	
	Ha_PollLoadTot_CatchWB	Total Pollution Load for Water Balance Catchment	\\04_Hydrology\Hy_CatchmentWaterBal	Code	Analysis/Planning	XLS	JICA Study Team	2009	Study Area	
Monitoring	M_Hyperlink_ClimData.xls	Table to setup hyperlink for climatic data	\\08_Monitoring\IM_RainfallStation	Name	Basic	XLS	PAGASA	1977-2007	Cabanatuan, CLSU Muñoz	
	M_Hyperlink_DailyDischarge.xls	Table to setup hyperlink for daily discharge	\\08_Monitoring\IM_HMS	ID_HMS	Basic	XLS	NWRB BRS	varying dates from	23 Stations within the Study Area	
	M_Hyperlink_DailyPrec.xls	Table to setup hyperlink for daily precipitation	\\08_Monitoring\IM_RainfallStation	Name	Basic	XLS	PAGASA	varying dates from 1950's-2000's	9 Stations of PAGASA synoptic stations	
	M_Hyperlink_interpolatedSelectedStationMonthlyPrecipitation.xls	Table to setup hyperlink for interpolated monthly precipitation for selected stations	\\08_Monitoring\IM_RainfallStation	Name	Basic	XLS	JICA Study Team	2009	36 Stations within and around the Study Area	
	M_Hyperlink_MonthlyDischarge.xls	Table to setup hyperlink for monthly discharge	\\08_Monitoring\IM_HMS	ID_HMS	Basic	XLS	NWRB BRS	1946-2007	58 Stations within the Study Area	
	M_Hyperlink_rawSelectedStationMonthlyPrecipitation.xls	Table to setup hyperlink for raw data of monthly precipitation for selected stations	\\08_Monitoring\IM_RainfallStation	Name	Basic	XLS	PAGASA	1951-2007	36 Stations within and around the Study Area	
Socio-Economic	S_IP_Pop_FullCM	Population of Indigenous People for entire City/Municipality	\\00_Administrative\A_CityMun_SA	PSGC	General	XLS	NCIP	2006	Region 3	
	S_IP_PopProf	Indigenous People Population Profile	\\00_Administrative\A_Province	PSGC	General	XLS	NCIP	2006	Region 3	
	S_IP_RegProf	Indigenous People Regional Profile	\\00_Administrative\A_Province	PSGC	General	XLS	NCIP	2006	Region 3	
	S_Pop_FullCM	Population for entire City/Municipality	\\00_Administrative\A_CityMun	PSGC	General	XLS	NSCB	2007	Study Area and vicinity	
	S_Pop_SA	Population for Study Area	\\00_Administrative\A_CityMun_SA	PSGC	General	XLS	JICA Study Team	2009	Study Area and vicinity	
	S_PopDen_FullCM	Population Density for entire City/Municipality	\\00_Administrative\A_CityMun	PSGC	General	XLS	JICA Study Team	2009	Study Area and vicinity	
	S_PopDen_SA	Population Density for Study Area	\\00_Administrative\A_CityMun_SA	PSGC	General	XLS	JICA Study Team	2009	Study Area and vicinity	
	S_PopProj_FullCM	Population Projection for entire City/Municipality	\\00_Administrative\A_CityMun	PSGC	General	XLS	NSO	2007	Study Area and vicinity	
	S_PopProj_SA	Population Projection for Study Area	\\00_Administrative\A_CityMun_SA	PSGC	General	XLS	JICA Study Team	2007	Study Area and vicinity	
	S_ServedPop_CityMun_OutSA	Served Population by City/Municipality outside Study Area	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	S_ServedPop_CityMun_SA	Served Population by City/Municipality in Study Area	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area	
	S_ServedPop_Prov_SA	Served Population by Province in Study Area	\\00_Administrative\A_Province	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area	
	S_ServedPopAdd_CityMun_OutSA	Additional Population to be Served by City/Municipality outside Study Area	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area and vicinity	
	S_ServedPopAdd_CityMun_SA	Additional Population to be Served by City/Municipality in Study Area	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area	
S_ServedPopAdd_Prov_SA	Additional Population to be Served by Province in Study Area	\\00_Administrative\A_Province	PSGC	Analysis/Planning	XLS	JICA Study Team	2010	Study Area		
S_Poverty	Poverty	\\00_Administrative\A_CityMun_SA	PSGC	General	XLS	NSCB-WB, Intercasal Updating of Small Area Poverty Estimates	2003	Tarlac, Nueva Ecija, Pampanga, Bulacan	*Values are for the entire cities/municipalities	
S_SanitaryToiletCov	Sanitary Toilet Coverage Ratio	\\00_Administrative\A_CityMun	PSGC	Analysis/Planning	XLS	Provincial Health Offices JICA Study Team	2009 2009	Study Area and vicinity		
Others										

## Annex-T M.1.4.3 (1/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description	
Administrative	A_CandSwampWildlifeSanct_Lot	Shape	FID	Object ID	Object ID	
			Shape	Polygon	Geometry	
			ArSqKm	Double	Area in sq km	
	A_CityMun	Shape	FID	Object ID	Object ID	
			Shape	Polygon	Geometry	
			CityMun	Text	Name of city/municipality	
			Province	Text	Name of province	
			AqSqKm	Double	Area in sq km of the entire city/municipality	
			ArSqKm_SA	Double	Area in sq km inside Study Area	
			Category	Short Integer	Category, where: 0 - Outside Study Area 1 - Inside Study Area 2 - Related Area for Water Demand 3 - Metro Manila 4 - Related Area for Water Transfer	
			ArRatio	Double	Ratio (in percentage) between ArSqKm_SA and ArSqkm	
			PSGC	Text	Philippine Standard Geographic Code	
			Class	Text	Distinguishes if the feature is a city or a municipality	
			A_CityMun_SA	Shape	FID	Object ID
	Shape	Polygon			Geometry	
	CityMun	Text			Name of city/municipality	
	Province	Text			Name of province	
	AqSqKm	Double			Area in sq km of the entire city/municipality	
	ArSqKm_SA	Double			Area in sq km inside Study Area	
	Category	Short Integer			Category, where: 0 - Outside Study Area 1 - Inside Study Area 2 - Related Area for Water Demand 3 - Metro Manila 4 - Related Area for Water Transfer	
	ArRatio	Double			Ratio (in percentage) between ArSqKm_SA and ArSqkm	
	PSGC	Text			Philippine Standard Geographic Code	
	Class	Text			Distinguishes if the feature is a city or a municipality	
	A_CityMun_Main	Shape			FID	Object ID
			Shape	Point	Geometry	
			CityMun	Text	Name of city/municipality	
			Province	Text	Name of province	
			Class	Text	Distinguishes if the feature is a city or a municipality	
			Capital	Short Integer	Classified as a capital city? 0 - No 1 - Yes	
			Cat1	Short Integer	Considered as main city/municipality (Selection #1)? 0 - No 1 - Yes	
Cat2			Short Integer	Considered as main city/municipality (Selection #2)? 0 - No 1 - Yes		
PSGC			Text	Philippine Standard Geographic Code		
Class			Text	Distinguishes if the feature is a city or a municipality		
A_Philippines	Shape	FID	Object ID	Object ID		
		Shape	Polygon	Geometry		
A_Province	Shape	Province	Text	Name of province		
		AqSqKm	Double	Area in sq km		
		PSGC	Text	Philippine Standard Geographic Code		
		Class	Text	Distinguishes if the feature is a city or a municipality		
A_StudyArea	Shape	FID	Object ID	Object ID		
		Shape	Polygon	Geometry		
Transportation	Tr_Road	Shape	FID	Object ID	Object ID	
			Shape	Line	Geometry	
Infrastructure	I_StrucFloodMitProj	Shape	FID	Object ID	Object ID	
			Shape	Line	Geometry	
	T_PDPP-FC	Shape	Name	Text	Name of project	
			Phase	Short Integer	Project Phase	
	I_ESWComp08	XLS	PSGC	N/A	Philippine Standard Geographic Code	
			Province	N/A	Name of province	
			CityMun	N/A	Name of city/municipality	
			VolMTPD	N/A	Volume of Waste Generation (Metric Tons Per Day)	
			Seg	N/A	Are there any Segregation (3R) activities? 0 - No 1 - Yes 2 - Partial 3 - Not Applicable 4 - No Information	
			MRF	N/A	Are there any Materials Recovery Facilities? 0 - No 1 - Yes 2 - Partial 3 - Proposed 4 - Not Applicable 5 - No Information	
			OD	N/A	Are there any Open Dumpsites? 0 - No 1 - Yes 2 - Partial 3 - Proposed 4 - Not Applicable 5 - No Information	
			CD	N/A	Are there any Closed Dumpsites? 0 - No 1 - Yes 2 - Partial 3 - Proposed 4 - Not Applicable 5 - No Information	
			SL	N/A	Are there any Sanitary Landfills? 0 - No 1 - Yes 2 - Partial 3 - Proposed 4 - Not Applicable 5 - No Information	
			Buildings	B_CityMunHall	Shape	FID
	Shape	Point				Geometry
	CityMun	Text				Name of city/municipality
	Province	Text				Name of province
AssLoc	Short Integer	Location is based on assumptions and maybe highly inaccurate? 0 - No 1 - Yes				
PSGC	Text	Philippine Standard Geographic Code				
Class	Text	Distinguishes if the feature is a city or a municipality				

## Annex-T M.1.4.3 (2/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Hydrology	Hy_Canal	Shape	FID	Object ID	Object ID
			Shape	Line	Geometry
	Hy_CandabaDrChan.shp	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
	Hy_CandabaEmSpill.shp	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
	Hy_CandabaOutletChGate.shp	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
	Hy_CandabaFlapDrGate.shp	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
	Hy_CandabaRBDike.shp	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			AqSqKm	Double	Area in sq km
	Hy_CatchmentPasac	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of catchment
			AqSqKm	Double	Area in sq km
	Hy_CatchmentProposedDam	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of catchment
			Recommend	Short Integer	Recommended? 0 - No 1 - Yes
			ArSqKm	Double	Area in sq km
	Hy_CatchmentRiversMain	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Code	Text	Catchment code assigned by the JICA Study Team
			Code_NWRB	Text	Catchment code assigned by NWRB
			Name_NWRB	Text	Name of catchment assigned by NWRB
			AqSqKm	Double	Area in sq km
	Hy_CatchmentSubBasin	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Code	Text	Catchment code assigned by the JICA Study Team
			Code_NWRB	Text	Catchment code assigned by NWRB
			Name_NWRB	Text	Name of catchment assigned by NWRB
			P_annual	Double	Annual precipitation
			PET_Annual	Double	Annual PET
			P_01	Double	Precipitation: January
			P_02	Double	Precipitation: February
			P_03	Double	Precipitation: March
			P_04	Double	Precipitation: April
			P_05	Double	Precipitation: May
			P_06	Double	Precipitation: June
			P_07	Double	Precipitation: July
			P_08	Double	Precipitation: August
			P_09	Double	Precipitation: September
			P_10	Double	Precipitation: October
			P_11	Double	Precipitation: November
			P_12	Double	Precipitation: December
			PET_01	Double	PET: January
			PET_02	Double	PET: February
			PET_03	Double	PET: March
			PET_04	Double	PET: April
			PET_05	Double	PET: May
			PET_06	Double	PET: June
			PET_07	Double	PET: July
			PET_08	Double	PET: August
			PET_09	Double	PET: September
			PET_10	Double	PET: October
			PET_11	Double	PET: November
			PET_12	Double	PET: December
			AqSqKm	Double	Area in sq km
	Hy_CatchmentSubBasinTransBasin2	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Code	Text	Catchment code assigned by the JICA Study Team
	Hy_CatchmentSubBasin_3Main	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of catchment
	Hy_CatchmentTransBasin	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of catchment
			AqSqKm	Double	Area in sq km
	Hy_CatchmentWaterBal	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Code	Text	Catchment code assigned by the JICA Study Team
			ArSqKm	Double	Area in sq km
	Hy_CIS	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Name	Text	Name of CIS
			Status	Text	Status
			CityMun_Off	Text	Official data from NIA indicating the city/municipality where CIS is located.; this information may not be consistent with the administrative data used in this study
			ArHa_Off	Double	Official data from NIA indicating the area in hectares
			ID	Long Integer	Unique ID
	Hy_CPWaterBal	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			CP_ID	Text	Control Point ID
			DrArSqKm	Double	Drainage area in sq km
			DSirCatch	Text	Most Downstream Catchment
			RiverSys	Text	River System
			Descr	Text	Description
	Hy_DamIntakePointsNIS	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Name	Text	Name of dam / intake point
			Status	Text	Identifies if dam is existing or proposed
	Hy_DamMain	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Name	Text	Name of dam
			Type	Text	Type of dam
	Hy_DamProp	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Name	Text	Name of dam
			Recommend	Short Integer	Recommended? 0 - No 1 - Yes 2 - For consideration
		NorOpLevM	Double	Normal operation Level in meters	

### Annex-T M.1.4.3 (3/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description		
Hydrology	Hy_DamSiteIdentifiedPossible	Shape	FID	Object ID	Object ID		
			Shape	Point	Geometry		
			Code	Text	Code of site		
			Site	Text	Name of site		
			River	Text	Name of related river		
			Province	Text	Name of province		
			Lat	Text	Latitude		
			Long	Text	Longitude		
			DrArSqKm	Text	Drainage area in sq km		
			DamHtM	Text	Dam height in meters		
			GRVolMCM	Text	Gross Reservoir Volume in million cu. meters		
			I	Double	Used for Irrigation? 0 - No 1 - Yes		
			P	Double	Used for Hydropower? 0 - No 1 - Yes		
			FC	Double	Used for Flood Control? 0 - No 1 - Yes		
			MI	Double	Used for Municipal/Industrial? 0 - No 1 - Yes		
			Agency	Text	Agency		
			Status	Text	Status		
			Hy_DivDamMain	Shape	FID	Object ID	Object ID
	Hy_DivDamTransBasin	Shape	Shape	Point	Geometry		
			Name	Text	Name of diversion dam		
	Hy_DivWatDemExistCISSSI_Maj	XLS	FID	Object ID	Object ID		
			Shape	Point	Geometry		
			Name	Text	Name of trans-basin diversion dam		
			Code	N/A	Catchment code assigned by the JICA Study Team		
			River	N/A	River		
			WRm3ps_01	N/A	Diversion Water Requirement in m3/s: January		
			WRm3ps_02	N/A	Diversion Water Requirement in m3/s: February		
			WRm3ps_03	N/A	Diversion Water Requirement in m3/s: March		
			WRm3ps_04	N/A	Diversion Water Requirement in m3/s: April		
			WRm3ps_05	N/A	Diversion Water Requirement in m3/s: May		
			WRm3ps_06	N/A	Diversion Water Requirement in m3/s: June		
			WRm3ps_07	N/A	Diversion Water Requirement in m3/s: July		
			WRm3ps_08	N/A	Diversion Water Requirement in m3/s: August		
			WRm3ps_09	N/A	Diversion Water Requirement in m3/s: September		
			WRm3ps_10	N/A	Diversion Water Requirement in m3/s: October		
			WRm3ps_11	N/A	Diversion Water Requirement in m3/s: November		
			WRm3ps_12	N/A	Diversion Water Requirement in m3/s: December		
			Hy_DivWatDemExistCISSSI_Oth	XLS	Code	N/A	Catchment code assigned by the JICA Study Team
	River	N/A			River		
	WRm3ps_01	N/A			Diversion Water Requirement in m3/s: January		
	WRm3ps_02	N/A			Diversion Water Requirement in m3/s: February		
	WRm3ps_03	N/A			Diversion Water Requirement in m3/s: March		
	WRm3ps_04	N/A			Diversion Water Requirement in m3/s: April		
	WRm3ps_05	N/A			Diversion Water Requirement in m3/s: May		
	WRm3ps_06	N/A			Diversion Water Requirement in m3/s: June		
	WRm3ps_07	N/A			Diversion Water Requirement in m3/s: July		
	WRm3ps_08	N/A			Diversion Water Requirement in m3/s: August		
	WRm3ps_09	N/A			Diversion Water Requirement in m3/s: September		
	WRm3ps_10	N/A			Diversion Water Requirement in m3/s: October		
	WRm3ps_11	N/A			Diversion Water Requirement in m3/s: November		
	WRm3ps_12	N/A			Diversion Water Requirement in m3/s: December		
	Hy_DivWatDemExistNIS	XLS			IntakePt	N/A	Intake Point
					NIS	N/A	NIS
					River	N/A	River
					WRm3ps_01	N/A	Diversion Water Requirement in m3/s: January
			WRm3ps_02	N/A	Diversion Water Requirement in m3/s: February		
			WRm3ps_03	N/A	Diversion Water Requirement in m3/s: March		
			WRm3ps_04	N/A	Diversion Water Requirement in m3/s: April		
			WRm3ps_05	N/A	Diversion Water Requirement in m3/s: May		
			WRm3ps_06	N/A	Diversion Water Requirement in m3/s: June		
			WRm3ps_07	N/A	Diversion Water Requirement in m3/s: July		
			WRm3ps_08	N/A	Diversion Water Requirement in m3/s: August		
			WRm3ps_09	N/A	Diversion Water Requirement in m3/s: September		
			WRm3ps_10	N/A	Diversion Water Requirement in m3/s: October		
			WRm3ps_11	N/A	Diversion Water Requirement in m3/s: November		
			WRm3ps_12	N/A	Diversion Water Requirement in m3/s: December		
			Hy_DivWatDemExistNIS_Net	XLS	IntakePt	N/A	Intake Point
					NIS	N/A	NIS
					River	N/A	River
	NWRm3ps_01	N/A			Net Diversion Water Requirement in m3/s: January		
	NWRm3ps_02	N/A			Net Diversion Water Requirement in m3/s: February		
	NWRm3ps_03	N/A			Net Diversion Water Requirement in m3/s: March		
	NWRm3ps_04	N/A			Net Diversion Water Requirement in m3/s: April		
	NWRm3ps_05	N/A			Net Diversion Water Requirement in m3/s: May		
	NWRm3ps_06	N/A			Net Diversion Water Requirement in m3/s: June		
	NWRm3ps_07	N/A			Net Diversion Water Requirement in m3/s: July		
	NWRm3ps_08	N/A			Net Diversion Water Requirement in m3/s: August		
	NWRm3ps_09	N/A			Net Diversion Water Requirement in m3/s: September		
	NWRm3ps_10	N/A			Net Diversion Water Requirement in m3/s: October		
	NWRm3ps_11	N/A			Net Diversion Water Requirement in m3/s: November		
	NWRm3ps_12	N/A			Net Diversion Water Requirement in m3/s: December		
	Hy_DivWatDemFutureNIS	XLS			IntakePt	N/A	Intake Point
					NIS	N/A	NIS
					River	N/A	River
			WRm3ps_01	N/A	Diversion Water Requirement in m3/s: January		
			WRm3ps_02	N/A	Diversion Water Requirement in m3/s: February		
			WRm3ps_03	N/A	Diversion Water Requirement in m3/s: March		
			WRm3ps_04	N/A	Diversion Water Requirement in m3/s: April		
			WRm3ps_05	N/A	Diversion Water Requirement in m3/s: May		
			WRm3ps_06	N/A	Diversion Water Requirement in m3/s: June		
			WRm3ps_07	N/A	Diversion Water Requirement in m3/s: July		
			WRm3ps_08	N/A	Diversion Water Requirement in m3/s: August		
			WRm3ps_09	N/A	Diversion Water Requirement in m3/s: September		
			WRm3ps_10	N/A	Diversion Water Requirement in m3/s: October		
			WRm3ps_11	N/A	Diversion Water Requirement in m3/s: November		
			WRm3ps_12	N/A	Diversion Water Requirement in m3/s: December		



## Annex-T M.1.4.3 (4/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Hydrology	Hy_DivWatDemFutureNIS_Net	XLS	IntakePt	N/A	Intake Point
			NIS	N/A	NIS
			River	N/A	River
			NWRm3ps_01	N/A	Net Diversion Water Requirement in m3/s: January
			NWRm3ps_02	N/A	Net Diversion Water Requirement in m3/s: February
			NWRm3ps_03	N/A	Net Diversion Water Requirement in m3/s: March
			NWRm3ps_04	N/A	Net Diversion Water Requirement in m3/s: April
			NWRm3ps_05	N/A	Net Diversion Water Requirement in m3/s: May
			NWRm3ps_06	N/A	Net Diversion Water Requirement in m3/s: June
			NWRm3ps_07	N/A	Net Diversion Water Requirement in m3/s: July
			NWRm3ps_08	N/A	Net Diversion Water Requirement in m3/s: August
			NWRm3ps_09	N/A	Net Diversion Water Requirement in m3/s: September
			NWRm3ps_10	N/A	Net Diversion Water Requirement in m3/s: October
	NWRm3ps_11	N/A	Net Diversion Water Requirement in m3/s: November		
	NWRm3ps_12	N/A	Net Diversion Water Requirement in m3/s: December		
	Hy_GWAval	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Province	Text	Name of province
			PSGC	Text	Philippine Standard Geographic Code
			Area	Text	Area classification
	Hy_GWAval	Shape	ArSqKm	Double	Area in sq km
			Category	Text	Groundwater Availability category where A - High Productivity B - Medium Productivity C - Limited Productivity S - Limited by Salt Water Encroachment
			PSGC	N/A	Philippine Standard Geographic Code
			CityMun	N/A	Name of city/municipality
			Province	N/A	Name of province
			P_Annual	N/A	Annual Total Precipitation in mm/year
			PET_Annual	N/A	Annual Total PET in mm/year
			R_H_Annual	N/A	Annual Total Recharge (High) in mm/year
			R_L_Annual	N/A	Annual Total Recharge (Low) in mm/year
			Sub1ArSqKm	N/A	Sub-Area 1 in sq km
			Sub2ArSqKm	N/A	Sub-Area 2 in sq km
			Sub3ArSqKm	N/A	Sub-Area 3 in sq km
			SWE_ArSqKm	N/A	Saltwater Encroached Area in sq km
			Rat_RA_Aq	N/A	Ratio of Restricted Area by Aquifer Condition
			Rat_RA_SW	N/A	Ratio of Restricted Area by Saltwater Intrusion
	Hy_LakeMain	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of lake
			CP_ID	N/A	Control Point ID
			MSFR_m3ps	N/A	Minimum Stream Flow Requirement in cu.m/s
			CP_ID	N/A	Control Point ID
			QNat_m3ps	N/A	Quasi-Natural in cu.m/s
			DxTB_m3ps	N/A	With Existing Storage Dams, Without Trans-Basin, in cu.m/s
			DTB_m3ps	N/A	With Existing Storage Dams, With Trans-Basin, in cu.m/s
			EPD_m3ps	N/A	With Existing and Proposed Storage Dams, in cu.m/s
			CP_ID	N/A	Control Point ID
			AAD2_m3ps	N/A	Probable Annual Ave. Discharge for 2-year return period, in cu.m/s
			AAD5_m3ps	N/A	Probable Annual Ave. Discharge for 5-year return period, in cu.m/s
			AAD10_m3ps	N/A	Probable Annual Ave. Discharge for 10-year return period, in cu.m/s
			MMD2_m3ps	N/A	Probable Minimum Monthly Discharge for 2-year return period, in cu.m/s
	MMD5_m3ps	N/A	Probable Minimum Monthly Discharge for 5-year return period, in cu.m/s		
	MMD10_m3ps	N/A	Probable Minimum Monthly Discharge for 10-year return period, in cu.m/s		
	DepFl_m3ps	N/A	Dependable Flow in cu.m/s		
	Hy_SurfWatResPot_Dam	XLS	Code	N/A	Catchment code assigned by the JICA Study Team
			P_ArSqKm	N/A	Present Net Fishpond Area in sq km
			F_ArSqKm	N/A	Future Net Fishpond Area in sq km
			Perc_FrWat	N/A	Percentage of Freshwater Fishpond (%)
			P_T_m3ps	N/A	Present Total Water Demand in cu.m/s
			P_T_MCMpY	N/A	Present Total Water Demand in MCM/year
			P_FW_m3ps	N/A	Present Fresh Water Water Demand in cu.m/s
			P_FW_MCMpY	N/A	Present Fresh Water Water Demand in MCM/year
			F_T_m3ps	N/A	Future Total Water Demand in cu.m/s
			F_T_MCMpY	N/A	Future Total Water Demand in MCM/year
			F_FW_m3ps	N/A	Future Fresh Water Water Demand in cu.m/s
			F_FW_MCMpY	N/A	Future Fresh Water Water Demand in MCM/year
			PSGC	N/A	Philippine Standard Geographic Code
			Province	N/A	Name of province
			CityMun	N/A	Name of city/municipality
	UOm3ps	N/A	Water Use Permit: Others, in cu.m/s		
	UNIAm3ps	N/A	Water Use Permit: N/A, in cu.m/s		
	DO08m3ps	N/A	Demand: Others, in cu.m/s		
	DNIA08m3ps	N/A	Demand: N/A, in cu.m/s		
	ArHa_25	N/A	New Area in Ha, 2025		
	DAr25_m3ps	N/A	Demand in New Area (2025), in cu.m/s		
	D_08_m3ps	N/A	2008 Demand, in cu.m/s		
	D_08_MCMpY	N/A	2008 Demand, in MCM/year		
	D_25_m3ps	N/A	2025 Demand, in cu.m/s		
	D_25_MCMpY	N/A	2025 Demand, in MCM/year		
	Hy_WaterDemandFish	XLS	Code	N/A	Catchment code assigned by the JICA Study Team
			WD08_m3ps	N/A	Industrial water demand in cu.m/s, 2008
			WD08_MCMpY	N/A	Industrial water demand in MCM/year 2008
			WD25_m3ps	N/A	Industrial water demand in cu.m/s, 2025
			WD25_MCMpY	N/A	Industrial water demand in MCM/year 2025
			PSGC	N/A	Philippine Standard Geographic Code
			CityMun	N/A	Name of city/municipality
			Province	N/A	Name of province
			R_Com_Cat	N/A	Ratio of Commercial Farm and Cattle/Carabao
			R_Com_Oth	N/A	Ratio of Commercial Farm and Other Livestock
			R_Com_Poul	N/A	Ratio of Commercial Farm and Poultry
			H_Cat_08	N/A	Cattle / Carabao in 2008 (Head)
			H_Oth_08	N/A	Other Livestock in 2008 (Head)
			H_Poul_08	N/A	Poultry in 2008 (Head)
			H_Cat_25	N/A	Cattle / Carabao in 2025 (Head)
	H_Oth_25	N/A	Other Livestock in 2025 (Head)		
	H_Poul_25	N/A	Poultry in 2025 (Head)		
	WD08_m3ps	N/A	Water Demand in cu.m/s (2008)		
	WD08_MCMpY	N/A	Water demand in MCM/year (2008)		
	WD25_m3ps	N/A	Water Demand in cu.m/s (2025)		
	WD25_MCMpY	N/A	Water demand in MCM/year (2025)		
	Hy_WaterDemandIrrig_SW	XLS	PSGC	N/A	Philippine Standard Geographic Code
CityMun			N/A	Name of city/municipality	
Province			N/A	Name of province	
R_Com_Cat			N/A	Ratio of Commercial Farm and Cattle/Carabao	
R_Com_Oth			N/A	Ratio of Commercial Farm and Other Livestock	
R_Com_Poul			N/A	Ratio of Commercial Farm and Poultry	
H_Cat_08			N/A	Cattle / Carabao in 2008 (Head)	
H_Oth_08			N/A	Other Livestock in 2008 (Head)	
H_Poul_08			N/A	Poultry in 2008 (Head)	
H_Cat_25			N/A	Cattle / Carabao in 2025 (Head)	
H_Oth_25			N/A	Other Livestock in 2025 (Head)	
H_Poul_25			N/A	Poultry in 2025 (Head)	
WD08_m3ps			N/A	Water Demand in cu.m/s (2008)	
WD08_MCMpY			N/A	Water demand in MCM/year (2008)	
WD25_m3ps			N/A	Water Demand in cu.m/s (2025)	
WD25_MCMpY	N/A	Water demand in MCM/year (2025)			
Hy_WaterDemandLiv	XLS	PSGC	N/A	Philippine Standard Geographic Code	
		CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		R_Com_Cat	N/A	Ratio of Commercial Farm and Cattle/Carabao	
		R_Com_Oth	N/A	Ratio of Commercial Farm and Other Livestock	
		R_Com_Poul	N/A	Ratio of Commercial Farm and Poultry	
		H_Cat_08	N/A	Cattle / Carabao in 2008 (Head)	
		H_Oth_08	N/A	Other Livestock in 2008 (Head)	
		H_Poul_08	N/A	Poultry in 2008 (Head)	
		H_Cat_25	N/A	Cattle / Carabao in 2025 (Head)	
		H_Oth_25	N/A	Other Livestock in 2025 (Head)	
		H_Poul_25	N/A	Poultry in 2025 (Head)	
		WD08_m3ps	N/A	Water Demand in cu.m/s (2008)	
		WD08_MCMpY	N/A	Water demand in MCM/year (2008)	
		WD25_m3ps	N/A	Water Demand in cu.m/s (2025)	
WD25_MCMpY	N/A	Water demand in MCM/year (2025)			



## Annex-T M.1.4.3 (6/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description	
Hydrology	Hy_NIP	Shape	FID	Object ID	Object ID	
			Shape	Polygon	Geometry	
			Name	Text	Name of NIP	
	Hy_NIS	Shape	FID	Object ID	Object ID	
			Shape	Polygon	Geometry	
			Name	Text	Name of NIS	
			Status	Text	Status	
			Class_08	Short Integer	NIS classification in 2008 where 0 - No Information 1 - Safe 2 - Conditionally Safe 3 - At Risk of Shortage	
	Hy_PIA	Shape	Class_25	Short Integer	NIS classification in 2025 where 0 - No Information 1 - Safe 2 - Conditionally Safe 3 - At Risk of Shortage	
			FID	Polygon	Object ID	
	Hy_ReservoirMain	Shape	Shape	Geometry	Geometry	
			FID	Object ID	Object ID	
			Name	Text	Name of reservoir	
	Hy_RiversMain	Shape	AzSqKm	Double	Area in sq km	
			FID	Object ID	Object ID	
			Shape	Line	Geometry	
			Name	Text	Name of river	
			Code_NWRB	Text	River code assigned by NWRB	
			Name_NWRB	Text	River name assigned by NWRB	
			Code	Text	River code assigned by the JICA Study Team	
			Label	Short Integer	Labelling Priority: 0 - Not Important 1 - Important	
			WaterUsage	Text	Water Usage	
			Category	Short Integer	Sub-classification as Main River: 0 - Minor 1 - Major	
	Hy_RiversMain_GuguCrSupData	Shape	FID	Object ID	Object ID	
			Shape	Line	Geometry	
	Hy_SurfWater	Shape	FID	Object ID	Object ID	
			Shape	Polygon	Geometry	
			Name	Text	Name of Proposed Dam	
			NorOpLevM	Double	Normal operation Level in meters	
	Hy_SRIP	Shape	ArSqKm	Double	Area in sq km	
			FID	Object ID	Object ID	
	Hy_SWIP	Shape	Shape	Point	Geometry	
			Name	Text	Name of SRIP	
			FID	Object ID	Object ID	
			Shape	Point	Geometry	
			Name	Text	Name of SWIP	
			Status	Text	Status	
			WS_Ar	Double	Watershed area [no information from source regarding the unit]	
			Pond_Ar	Double	Pond area [no information from source regarding the unit]	
			Dam_HTM	Double	Dam height in meters	
			Dam_Len	Double	Dam length [no information from source regarding the unit]	
			Svc_Ar_W	Long Integer	Service Area (Wet Season) [no information from source regarding the unit]	
			Svc_Ar_D	Long Integer	Service Area (Dry Season) [no information from source regarding the unit]	
			Benef	Long Integer	Number of beneficiaries	
	Hy_WaterBodies_Line	Shape	Type	Text	Type of SWIP where: DD - Diversion Dam FR - Farm Reservoir SWIP - Small Water Impounding Project WIP - Water Impounding Project	
ID			Text	Unique ID		
Hy_WaterBodies_Polygon	Shape	FID	Object ID	Object ID		
		Shape	Line	Geometry		
		Name	Text	Name of Water Body (unverified)		
Hy_WaterPermit_CityMun_GW	XLS	FID	Object ID	Object ID		
		Shape	Polygon	Geometry		
		Name	Text	Name of Water Body (unverified)		
		PSGC	N/A	Philippine Standard Geographic Code		
		CityMun	N/A	Name of city/municipality		
		Province	N/A	Name of province		
		DM_m3ps	N/A	Domestic / Municipal, in cu.m/s		
		MWSS_m3ps	N/A	MWSS, in cu.m/s		
		Irrig_m3ps	N/A	Irrigation, in cu.m/s		
		NIA_m3ps	N/A	NIA, in cu.m/s		
		PG_m3ps	N/A	Power Generation, in cu.m/s		
		Fish_m3ps	N/A	Fisheries, in cu.m/s		
		LS_m3ps	N/A	Livestock, in cu.m/s		
		Ind_m3ps	N/A	Industrial, in cu.m/s		
		Rec_m3ps	N/A	Recreation, in cu.m/s		
		Oth_m3ps	N/A	Other Purpose, in cu.m/s		
		Total_m3ps	N/A	Total, in cu.m/s		
Hy_WaterPermit_CityMun_SW	XLS	PSGC	N/A	Philippine Standard Geographic Code		
		CityMun	N/A	Name of city/municipality		
		Province	N/A	Name of province		
		DM_m3ps	N/A	Domestic / Municipal, in cu.m/s		
		MWSS_m3ps	N/A	MWSS, in cu.m/s		
		Irrig_m3ps	N/A	Irrigation, in cu.m/s		
		NIA_m3ps	N/A	NIA, in cu.m/s		
		PG_m3ps	N/A	Power Generation, in cu.m/s		
		Fish_m3ps	N/A	Fisheries, in cu.m/s		
		LS_m3ps	N/A	Livestock, in cu.m/s		
		Ind_m3ps	N/A	Industrial, in cu.m/s		
		Rec_m3ps	N/A	Recreation, in cu.m/s		
		Oth_m3ps	N/A	Other Purpose, in cu.m/s		
		T_xPG_m3ps	N/A	Total Excluding Power Generation, in cu.m/s		
		Total_m3ps	N/A	Total, in cu.m/s		
		Hy_WaterPermit_SB_GW	XLS	Code	N/A	Catchment code assigned by the JICA Study Team
				DM_m3ps	N/A	Domestic / Municipal, in cu.m/s
MWSS_m3ps	N/A			MWSS, in cu.m/s		
Irrig_m3ps	N/A			Irrigation, in cu.m/s		
NIA_m3ps	N/A			NIA, in cu.m/s		
PG_m3ps	N/A			Power Generation, in cu.m/s		
Fish_m3ps	N/A			Fisheries, in cu.m/s		
LS_m3ps	N/A			Livestock, in cu.m/s		
Ind_m3ps	N/A			Industrial, in cu.m/s		
Rec_m3ps	N/A			Recreation, in cu.m/s		
Oth_m3ps	N/A			Other Purpose, in cu.m/s		
T_xPG_m3ps	N/A			Total Excluding Power Generation, in cu.m/s		
Total_m3ps	N/A			Total, in cu.m/s		

## Annex-T M.1.4.3 (7/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description		
Hydrology	Hy_WaterPermit_SB_SW	XLS	Code	N/A	Catchment code assigned by the JICA Study Team		
			DM_m3ps	N/A	Domestic / Municipal, in cu.m/s		
			MWSS_m3ps	N/A	MWSS, in cu.m/s		
			Irrig_m3ps	N/A	Irrigation, in cu.m/s		
			NIA_m3ps	N/A	NIA, in cu.m/s		
			PG_m3ps	N/A	Power Generation, in cu.m/s		
			Fish_m3ps	N/A	Fisheries, in cu.m/s		
			Ls_m3ps	N/A	Livestock, in cu.m/s		
			Ind_m3ps	N/A	Industrial, in cu.m/s		
			Rec_m3ps	N/A	Recreation, in cu.m/s		
			Oth_m3ps	N/A	Other Purpose, in cu.m/s		
			T_xPG_m3ps	N/A	Total Excluding Power Generation, in cu.m/s		
			Total_m3ps	N/A	Total, in cu.m/s		
	Hy_WatershedHMS	Shape	FID	Object ID	Object ID		
			Shape	Polygon	Geometry		
			HMS_ID	Short Integer	ID		
			ArSqKm	Double	Area in sq km		
			Remarks	Text	Remarks		
	Hy_WaterSupplyCov	XLS	PSGC	N/A	Philippine Standard Geographic Code		
			Province	N/A	Name of province		
			CityMun	N/A	Name of city/municipality		
			U_L3_08	N/A	Urban water ratio for Level 3, 2008		
			U_L2_08	N/A	Urban water ratio for Levels 2 and 1, 2008		
			U_Uns_08	N/A	Urban unsafe water ratio, 2008		
			U_Safe_08	N/A	Urban safe water ratio, 2008		
			R_L3_08	N/A	Rural water ratio for Level 3, 2008		
			R_L2_08	N/A	Rural water ratio for Level 2, 2008		
			R_L1_08	N/A	Rural water ratio for Level 1, 2008		
			R_Uns_08	N/A	Rural unsafe water ratio, 2008		
			R_Safe_08	N/A	Rural safe water ratio, 2008		
			Tot_L3_08	N/A	Total water ratio for Level 3, 2008		
			Tot_L2_08	N/A	Total water ratio for Level 2, 2008		
			Tot_L1_08	N/A	Total water ratio for Level 1, 2008		
			Tot_Uns_08	N/A	Total unsafe water ratio, 2008		
			Tot_Safe_08	N/A	Total safe water ratio, 2008		
	Hy_WaterUsageCondGW	XLS	PSGC	N/A	Philippine Standard Geographic Code		
			CityMun	N/A	Name of city/municipality		
			Province	N/A	Name of province		
			GWP_H	N/A	Groundwater Potential (High) in MCM/year		
			GWP_L	N/A	Groundwater Potential (Low) in MCM/year		
			SWE_H	N/A	Part of groundwater resources potential which may be affected by possible saltwater intrusion (High) in MCM/year		
			SWE_L	N/A	Part of groundwater resources potential which may be affected by possible saltwater intrusion (Low) in MCM/year		
			Dem_Oth_08	N/A	Demand for other uses (2008) in MCM/year		
			GWH_I23_08	N/A	GWP_H for Level 2 & 3 and Industrial use (2008) in MCM/year		
			GWL_I23_08	N/A	GWP_L for Level 2 & 3 and Industrial use (2008) in MCM/year		
			Dem_I23_08	N/A	Demand for Level 2 & 3 and Industrial use (2008) in MCM/year		
			Def_08	N/A	Deficit (2008) in MCM/year		
			Dem_Oth_25	N/A	Demand for other uses (2025) in MCM/year		
			GWH_I23_25	N/A	GWP_H for Level 2 & 3 and Industrial use (2025) in MCM/year		
			GWL_I23_25	N/A	GWP_L for Level 2 & 3 and Industrial use (2025) in MCM/year		
			Dem_I23_25	N/A	Demand for Level 2 & 3 and Industrial use (2025) in MCM/year		
			Def_25	N/A	Deficit (2025) in MCM/year		
	Eval_08	N/A	Evaluation in 2008 where: R: At Risk HR: At High Risk				
	Eval_25	N/A	Evaluation in 2025 where: R: At Risk HR: At High Risk				
	Land Condition	L_LaharDeposit	Shape	FID	Object ID	Object ID	
				Shape	Polygon	Geometry	
		L_LandClassification	Shape	FID	Object ID	Object ID	
				Shape	Polygon	Geometry	
				Class	Text	Original Land Classification	
				Reclass	Text	Land Classification with modifications by the JICA Study Team	
		L_LandCover_DENR	Shape	ArSqKm	Double	Area in sq km	
				FID	Object ID	Object ID	
				Shape	Polygon	Geometry	
				Class	Text	Original Land Cover	
		L_LandCover_JST	Shape	Reclass	Text	Land Cover as reclassified by the JICA Study Team	
				Reclass2	Text	Land Cover as reclassified (slightly more detailed) by the JICA Study Team	
				ArSqKm	Double	Area in sq km	
				FID	Object ID	Object ID	
		L_LandCover_NAMRIA,JICA	Shape	Shape	Polygon	Geometry	
				Class	Text	Original Land Cover	
				Reclass	Text	Land Cover as reclassified by the JICA Study Team	
				Reclass2	Text	Land Cover as reclassified (slightly more detailed) by the JICA Study Team	
		L_LandSub	Shape	ArSqKm	Double	Area in sq km	
				FID	Object ID	Object ID	
		L_SAFDZ	Shape	Shape	Line	Geometry	
				SubsCmPYr	Double	Land Subsidence in cm/yr	
				FID	Object ID	Object ID	
				Shape	Polygon	Geometry	
		Natural Condition	N_Climate	Shape	Descrip	Text	Description
					SAFDZ	Short Integer	Classified as an SAFDZ Area? 0 - No 1 - Yes
					ArSqKm	Double	Area in sq km
			N_Contours_50K	Shape	FID	Object ID	Object ID
	Shape				Polygon	Geometry	
	Elevation				Line	Elevation in meters	
	N_Contours_50K_PrePinatubo		Shape	FID	Object ID	Object ID	
				Shape	Line	Geometry	
	N_Contours_CandabaRBDike		Shape	Elevation	Line	Elevation in meters	
				FID	Object ID	Object ID	
	N_Elevation		Shape	Shape	Line	Geometry	
				FID	Object ID	Object ID	
		Shape		Polygon	Geometry		
		Range		Text	Range ID		
	N_Elevation_CandabaRBDike	Shape	Range2	Text	Actual Elevation in meters ranges		
			ArSqKm	Double	Area in sq km		
			FID	Object ID	Object ID		
			Shape	Polygon	Geometry		
				Range	Text	Elevation in meters range	
				ArSqKm	Double	Area in sq km	

### Annex-T M.1.4.3 (8/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Natural Condition	N_Geology1	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Descrip	Text	Description
			Code	Text	Original Code
			Code2	Text	Code by the JICA Study Team
	N_Geology2	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Descrip	Text	Description
			Code	Text	Original Code
			ArSqKm	Double	Area in sq km
	N_Hydrogeology	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Class	Text	Hydrogeology classification
	N_Mangrove	Shape	ArSqKm	Double	Area in sq km
			FID	Object ID	Object ID
			Shape	Point	Geometry
			Brgy_Off	Text	Official data from PAWCZMS-DENR-Region 3 indicating barangay where mangrove is located
			CityMun_Off	Text	Official data from PAWCZMS-DENR-Region 3 indicating city/municipality where mangrove is located
	N_MountainsHills	Shape	Prov_Off	Text	Official data from PAWCZMS-DENR-Region 3 indicating province where mangrove is located
			ArHa_Off	Double	Official data from PAWCZMS-DENR-Region 3 indicating area in hectares
			FID	Object ID	Object ID
			Shape	Point	Geometry
			Name	Text	Name of Mountain/Hill
	N_PAnnual_Contour	Shape	Class	Text	Classification
			FID	Object ID	Object ID
			Shape	Line	Geometry
	N_PDry_Contour	Shape	Contour	Double	Annual precipitation contour
			FID	Object ID	Object ID
			Shape	Line	Geometry
	N_PETAnnual_Contour	Shape	Contour	Double	Dry season precipitation contour
			FID	Object ID	Object ID
			Shape	Line	Geometry
	N_PWet_Contour	Shape	Contour	Double	Annual PET contour
			FID	Object ID	Object ID
			Shape	Line	Geometry
	N_SlopePercent	Shape	Contour	Double	Wet season precipitation contour
			FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Range	Text	Slope range
			ArSqKm	Double	Area in sq km
	N_Soil	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Class	Text	Soil classification
			Reclass	Text	Soil as reclassified by the JICA Study Team
			ArSqKm	Double	Area in sq km
	N_SpotHt	Shape	FID	Object ID	Object ID
Shape			Point	Geometry	
Elevation			Line	Elevation in meters	
N_SpotHt_PrePinatubo	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
		Elevation	Line	Elevation in meters	
N_TAnnual_Contour	Shape	FID	Object ID	Object ID	
		Shape	Line	Geometry	
		Contour	Double	Annual temperature contour	
N_WaterSurfElev	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
		Elevation	Line	Elevation in meters	
N_WorldClim_Point	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
		POINTID	Long Integer	ID	
N_WorldClim_Polygon	Shape	FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
		POINTID	Long Integer	ID	
N_WcElev	DBF	POINTID	N/A	ID	
		ELEVATION	N/A	Elevation in meters	
		POINTID	N/A	ID	
N_WcPET	DBF	PET_01	N/A	PET: January	
		PET_02	N/A	PET: February	
		PET_03	N/A	PET: March	
		PET_04	N/A	PET: April	
		PET_05	N/A	PET: May	
		PET_06	N/A	PET: June	
		PET_07	N/A	PET: July	
		PET_08	N/A	PET: August	
		PET_09	N/A	PET: September	
		PET_10	N/A	PET: October	
		PET_11	N/A	PET: November	
		PET_12	N/A	PET: December	
		PET annual	N/A	Annual PET	
N_WcPrec	DBF	POINTID	N/A	ID	
		P0_01	N/A	Precipitation at estimated Mean Sea Level: January	
		P0_02	N/A	Precipitation at estimated Mean Sea Level: February	
		P0_03	N/A	Precipitation at estimated Mean Sea Level: March	
		P0_04	N/A	Precipitation at estimated Mean Sea Level: April	
		P0_05	N/A	Precipitation at estimated Mean Sea Level: May	
		P0_06	N/A	Precipitation at estimated Mean Sea Level: June	
		P0_07	N/A	Precipitation at estimated Mean Sea Level: July	
		P0_08	N/A	Precipitation at estimated Mean Sea Level: August	
		P0_09	N/A	Precipitation at estimated Mean Sea Level: September	
		P0_10	N/A	Precipitation at estimated Mean Sea Level: October	
		P0_11	N/A	Precipitation at estimated Mean Sea Level: November	
		P0_12	N/A	Precipitation at estimated Mean Sea Level: December	
		P_01	N/A	Precipitation: January	
		P_02	N/A	Precipitation: February	
		P_03	N/A	Precipitation: March	
		P_04	N/A	Precipitation: April	
		P_05	N/A	Precipitation: May	
		P_06	N/A	Precipitation: June	
		P_07	N/A	Precipitation: July	
		P_08	N/A	Precipitation: August	
		P_09	N/A	Precipitation: September	
		P_10	N/A	Precipitation: October	
		P_11	N/A	Precipitation: November	
		P_12	N/A	Precipitation: December	
		P_ANNUAL	N/A	Annual precipitation	
		P_DRY	N/A	Dry season precipitation	
P_WET	N/A	Wet season precipitation			

## Annex-T M.1.4.3 (9/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Natural Condition	N_WcTemp	DBF	POINTID	N/A	ID
			T_JAN	N/A	Temperature: January
			T_FEB	N/A	Temperature: February
			T_MAR	N/A	Temperature: March
			T_APR	N/A	Temperature: April
			T_MAY	N/A	Temperature: May
			T_JUN	N/A	Temperature: June
			T_JUL	N/A	Temperature: July
			T_AUG	N/A	Temperature: August
			T_SEP	N/A	Temperature: September
			T_OCT	N/A	Temperature: October
			T_NOV	N/A	Temperature: November
			T_DEC	N/A	Temperature: December
T_ANNUAL	N/A	Annual temperature			
Hazard	Ha_ActVolcano	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Name	Text	Name of volcano
			Class	Text	Classification of activity
	Ha_Earthquake	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Date	Date	Date of occurrence
			Lat	Double	Latitude
			Long	Double	Longitude
			Depth	Short Integer	Depth
		UTC_hhmmss	Double	Coordinated Universal Time (UTC) in [hh][mm][ss.ss]	
		Mag	Double	Magnitude	
Ha_Erosion	Shape	FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
		Class	Text	Original Classification	
		Reclass	Text	Reclassification by the JICA Study Team	
Ha_Faultlines_DENR	Shape	FID	Object ID	Object ID	
		Shape	Line	Geometry	
		Class	Text	Classification of fault line where: AP - no information from source data CF - Concealed Fault HF - High Angle Fault NF - Normal Fault	
Ha_Faultlines_JST	Shape	FID	Object ID	Object ID	
		Shape	Line	Geometry	
		Class	Text	Classification of fault line	
Ha_FIFloodExitPt	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
Ha_FloodedAreas_DFO	Shape	FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
		StudyArea	Short Integer	Located inside the Study Area? 0 - No 1 - Yes	
		F_All	Short Integer	Area is frequently flooded? 0 - No 1 - Yes	
		F_Aug04	Short Integer	Area was flooded during August 2004 only? 0 - No 1 - Yes	
		ArSqKm	Double	Area in sq km	
Ha_FloodProneAreas_MGB	Shape	FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
Ha_Cyclone	XLS	PSGC	N/A	Philippine Standard Geographic Code	
		Cyc_Freq	N/A	Frequency of Tropical Cyclone (times/year); Record Year 1948-2000	
		PSGC	N/A	Philippine Standard Geographic Code	
		Province	N/A	Name of province	
		CityMun	N/A	Name of city/municipality	
		R_MI_2008	N/A	Municipal & Industrial Groundwater Balance in 2008, where 0 - no risk 1 - conditional risk 2 - at risk 3 - at high risk	
		R_T_2008	N/A	Total Groundwater Balance in 2008, where 0 - no risk 1 - conditional risk 2 - at risk 3 - at high risk	
Ha_GWBalance	XLS	R_MI_2025	N/A	Municipal & Industrial Groundwater Balance in 2025, where 0 - no risk 1 - conditional risk 2 - at risk 3 - at high risk	
		R_T_2025	N/A	Total Groundwater Balance in 2025, where 0 - no risk 1 - conditional risk 2 - at risk 3 - at high risk	
		R_2008	N/A	Groundwater Balance in 2008, where 0 - no risk 1 - at risk 2 - at high risk	
		R_2025	N/A	Groundwater Balance in 2025, where 0 - no risk 1 - at risk 2 - at high risk	
Ha_PollLoadDom_CatchSB	XLS	Code	N/A	Catchment code assigned by the JICA Study Team	
		ArSqKm	N/A	Area in sq km	
		Pop08	N/A	2008 Population	
		Pop25	N/A	2025 Population	
		PL_Tot08	N/A	Pollution Load: Domestic in kg-BOD/day, 2008	
		PL0_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (without structural measures)	
		PL1_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (with structural measures)	
		PopDen08	N/A	2008 Population Density	
		PopDen25	N/A	2025 Population Density	
		PLD_Tot08	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2008	
		PLD0_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (without structural measures)	
		PLD1_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (with structural measures)	
Ha_PollLoadDom_CatchWB	XLS	Code	N/A	Catchment code assigned by the JICA Study Team	
		ArSqKm	N/A	Area in sq km	
		Pop08	N/A	2008 Population	
		Pop25	N/A	2025 Population	
		PL_Tot08	N/A	Pollution Load: Domestic in kg-BOD/day, 2008	
		PL0_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (without structural measures)	
		PL1_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (with structural measures)	
		PopDen08	N/A	2008 Population Density	
		PopDen25	N/A	2025 Population Density	
		PLD_Tot08	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2008	
		PLD0_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (without structural measures)	
		PLD1_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (with structural measures)	

**Annex-T M.1.4.3 (10/15) Detailed Specifications Shapefile and Table Data**

Category	Layer	Format	Field	Type	Description
Hazard	Ha_PollLoadTot_CatchSB	XLS	Code	N/A	Catchment code assigned by the JICA Study Team
			ArSqKm	N/A	Area in sq km
			Pop08	N/A	2008 Population
			Pop25	N/A	2025 Population
			PL_Tot08	N/A	Pollution Load: Domestic in kg-BOD/day, 2008
			PL0_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (without structural measures)
			PL1_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (with structural measures)
			PopDen08	N/A	2008 Population Density
			PopDen25	N/A	2025 Population Density
			PLD_Tot08	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2008
			PLD0_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (without structural measures)
			PLD1_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (with structural measures)
	Ha_PollLoadTot_CatchWB	XLS	Code	N/A	Catchment code assigned by the JICA Study Team
			ArSqKm	N/A	Area in sq km
			Pop08	N/A	2008 Population
			Pop25	N/A	2025 Population
			PL_Tot08	N/A	Pollution Load: Domestic in kg-BOD/day, 2008
			PL0_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (without structural measures)
			PL1_Tot25	N/A	Pollution Load: Domestic in kg-BOD/day, 2025 (with structural measures)
			PopDen08	N/A	2008 Population Density
			PopDen25	N/A	2025 Population Density
			PLD_Tot08	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2008
			PLD0_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (without structural measures)
			PLD1_Tot25	N/A	Pollution Load Density: Domestic in kg-BOD/day/sqkm, 2025 (with structural measures)
Monitoring	M_DischGaugSta_Prop	Shape	FID	Object ID	Object ID
	M_HMS	Shape	Shape	Point	Geometry
			FID	Object ID	Object ID
			Shape	Point	Geometry
			ID_HMS	Double	HMS ID
			Location	Text	Location
			Or_Lat	Double	Original Latitude
			Or_Long	Double	Original Longitude
			JST_Lat	Double	Latitude adjusted by the JICA Study Team
			JST_Long	Double	Longitude adjusted by the JICA Study Team
			OrDrArSqKm	Text	Original Drainage area in sq km
			JSTDRSqKm	Text	Drainage area in sq km modified by the JICA Study Team
			RiverName	Text	River Name
			Status	Text	Status o - operational a - abandoned
			ModLoc	Short Integer	Location was modified by JICA Study Team? 0 - No 1 - Yes
			Remarks	Text	Remarks
	M_IntakeFlowMeas	Shape	FID	Object ID	Object ID
	M_PumpingStation	Shape	Shape	Point	Geometry
			Status	Text	Status if existing or proposed
			FID	Object ID	Object ID
			WD	Text	Water District
			Source	Text	Source
			Lat	Double	Latitude
			Long	Double	Longitude
	M_RainfallStation	Shape	Remarks	Text	Remarks
			Cl_MgPL	Double	Chloride concentration in mg/l
			FID	Object ID	Object ID
			Shape	Point	Geometry
			No	Text	Rainfall Station ID
			Name	Text	Name of Rainfall Station
			Province	Text	Province
			Type	Text	Type
			Source	Text	Data source where: 1 - NWIN, <a href="http://www.nwin.nwr.gov.ph/">http://www.nwin.nwr.gov.ph/</a> 2 - PAGASA-JICA, Basic Design Study Report on the Project for Upgrading of Flood Forecasting and Warning System in Pampanga and Agno River and Basins in Republic of the Philippines, 2007 3 - NIA, Definitive Development Plan, Irrigation Component of the Casecanan Multipurpose Irrigation and Power Project (CMIPP-IC), Appendix 1, 2000 4 - DPWH-NK, Pinatubo Hazard Urgent Rehabilitation Project, Monitoring and Planning of Flood Control Works on the Pasac Delta (inc. the Porac-Gumain River) and Third River Channel, Final Report, Appendix No. 2, Meteorology and Hydrology, 2002. 5 - JICA-NWRB, The Study on Water Resources Development for Metro Manila in the Republic of the Philippines, Final Report, Vol. III, Master Plan Study, Supporting Report, 2003.
			Pave	Double	Average precipitation
			P0_01	Double	Precipitation at estimated Mean Sea Level: January
			P0_02	Double	Precipitation at estimated Mean Sea Level: February
			P0_03	Double	Precipitation at estimated Mean Sea Level: March
			P0_04	Double	Precipitation at estimated Mean Sea Level: April
			P0_05	Double	Precipitation at estimated Mean Sea Level: May
			P0_06	Double	Precipitation at estimated Mean Sea Level: June
			P0_07	Double	Precipitation at estimated Mean Sea Level: July
			P0_08	Double	Precipitation at estimated Mean Sea Level: August
			P0_09	Double	Precipitation at estimated Mean Sea Level: September
			P0_10	Double	Precipitation at estimated Mean Sea Level: October
			P0_11	Double	Precipitation at estimated Mean Sea Level: November
			P0_12	Double	Precipitation at estimated Mean Sea Level: December
			Or_Lat	Double	Original Latitude
	Or_Long	Double	Original Longitude		
JST_Lat	Double	Latitude adjusted by the JICA Study Team			
JST_Long	Double	Longitude adjusted by the JICA Study Team			
M_Thiessen	Shape	FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
		No	Text	Rainfall Station ID	
		Name	Text	Name of Rainfall Station	
		Pave	Double	Average precipitation	
M_WLRR	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
		Name	Text	Name of Water Level / Rainfall Station	
		Lat	Double	Latitude	
		Long	Double	Longitude	
		Source	Text	Data source where: 2 - PAGASA-JICA, Basic Design Study Report on the Project for Upgrading of Flood Forecasting and Warning System in Pampanga and Agno River and Basins in Republic of the Philippines, 2007 JST - JICA Study Team	
		Obs	Text	Observation	
		Status	Text	Status	
Remarks	Text	Remarks			
M_WQMonStation_Prop	Shape	FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
		ID	Short Integer	Unique ID	
		WaterBody	Text	Related Water-body	
		CityMun	Text	City/municipality where it is located	
DKmSFHall	Double	Straight-line distance to San Fernando City Hall, Pampanga			
DKmSFCent	Double	Straight-line distance to the centroid of City of San Fernando, Pampanga			

## Annex-T M.1.4.3 (11/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Socio-Economic	S_AD_AppCADT	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of CADT
			Code	Text	Code
			Tribe	Text	Tribe
			ArHa_Off	Double	Total Area from NCIP: in hectares
	S_AD_SocPrep	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of Ancestral Domain
			Location	Text	Location
			Tribe	Text	Tribe
			Benef_Fam	Short Integer	No. of Beneficiaries (Families)
	S_AD_SunComp	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of Ancestral Domain
			Location	Text	Location
			Tribe	Text	Tribe
			Benef_Ind	Short Integer	No. of Beneficiaries (Individuals)
	S_AD_SunOnGoing	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			Name	Text	Name of Ancestral Domain
			Location	Text	Location
			Tribe	Text	Tribe
			Benef_Fam	Short Integer	No. of Beneficiaries (Families)
	S_HistCulSite	Shape	Name	Text	Name of site
			Province	N/A	Name of province
	S_IP_Pop_FullCM	XLS	CityMun	N/A	Name of city/municipality
			PSGC	N/A	Philippine Standard Geographic Code
			Comm_Cnt	N/A	Number of communities
			Fam_Cnt	N/A	Number of families
			Tribe	N/A	Tribe
			Pop06	N/A	2006 Population
			Province	N/A	Name of province
			PSGC	N/A	Philippine Standard Geographic Code
	S_IP_PopProf	XLS	Aeta_Fam	N/A	Number of Aeta families
			Aeta_Ind	N/A	Number of Aeta individuals
Abe_Fam			N/A	Number of Abelling families	
Abe_Ind			N/A	Number of Abelling individuals	
DR_Fam			N/A	Number of Dumagat/Remontado families	
DR_Ind			N/A	Number of Dumagat/Remontado individuals	
IKK_Ind			N/A	Number of Ibaloi/Kalanguya/Kankanaey (Cordillera Tribes) families	
IKK_Ind			N/A	Number of Ibaloi/Kalanguya/Kankanaey (Cordillera Tribes) individuals	
IB_Fam			N/A	Number of Ilongot/Bugkalot families	
IB_Ind			N/A	Number of Ilongot/Bugkalot individuals	
Total_Fam			N/A	Total number of families	
FamRat_Per			N/A	Ratio between Provincial Total and Regional Total of families (in percent)	
Total_Ind			N/A	Total number of individuals	
IndRat_Per			N/A	Ratio between Provincial Total and Regional Total of individuals (in percent)	
S_IP_RegProf	XLS	Province	N/A	Name of province	
		PSGC	N/A	Philippine Standard Geographic Code	
		District_Cnt	N/A	Number of districts	
		City_Cnt	N/A	Number of cities	
		Mun_Cnt	N/A	Number of municipalities	
		CityMun_IP	N/A	Number of cities/municipalities with indigeous people	
		Comm_Cnt	N/A	Number of communities	
		Pop06_Fam	N/A	2006 Population (families)	
		Pop06_Indiv	N/A	2006 Population (individuals)	
		S_NatStour	Shape	Name	Text
PSGC	N/A			Philippine Standard Geographic Code	
S_Pop_FullCM	XLS	CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		Pop80	N/A	1980 Population	
		Pop90	N/A	1990 Population	
		Pop95	N/A	1995 Population	
		Pop00	N/A	2000 Population	
		Pop07	N/A	2007 Population	
		PSGC	N/A	Philippine Standard Geographic Code	
S_Pop_SA	XLS	CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		Pop80	N/A	1980 Population	
		Pop90	N/A	1990 Population	
		Pop95	N/A	1995 Population	
		Pop00	N/A	2000 Population	
		Pop07	N/A	2007 Population	
		PSGC	N/A	Philippine Standard Geographic Code	
S_PopDen_FulICM	XLS	CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		PopDen80	N/A	1980 Population Density	
		PopDen90	N/A	1990 Population Density	
		PopDen95	N/A	1995 Population Density	
		PopDen00	N/A	2000 Population Density	
		PopDen07	N/A	2007 Population Density	
		PSGC	N/A	Philippine Standard Geographic Code	
S_PopDen_SA	XLS	CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		PopDen80	N/A	1980 Population Density	
		PopDen90	N/A	1990 Population Density	
		PopDen95	N/A	1995 Population Density	
		PopDen00	N/A	2000 Population Density	
		PopDen07	N/A	2007 Population Density	
		PSGC	N/A	Philippine Standard Geographic Code	
S_PopProj_FulICM	XLS	CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		Pop08	N/A	2008 Population	
		Pop10	N/A	2010 Population	
		Pop15	N/A	2015 Population	
		Pop20	N/A	2020 Population	
		Pop25	N/A	2025 Population	
		PSGC	N/A	Philippine Standard Geographic Code	
S_PopProj_SA	XLS	CityMun	N/A	Name of city/municipality	
		Province	N/A	Name of province	
		Pop08	N/A	2008 Population	
		Pop10	N/A	2010 Population	
		Pop15	N/A	2015 Population	
		Pop20	N/A	2020 Population	
		Pop25	N/A	2025 Population	
		PSGC	N/A	Philippine Standard Geographic Code	





## Annex-T M.1.4.3 (13/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description		
Socio-Economic	S_ServedPopAdd_CityMun_OutSA	XLS	PSGC	N/A	Philippine Standard Geographic Code		
			Province	N/A	Name of province		
			CityMun	N/A	Name of city/municipality		
			A_UL3_0825	N/A	Additional population to be served for Urban Level 3, 2008-2025		
			A_UL2_0825	N/A	Additional population to be served for Urban Level 2, 2008-2025		
			A_UL1_0825	N/A	Additional population to be served for Urban Level 1, 2008-2025		
			A_RL3_0825	N/A	Additional population to be served for Rural Level 3, 2008-2025		
			A_RL2_0825	N/A	Additional population to be served for Rural Level 2, 2008-2025		
			A_RL1_0825	N/A	Additional population to be served for Rural Level 1, 2008-2025		
			A_UL3_0815	N/A	Additional population to be served for Urban Level 3, 2008-2015		
			A_UL2_0815	N/A	Additional population to be served for Urban Level 2, 2008-2015		
			A_UL1_0815	N/A	Additional population to be served for Urban Level 1, 2008-2015		
			A_RL3_0815	N/A	Additional population to be served for Rural Level 3, 2008-2015		
			A_RL2_0815	N/A	Additional population to be served for Rural Level 2, 2008-2015		
			A_RL1_0815	N/A	Additional population to be served for Rural Level 1, 2008-2015		
			A_UL3_1620	N/A	Additional population to be served for Urban Level 3, 2016-2020		
			A_UL2_1620	N/A	Additional population to be served for Urban Level 2, 2016-2020		
			A_UL1_1620	N/A	Additional population to be served for Urban Level 1, 2016-2020		
			A_RL3_1620	N/A	Additional population to be served for Rural Level 3, 2016-2020		
			A_RL2_1620	N/A	Additional population to be served for Rural Level 2, 2016-2020		
			A_RL1_1620	N/A	Additional population to be served for Rural Level 1, 2016-2020		
			A_UL3_2125	N/A	Additional population to be served for Urban Level 3, 2021-2025		
			A_UL2_2125	N/A	Additional population to be served for Urban Level 2, 2021-2025		
			A_UL1_2125	N/A	Additional population to be served for Urban Level 1, 2021-2025		
			A_RL3_2125	N/A	Additional population to be served for Rural Level 3, 2021-2025		
			A_RL2_2125	N/A	Additional population to be served for Rural Level 2, 2021-2025		
			A_RL1_2125	N/A	Additional population to be served for Rural Level 1, 2021-2025		
			S_ServedPopAdd_CityMun_SA	XLS	PSGC	N/A	Philippine Standard Geographic Code
					Province	N/A	Name of province
					CityMun	N/A	Name of city/municipality
	A_UL3_0825	N/A			Additional population to be served for Urban Level 3, 2008-2025		
	A_UL2_0825	N/A			Additional population to be served for Urban Level 2, 2008-2025		
	A_UL1_0825	N/A			Additional population to be served for Urban Level 1, 2008-2025		
	A_RL3_0825	N/A			Additional population to be served for Rural Level 3, 2008-2025		
	A_RL2_0825	N/A			Additional population to be served for Rural Level 2, 2008-2025		
	A_RL1_0825	N/A			Additional population to be served for Rural Level 1, 2008-2025		
	A_UL3_0815	N/A			Additional population to be served for Urban Level 3, 2008-2015		
	A_UL2_0815	N/A			Additional population to be served for Urban Level 2, 2008-2015		
	A_UL1_0815	N/A			Additional population to be served for Urban Level 1, 2008-2015		
	A_RL3_0815	N/A			Additional population to be served for Rural Level 3, 2008-2015		
	A_RL2_0815	N/A			Additional population to be served for Rural Level 2, 2008-2015		
	A_RL1_0815	N/A			Additional population to be served for Rural Level 1, 2008-2015		
	A_UL3_1620	N/A			Additional population to be served for Urban Level 3, 2016-2020		
	A_UL2_1620	N/A			Additional population to be served for Urban Level 2, 2016-2020		
	A_UL1_1620	N/A			Additional population to be served for Urban Level 1, 2016-2020		
	A_RL3_1620	N/A			Additional population to be served for Rural Level 3, 2016-2020		
	A_RL2_1620	N/A			Additional population to be served for Rural Level 2, 2016-2020		
	A_RL1_1620	N/A			Additional population to be served for Rural Level 1, 2016-2020		
	A_UL3_2125	N/A			Additional population to be served for Urban Level 3, 2021-2025		
	A_UL2_2125	N/A			Additional population to be served for Urban Level 2, 2021-2025		
	A_UL1_2125	N/A			Additional population to be served for Urban Level 1, 2021-2025		
	A_RL3_2125	N/A			Additional population to be served for Rural Level 3, 2021-2025		
	A_RL2_2125	N/A			Additional population to be served for Rural Level 2, 2021-2025		
	A_RL1_2125	N/A			Additional population to be served for Rural Level 1, 2021-2025		
	S_ServedPopAdd_Province_SA	XLS			PSGC	N/A	Philippine Standard Geographic Code
					Province	N/A	Name of province
					CityMun	N/A	Name of city/municipality
			A_UL3_0825	N/A	Additional population to be served for Urban Level 3, 2008-2025		
			A_UL2_0825	N/A	Additional population to be served for Urban Level 2, 2008-2025		
			A_UL1_0825	N/A	Additional population to be served for Urban Level 1, 2008-2025		
			A_RL3_0825	N/A	Additional population to be served for Rural Level 3, 2008-2025		
			A_RL2_0825	N/A	Additional population to be served for Rural Level 2, 2008-2025		
			A_RL1_0825	N/A	Additional population to be served for Rural Level 1, 2008-2025		
			A_UL3_0815	N/A	Additional population to be served for Urban Level 3, 2008-2015		
			A_UL2_0815	N/A	Additional population to be served for Urban Level 2, 2008-2015		
			A_UL1_0815	N/A	Additional population to be served for Urban Level 1, 2008-2015		
			A_RL3_0815	N/A	Additional population to be served for Rural Level 3, 2008-2015		
			A_RL2_0815	N/A	Additional population to be served for Rural Level 2, 2008-2015		
			A_RL1_0815	N/A	Additional population to be served for Rural Level 1, 2008-2015		
			A_UL3_1620	N/A	Additional population to be served for Urban Level 3, 2016-2020		
			A_UL2_1620	N/A	Additional population to be served for Urban Level 2, 2016-2020		
			A_UL1_1620	N/A	Additional population to be served for Urban Level 1, 2016-2020		
			A_RL3_1620	N/A	Additional population to be served for Rural Level 3, 2016-2020		
			A_RL2_1620	N/A	Additional population to be served for Rural Level 2, 2016-2020		
			A_RL1_1620	N/A	Additional population to be served for Rural Level 1, 2016-2020		
			A_UL3_2125	N/A	Additional population to be served for Urban Level 3, 2021-2025		
			A_UL2_2125	N/A	Additional population to be served for Urban Level 2, 2021-2025		
			A_UL1_2125	N/A	Additional population to be served for Urban Level 1, 2021-2025		
			A_RL3_2125	N/A	Additional population to be served for Rural Level 3, 2021-2025		
			A_RL2_2125	N/A	Additional population to be served for Rural Level 2, 2021-2025		
			A_RL1_2125	N/A	Additional population to be served for Rural Level 1, 2021-2025		
			S_Poverty	XLS	PovInc	N/A	Poverty Incidence
					PovInc_SE	N/A	Poverty Incidence Standard Error
					CoeffVar	N/A	Coefficient of Variation
	Rank	N/A			Rank, with 1 being the poorest		
	PoorPop	N/A			Magnitude of poor population		
	PoGap	N/A			Poverty Gap		
	PoGap_SE	N/A			Poverty Gap Standard Error		
	PoSev	N/A			Severity of Poverty		
	PoSev_SE	N/A			Severity of Poverty Standard Error		
	S_ProtAr_Init	Shape			FID	Object ID	Object ID
			Shape	Polygon	Geometry		
			Name	Text	Name of Protected Area		
			Location	Text	Location		
			Leg	Text	Legislation		
			Date	Date	Date		
			ArHa_Off	Double	Area from PAWB; in hectares		
			Category	Text	Category		
			Proclaimed	Short Integer	Proclaimed as Protected Area? 0 - No 1 - Yes		
			Region	Text	Region		
S_ProtAr_Proc	Shape	FID	Object ID	Object ID			
		Shape	Polygon	Geometry			
		Name	Text	Name of Protected Area			
		Location	Text	Location			
		Leg	Text	Legislation			
		Date	Date	Date			
		ArHa_Off	Double	Area from PAWB; in hectares			
		Category	Text	Category			
		Region	Text	Region			
		S_SanitaryToiletCov	XLS	PSGC	N/A	Philippine Standard Geographic Code	
Province	N/A			Name of city/municipality			
CityMun	N/A			Name of province			
ToilCovRa	N/A			Sanitary toilet coverage ratio			

### Annex-T M.1.4.3 (14/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Others	O_701Index	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			MapNumber	Text	Map Number
	O_AnnualIrrigationPrograms	Shape	MapName	Text	Map Name
			FID	Object ID	Object ID
			Shape	Point	Geometry
			Program	Text	Name of program
			Province	Text	Name of province
			District	Text	Name of district
	O_DischargePermittees	Shape	CityMun	Text	Name of city/municipality
			Barangay	Text	Name of barangay
			FID	Object ID	Object ID
			Shape	Point	Geometry
			ID	Text	Dishcharge Permittee ID
			Name	Text	Name of Permittee
			Address	Text	Address
			Class	Text	Project classification
			RefNo	Text	Reference No.
			DateRec	Date	Date Received
			DateApp	Date	Date Applied
	DateIss	Date	Date Issued		
	DateExp	Date	Date of Expiry		
	Geocode	Text	Geocode (Barangay), for location estimation		
	StudyArea	Short Integer	Located inside the Study Area? 0 - No 1 - Yes		
	O_Industry	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Class	Text	Industry classification
			Name	Text	Name of Industry
			Or_Lat	Double	Original Latitude
			Or_Long	Double	Original Longitude
			JST_Lat	Double	Latitude adjusted by the JICA Study Team
			JST_Long	Double	Longitude adjusted by the JICA Study Team
	Remarks	Text	Remarks		
	O_JicaNamriaPilotArea	Shape	FID	Object ID	Object ID
			Shape	Polygon	Geometry
			MapNumber	Text	Map Number
			MapName	Text	Map Name
	O_MinesQuarries	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Commodity	Text	Mineral Commodity
			Name	Text	Name of Company/Permittee/Operator
			Location	Text	Location of mining claims
			Address	Text	Mailing Address
			TelNo	Text	Telephone No.
			FaxNo	Text	Fax No.
			Website	Text	Website
			Email	Text	Email Address
Official			Text	Managing Official (Position/Designation)	
PermContNo			Text	Permit/Contract No.	
ArHa			Double	Area in sq km	
VolCuM			Double	Allowed volume in cu m	
VolMt			Double	Allowed volume in mt	
VolNoU			Double	Allowed volume (no units)	
PermDurFr			Date	Permit Duration (From)	
PerDurTo	Date	Permit Duration (To)			
Status	Text	Status			
PSSG	Text	Philippine Standard Geographic Code (Barangay), for location estimation			
O_NAMRIATopoLabel	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
		MapNumber	Text	Map Number	
		MapName	Text	Map Name	
O_NorthArrow	Shape	Shape	FID	Object ID	Object ID
O_Projects	Shape	Shape	Polygon	Geometry	
		FID	Object ID	Object ID	
		Shape	Polygon	Geometry	
		ProjCode	Text	Project Code	
		ProjGrp	Text	Project Group	
		Sector	Text	Sector	
		SerialNo	Double	Serial Number	
		ProjName	Text	Project Name	
		Agency	Text	Implementing Agency	
		ICostPHP	Double	Initial Cost in PHP	
OMCostPHP	Double	Operation & Maintenance Cost in PHP			
Remarks	Text	Remarks			
O_TenurialInst	Shape	FID	Object ID	Object ID	
		Shape	Point	Geometry	
		Ten_JST	Text	Tenurial Instruments as reclassified by the JICA Study Team from orinal tree plantations data	
		Class	Text	Classification, where Govt - Government Program Pvt - Private Forest Plantations Others	
		ProjName	Text	Project Name	
ArSqKm	Double	Area • Except for Protected Areas (Initial), where official areas were used if available, areas were calculated using GIS			

### Annex-T M.1.4.3 (15/15) Detailed Specifications Shapefile and Table Data

Category	Layer	Format	Field	Type	Description
Others	O_WaterRights	Shape	FID	Object ID	Object ID
			Shape	Point	Geometry
			Province	Text	Name of province
			CityMun	Text	Name of city/municipality
			L_ID	Double	Location ID, where 0 - Coordinates are available 1 - Coordinates are corrected by the JICA Study Team 2 - Estimated by barangay 3 - Estimated by city/municipality 4 - excluded
			Permit	Text	Permit No.
			Grantee	Text	Grantee
			Location	Text	Location
			Source	Text	Source
			Type	Text	Type of water right
			Or_Lat	Text	Original Latitude in DMS
			Or_Long	Text	Original Longitude in DMS
			JST_Lat	Text	Latitude adjusted by the JICA Study Team in DMS
			JST_Long	Text	Longitude adjusted by the JICA Study Team in DMS
			JST_Lat2	Double	Latitude adjusted by the JICA Study Team in decimal degrees
			JST_Long2	Double	Longitude adjusted by the JICA Study Team in decimal degrees
			Charges	Double	Charges
			Granted	Double	Permitted volume
			Purpose	Text	Water right purpose
			Date_App	Date	Date Applied
			PSGC_P	Text	Provincial Philippine Standard Geographic Code
			PSGC_M	Text	City/Municipal Philippine Standard Geographic Code
			PSGC_B	Text	Barangay Philippine Standard Geographic Code
			Code_WB	Text	Corresponding Water Balance Catchment Code
			Code_SB	Text	Corresponding Sub-Basin Catchment
			Status	Short Integer	Status of water rights where: 0 - operational 1 - abandoned as of 2007 2 - abandoned as of 2009
			Class	Text	Water right classification
			Reclass	Text	Water right reclassification

### Annex-T M.1.4.4 List of Spatial Data: Rasters

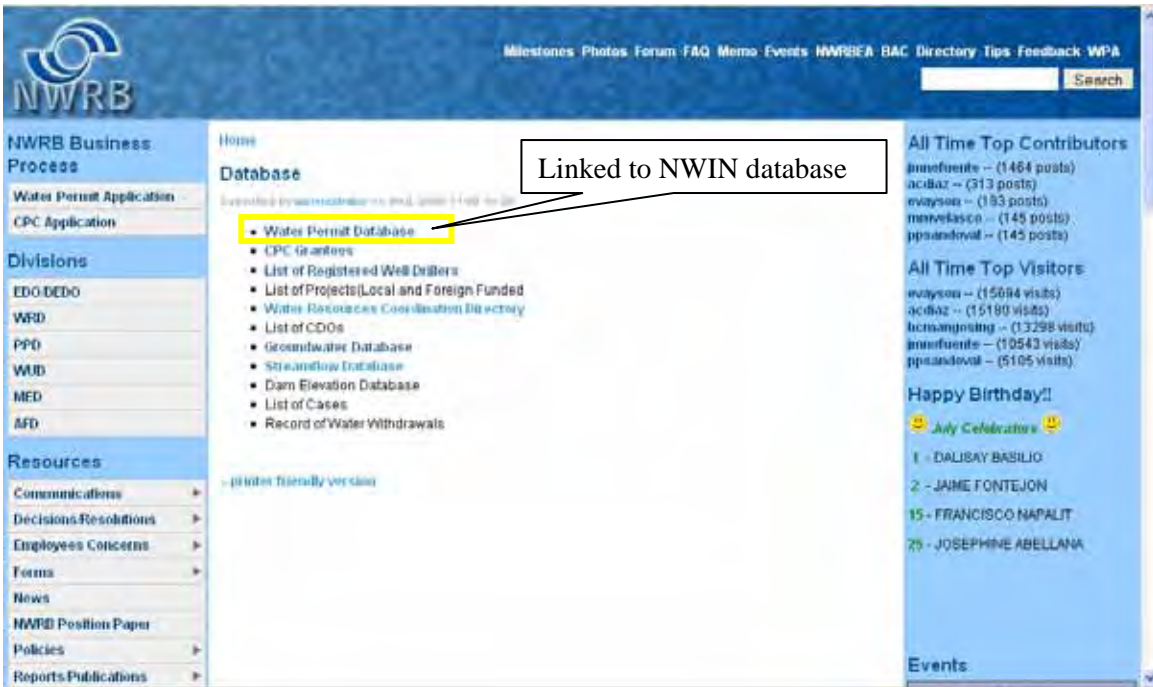
Category	Layer	Description	Data Classification	Format	Sources	Year	Coverage	Remarks
DEM	TIN	TIN	General	TIN	JICA Study Team	2009	Region III	• Based on N. Contours_50k, N_SpotHt
	DEM_100	DEM, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Region III	
	DEM_100_studyarea	DEM, 100 m cell size, clipped to Study Area	General	GeoTIFF	JICA Study Team	2009	Study Area	
	DEM_postpinatubo_100	DEM, 100 m cell size, clipped to Mt. Pinatubo and vicinity	General	GeoTIFF	JICA Study Team	2009	Mt. Pinatubo and vicinity	
	DEM_prepinatubo_100	DEM prior to Mt. Pinatubo eruption, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Mt. Pinatubo and vicinity	
	Diff_postprepinatubo	Raster calculation between post and pre Mt. Pinatubo eruption	General	GeoTIFF	JICA Study Team	2009	Mt. Pinatubo and vicinity	• DEM_postpinatubo_100 - DEM_prepinatubo_100
	Hillshade_100	Hillshade, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Region III	
	Hillshade_50	Hillshade, 50 m cell size	General	GeoTIFF	JICA Study Team	2009	Study Area	
	TIN_prepinatubo	TIN prior to Mt. Pinatubo eruption	General	GeoTIFF	JICA Study Team	2009	Mt. Pinatubo and vicinity	• Based on N. Contours_50k, PrePinatubo and N_SpotHt, PrePinatubo
	SRTM4	SRTM4	General	GeoTIFF	CGIAR-CSI	2009	Partial areas of Luzon and Visayas	• Downloaded from http://srtm.csi.cgiar.org
	SRTM4_Hillshade_90	SRTM4 hillshade, 90 m cell size	General	GeoTIFF	JICA Study Team	2009	Partial areas of Luzon and Visayas	• Based on SRTM4
	Slope	Slopedegree_100	Slope in degree unit, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Region III
Slopedegree_100_studyarea		Slope in degree unit clipped to Study Area, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Study Area	
Slopepercent_100		Slope in percent unit, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Region III	
Slopepercent_100_studyarea		Slope in percent unit clipped to Study Area, 100 m cell size	General	GeoTIFF	JICA Study Team	2009	Study Area	
WorldClim	Alt	WorldClim Altitude	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean01	WorldClim Temperature (Jan)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean02	WorldClim Temperature (Feb)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean03	WorldClim Temperature (Mar)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean04	WorldClim Temperature (Apr)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean05	WorldClim Temperature (May)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean06	WorldClim Temperature (Jun)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean07	WorldClim Temperature (Jul)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean08	WorldClim Temperature (Aug)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean09	WorldClim Temperature (Sep)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean10	WorldClim Temperature (Oct)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
	Tmean11	WorldClim Temperature (Nov)	General	GeoTIFF	WorldClim	2006	Partial Areas of the Philippines and vicinity	• Downloaded from http://www.worldclim.org
NAMRIA50K_New	3030-1_Olongapo	3030-1_Olongapo	General	JPG + Wordfile	NAMRIA	2007	Olongapo	
	3031-1_O'Donnel	3031-1_O'Donnel	General	JPG + Wordfile	NAMRIA	2007	O'Donnel	
	3031-2_MountPinatubo	3031-2_MountPinatubo	General	JPG + Wordfile	NAMRIA	2007	Mount Pinatubo	
	3032-1_SanCarlos	3032-1_SanCarlos	General	JPG + Wordfile	NAMRIA	2007	San Carlos	
	3032-2_Camiling	3032-2_Camiling	General	JPG + Wordfile	NAMRIA	2007	Camiling	
	3033-2_Dagupan	3033-2_Dagupan	General	JPG + Wordfile	NAMRIA	2007	Dagupan	
	3130-1_Malolos	3130-1_Malolos	General	JPG + Wordfile	NAMRIA	2007	Malolos	
	3130-4_Guagua	3130-4_Guagua	General	JPG + Wordfile	NAMRIA	2007	Guagua	
	3131-1_Cabanatuan	3131-1_Cabanatuan	General	JPG + Wordfile	NAMRIA	2007	Cabanatuan	
	3131-2_SanMiguel	3131-2_SanMiguel	General	JPG + Wordfile	NAMRIA	2007	San Miguel	
	3131-3_Angeles	3131-3_Angeles	General	JPG + Wordfile	NAMRIA	2007	Angeles	
	3131-4_Tarlac	3131-4_Tarlac	General	JPG + Wordfile	NAMRIA	2007	Tarlac	
	3132-2_Munoz	3132-2_Munoz	General	JPG + Wordfile	NAMRIA	2007	Munoz	
	3132-3_Gerona	3132-3_Gerona	General	JPG + Wordfile	NAMRIA	2007	Gerona	
	3132-4_Cuyapo	3132-4_Cuyapo	General	JPG + Wordfile	NAMRIA	2007	Cuyapo	
	3133-3_Binalonan	3133-3_Binalonan	General	JPG + Wordfile	NAMRIA	2007	Binalonan	
	3230-4_Angat	3230-4_Angat	General	JPG + Wordfile	NAMRIA	2007	Angat	
	3231-3_Sibal	3231-3_Sibal	General	JPG + Wordfile	NAMRIA	2007	Sibal	
	3231-4_GeneralTinio	3231-4_GeneralTinio	General	JPG + Wordfile	NAMRIA	2007	General Tinio	
	3232-3_PalayanCity	3232-3_PalayanCity	General	JPG + Wordfile	NAMRIA	2007	Palayan City	
NAMRIA50K_Old	7073-4_Botolan	7073-4_Botolan	General	JPG + Wordfile	NAMRIA	1977	Botolan	Map Information: 1977
	7174-1_San_Jose	7174-1_San_Jose	General	JPG + Wordfile	NAMRIA	1990	San_Jose	Reprinted: 1990
	7175-2_San_Nicolas	7175-2_San_Nicolas	General	JPG + Wordfile	NAMRIA		San_Nicolas	No information
	7272-1_Mt_Irid	7272-1_Mt_Irid	General	JPG + Wordfile	NAMRIA	2005	Mt_Irid	Reprinted: 2005
	7273-1_Gabalton	7273-1_Gabalton	General	JPG + Wordfile	NAMRIA		Gabalton	No information
	7273-2_Ulaikan_Point	7273-2_Ulaikan_Point	General	JPG + Wordfile	NAMRIA		Ulaikan_Point	No information
	7274-7_Maria_Aurora	7274-7_Maria_Aurora	General	JPG + Wordfile	NAMRIA	1990	Maria_Aurora	Reprinted: 1990
	7274-2_Ligaya	7274-2_Ligaya	General	JPG + Wordfile	NAMRIA		Ligaya	No information
	7274-4_Pantabangan	7274-4_Pantabangan	General	JPG + Wordfile	NAMRIA		Pantabangan	No information
	7275-2_Tauayan	7275-2_Tauayan	General	JPG + Wordfile	NAMRIA	2005	Tauayan	Reprinted: 2005
7275-3_Burgos	7275-3_Burgos	General	JPG + Wordfile	NAMRIA	2003	Burgos	Reprinted: 2003	



# *Annex-Figures*

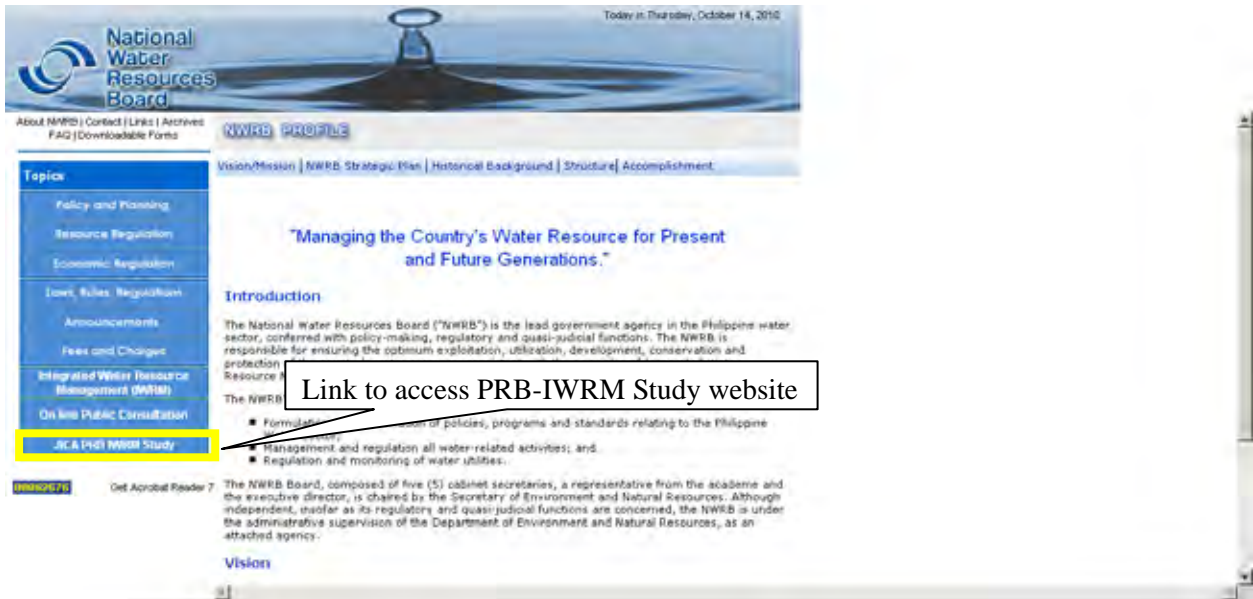






Source: Intranet Site in NWRB

Annex-F M.1.2.1 NWRB Intranet Site



Source: [www.nwr.gov.ph](http://www.nwr.gov.ph)

### Annex-F M.1.2.2 NWRB Official Website



Source: [www.philwatsan.org.ph](http://www.philwatsan.org.ph)

### Annex-F M.1.2.3 PhilWATSAN Website

**NATIONAL WATER INFORMATION NETWORK**

**Data and Information**

**Home**  
**Data and Information**  
**GIS Mapping**  
**Proposals/Reports**  
**Publications**  
**Reference Links**  
**FAQ Sheet**  
**Participating Agencies**  
**View Feedback**  
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**NWIN is a joint effort among the participating agencies to gather together data on water to come up with a broad picture of the water sector for better decision making on conservation and use of this vital resource. It is a component of the Water Resources Development Project (WRDP).**

**Project Background and Objectives**

WRDP was designed based on the decision reached during the December 1994 National Water Summit in Manila that there was a need for further integration and coordination of all water-related efforts towards a more focused approach to water resources management. The project would develop an appropriate policy and institutional framework to improve water resources planning, development and management in the country; initiating an integrated and comprehensive approach to watershed management to sustain water sources; improving efficiency of existing irrigation systems and thereby increasing agricultural production. The project would also improve irrigation services in the long term by accelerating management/transfer of irrigation systems to water users and by increasing NIA's institutional effectiveness.

The project is being implemented since 1997 by the National Irrigation Administration (NIA) as the lead agency; the National Water Resources Board (NWRB), the Department of Environment and Natural Resources (DENR) and the Department of Health (DOH).

**Development of the National Water Information Network**

The collection of water data in the Philippines has always been the responsibility of many agencies in the same manner that there are many agencies concerned with water resources development and management. In some agencies, data collection is one of their primary responsibilities. Other agencies are basically development or regulatory agencies whose data collection activity is only a secondary responsibility. The data collection by each of these agencies is usually limited to cover the particular segment of the water database that is needed by the agency to carry out its mandate.

Access to the database of the various agencies is inconsistent. Very few agencies publish their data collection regularly. Most data has remained as unpublished reports in the files of various agencies.

The National Water Information Network (NWIN) was conceptualized as a computer-based network system that electronically links the databases of the collection agencies and providing easy access to user agencies. The National Water Resources Board (NWRB) acts as the central database to which the various agencies are linked.

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**Data and Information**

**Home**  
**Data and Information**  
**GIS Mapping**  
**Proposals/Reports**  
**Publications**  
**Reference Links**  
**FAQ Sheet**  
**Participating Agencies**  
**View Feedback**  
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**Geohydrology** | **Basin/Office** | **Water Quality** | **Water Excess** | **Sanitary Inspection** | **Sanitary Climate** | **Sanitary** | **Sanitary**

**Land and Water Resources**

The Philippines is an archipelago composed of about 7,100 islands and islets with a total land area of approximately 300,000 sq.km, about 94% of which is contained within the 11 principal islands, namely Luzon, Mindanao, Samar, Negros, Palawan, Panay, Mindoro, Leyte, Cebu, Bohol and Masbate in order of size. The country is divided into three major island groups, namely Luzon with an area of 141,000 sq.km, Mindanao with 102,000 sq.km and Visayas with 57,000 sq.km.

As of 1997, the Philippines was delineated into 12 water resources regions (WRR) in consideration of hydrological boundaries for the purpose of comprehensive planning of water resources development. These are called Davao (WRR I), Cagayan Valley (WRR II), Central Luzon (WRR III), Southern Tagalog (WRR IV), Bicol (WRR V), Western Visayas (WRR VI), Central Visayas (WRR VII), Eastern Visayas (WRR VIII), Southeastern Mindanao (WRR IX), Northern Mindanao (WRR X), Southeastern Mindanao (WRR XI) and Southern Mindanao (WRR XII).

**River and Lake Systems**


There are 343 independent principal river basins that have at least 60 sq.km of basin area. Out of these, 18 are identified as major river basins with at least 100 sq.km of basin area. These are Cagayan, Pangasinan, Agno, Abita, Pasig-Ilaguna de San Isidro and Abulog near Zambo in Luzon Island; Agusan, Agut, Cacao, Cagayan de Oro, Mindanao, Tagum-Iligaganon, Tagulayan, and Buayan-Malungon river basins in Mindanao Island; the Pampas and Jelaon river basins in Panay Island; and the Ilog-Nilabangan river basin in Negros Island.

The 343 principal river basins cover a total land area of 189,437 sq.km, which is equivalent to 63.1% of the total land area of the Philippines. The 18 major river basins cover a total area of 108,679 sq.km equivalent to 36.2% of the total land area of the Philippines or 54.4% of that of the principal river basins (Principal River Basins of the Philippines-NWRB, 1976).

There are 14 major lakes (those with 400 ha and above area) and about 67 minor lakes (those with areas less than 400 ha). Of these, five (5) are located in Luzon (Laguna, Taal, Bato, Buhai and Baco Lakes); three (3) in the Visayas (Lake Madaya, Lake Manopao and Lake Danao); while the rest are found in Mindanao (Lake Lumbao, Lake Lantao, Lake Suluan, Lake Bongkang, Lake Labas, Lake Marit and Lake Pagani) (based on survey-interview at ICARD, 2001).

Source: [www.nwin.nwr.gov.ph](http://www.nwin.nwr.gov.ph)

Annex-F M.1.2.4 NWIN website



**National  
Water  
Resources  
Board**

**The Study on Integrated Water Resources Management for  
Poverty Alleviation and Economic Development in the  
Pampanga River Basin**



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Home

IWRM Plan Framework

Lessons Learned

Minutes of Meetings

Downloadable Data

Google Maps Interface

Contact Us

Search

Reminder of Upcoming Events

### Project Description

**PROJECT DESCRIPTION**

**OBJECTIVES**


**MANAGIS**


**STUDY AREA**

The importance of Integrated Water Resources Management (IWRM) has been well recognized by the Government of the Philippines (GOP) in order to cope with growing water demand due to increase in population, expansion of irrigation area and development of industry as well as frequent flooding. It is emphasized in the Philippine Mid-term Development Plan (2005-2010) that water resources is crucial for economic development and thus integrated water resources management is necessary for solving various problems related to water.

The Pampanga river basin is the fourth largest river basin with one of the greatest irrigation area in the Philippines. It is regarded as one of the most important river basins in the Philippines in terms of economic activities for the entire Philippines. It is located at north-west of the Metropolitan Manila, which makes close relationship with economic activities in the Metropolitan Manila. The urbanized area has been expanding towards the Pampanga river basin, which causes change of land use patterns in the basin. Two major reservoirs that are called as Angat and Pantabangan reservoirs have been operated for providing water for irrigation, domestic and hydropower as well as for flood control.


Recently, various problems, such as frequent flooding, unplanned conversion of irrigation water to domestic water in a drought year, overuse of groundwater and environmental degradation in wet land area, becomes prominent in the Pampanga river basin. To solve these problems, it is necessary to manage the river basin.





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Home

IWRM Plan Framework

Lessons Learned

Minutes of Meetings

Downloadable Data

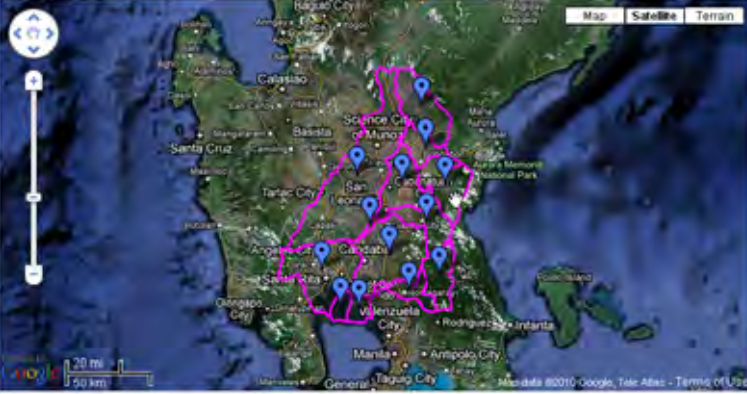
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Annex-F M.3.1.1 Pampanga River Basin IWRM Study Website