

Network of Asian River Basin Organizations

Sustainable Management for Water Resources Infrastructure

**- Outcome of a series of thematic workshop on sustainable
management for water resources infrastructure (2007 / 2008) -**

February 2008

Ver.1.1

Organized by:

Masahiro Sugiura

NARBO secretariat

Abbreviation

BD: Bangladesh

BWDB: Bangladesh Water Development Board

DWR: Department of Water Resources

GORBOS: General office for River Basin Organizations

ID: Indonesia

IWM: Institute of Water Modeling

IWRM: Integrated Water Resources Management

JP: Japan

JWA: Japan Water Agency

LK: Sri Lanka

MADAS: Ministry of Agricultural Development and Agrarian Services

MARD: Ministry of Agriculture and Rural Development

MASL: Mahaweli Authority of Sri Lanka

MLIT: Ministry of Land, Infrastructure, Transport and Tourism

MONRE: Ministry of Natural Resources and Environment

MWR: Ministry of Water Resources

NARBO: Network of Asian River Basin Organizations

PJTI: Jasa Tirta I, Indonesia

RBO: River Basin Organization

RBOs: River Basin Organizations

TH: Thailand

VN: Vietnam

Preface

The Sustainable Management for Water Resources Infrastructure becomes a very important tool to practice water resources management and it has been worked on by various methods in each country. About water resources management in particular, we must aim to draw out function of facilities at a maximum. In this respect we would like to take this opportunity to discuss a concrete issues and solution and to share experience with each country.

This series of thematic workshop was specified as one of the most important activities in the action plan (2006-2007) which was decided at the second NARBO general meeting. NARBO Secretariat, therefore, is planning to implement “workshop on sustainable management for water resources infrastructure” in accordance with the action plan.

This series workshop on sustainable management for water resources management was held four times during 2007-2008 in Vietnam, Bangladesh, Sri Lanka and Thailand. The workshop was participated by seven organizations from five Asian countries such as Bangladesh (2), Indonesia (1), Sri Lanka (1), Thailand (1) and Vietnam (2), and then the workshop was definitely a good opportunity for the participants to learn from each participant with sustainable management for water resources infrastructure.

This publication was jointly prepared by participants and NARBO secretariat of the series of thematic workshop on sustainable management for water resources infrastructure.

List of participants and NARBO secretariat

(The series of thematic workshop on sustainable management for water resources infrastructure)

1st Thematic Workshop on Sustainable Management for Water Resources Infrastructure

Date: 11-14, June 2007

Venue: Hanoi, VN

Host organization: DWR, MARD, VN

Participants

1. Mr. Fazlur Rashid, BWDB, BD
2. Mr. Ahmad Emaduddin, IWM, BD
3. Mr. Parwanto Widyo, PJTI, ID
4. Mr. Aruppola Sisira Rohana Kamal, MASL, MADAS, LK
5. Mr. Trongkandee Nitiphan, DWR, MONRE, TH
6. Mr. Nguyen Duc Lu, Bac Hung Hai Irrigation Management Company, VN
7. Mr. Pham Duc Thang, Bac Hung Hai Irrigation Management Company, VN
8. Mr. Dinh Khac Tinh, Cau sub Basin Organization, VN

9. Mr. Nghiem Dinh Thanh, Cuu Long River Basin Organization, VN
10. Mr. Nguyen Xuan Dong, Day Sub Basin Organization, VN
11. Dr. Thang Vu Van, DWR, MARD, VN
12. Mr. Nguyen Viet, DWR, MARD, VN
13. Mr. Nguyen Xuan Phong, Dong Nai River Basin Organization, VN
14. Mr. Nam Le Duc, GORBOs, MARD, VN
15. Mr. Phi Ngoc Lam, Nui Coc Irrigation Management Company, VN
16. Mr. Nguyen Van Toan, Red River Basin Organization, VN

NARBO Secretariat

17. Mr. Michio Ota, Vice Secretary General of NARBO/ JWA, JP
18. Mr. Masahiro Sugiura, JWA, JP

2nd Thematic Workshop on Sustainable Management for Water Resources Infrastructure

Term: 24-27, October 2007

Venue: Dhaka, BD

Host organization : BWDB, BD and IWM, BD

Participants:

1. Mr. Fazlur Rashid, BWDB, BD
2. Mr. Md.Ahsanul Alam, BWDB, BD
3. Mr. Md. Azizul Haque, BWDB, BD
4. Mr. Md. Habibur Rahman, BWDB, BD
5. Mr. Md. Shahidur Rahman, BWDB, BD
6. Mr. Ahmad Emaduddin, IWM, BD
7. Mr. Md. Masud Hasan, IWM, BD
8. Mr. Md. Shafquat Hasan, IWM, BD
9. Mr. Robin Kumar Biswas, IWM, BD
10. Mr. Mahbubul Alam, MWR, BD
11. Mr. Aruppola Sisira Rohana Kamal, MASL, MADAS, LK
12. Mr. Trongkandee Nitiphan, DWR, MONRE, TH
13. Dr. Dam Hoa Binh, DWR, MARD, VN
14. Mr. Le Quang Tuan, GORBOs, MARD, VN

NARBO Secretariat:

15. Mr. Michio Ota, Vice Secretary General of NARBO/ JWA, JP
16. Mr. Masahiro Sugiura, JWA, JP

3rd Thematic Workshop on Sustainable Management for Water Resources Infrastructure

Term: 12-16, December 2007

Venue: Kandy, LK

Host organization: MASL, MADASD, LK

Participants:

1. Mr. A. M. Aminul Haque, BWDB, BD
2. Mr. Parwanto Widyono, PJTI, ID
3. Mr. Ananda Sellahewa, MASL, MADAS, LK
4. Mr. Aruppola Sisira Rohana Kamal, MASL, MADAS, LK
5. Mr. Sudharma Elakanda, MASL, MADAS, LK
6. Mr. Thisara Bandara, MASL, MADSA, LK
7. Mr. Trongkandee Nitiphan, DWR, MONRE, TH
8. Mr. Pham Quoc Hung, DWR, MARD, VN
9. Ms. Doan Thi Tuyet Nga, GORBOs, MARD, VN

NARBO Secretariat

10. Mr. Michio Ota, Vice Secretary General of NARBO/ JWA, JP
11. Mr. Masahiro Sugiura, JWA, JP
12. Mr. Shinichiro Nakamura, JWA, JP

4th Thematic Workshop on Sustainable Management for Water Resources Infrastructure

Term: 4-7, February 2008

Venue: Bangkok, TH

Host organization: DWR, MONRE, TH

Participants:

1. Mr. Ahmad Emaduddin, IWM, BD
2. Mr. Parwanto Widyono, PJTI, ID
3. Mr. Kunio Kimura, DWR, MLIT, JP
4. Mr. Takashi Kato, DWR, MLIT, JP
5. Mr. Aruppola Sisira Rohana Kamal, MASL, MADAS, LK
6. Dr. Kanapoj Wandee, DWR, MONRE, TH
7. Mr. Trongkandee Nitiphan, DWR, MONRE, TH
8. Ms. Saifon, DWR, MONRE, TH
9. Ms. Sukontha Aekaraj, DWR, MONRE, TH
10. Mr. Surapol Pattanee, DWR, MONRE, TH
11. Mr. Panu Arunrat, DWR, MONRE, TH
12. Mr. Piriya Uraiwong, DWR, MONRE, TH
13. Ms. Wipada Ruamsuwan, DWR, MONRE, TH

14. Mr. Pham Quoc Hung, DWR, MARD, VN

NARBO Secretariat:

15. Mr. Michio Ota, Vice Secretary General of NARBO/ JWA, JP

16. Mr. Masahiro Sugiura, JWA, JP

Contents

Abbreviation	i
Preface	ii
Contents	vi
Chapter 1 Introduction	1
Chapter 2 Collection of concrete issues regarding sustainable management for water resources infrastructure	3
2-1 Legal and Institutional aspect of issues	4
2-2 Technical aspect of issues	8
2-3 Social/Customary aspect of issues	12
Chapter 3 Action Plan	16
3-1 Comprehensive South Comilla and North Noakhali drainage - proposed by BWDB, BD -	17
3-2 Development of decision support system for integrated water resources management - proposed by IWM, BD -	22
3-3 Strengthening of water resources management information system in the Brantas river basin - proposed by PJTI, ID -	30
3-4 Provision of Asian centre for dam safety training, a training centre for the technical staff of Mahaweli Authority of Sri Lanka and affiliated organizations and those of Asia - proposed by MASL, MADAS, LK -	38
3-5 Water resources management center - proposed by DWR, MONRE, TH -	46
3-6 Capacity improvement for irrigation sector - proposed by DWR, MARD, VN -	53
3-7 Dam safety management strengthening program in Vietnam - proposed by GORBOs, MARD, VN -	57
Chapter 4 Linkage among identified issues, categorized solution and action plan	62
4-1 Legal and institutional aspect of Linkage	63
4-2 Technical aspect of Linkage	64
4-3 Social/Customary aspect of Linkage.....	65
4-4 Linkage among three aspects, categorized solution and action plan	66
Chapter 5 Conclusion	67

Chapter 1 Introduction

This report shows the outcomes of a series of thematic workshop which were implemented in accordance with the procedure mentioned below.

Concept of workshop

This thematic workshop was specified as one of the most important activities in the action plan (2006-2007) which was decided at the second NARBO general meeting.

NARBO Secretariat, therefore, has planned to implement “workshop on sustainable management for water resources infrastructure” in accordance with the action plan.

For sustainable management for water resources management, water resources infrastructure management is very important. So far, various measures have been taken in Asian countries aiming for its sustainable water resource management. As a result, some problems were resolved but still some remains unsolved. It is extremely important for Asian nations to share experiences and information among different countries in addition to experiences and information at its own country, for the sustainable management of water resources infrastructure.

In this regards, NARBO Secretariat planed the thematic workshop in which participants can discuss actively and share different experiences and information among them, in order for participant to identify the problems of each country and find its solution. This workshop included field visits namely, “RBO advisory visit” and “RBO exchange visit”, so that participants could discuss actively its main issues on site also.

Agenda items for the workshops

- 1st Workshop “Discussion on characteristics and identified issues on sustainable management for water resources infrastructure in each country.”
- 2nd Workshop “Discussion on categorization of solution.”
- 3rd Workshop “Approach to solution with action plan.”
- 4th Workshop “Discussion on linkage among identified issues, categorized solution and action plan”

Requirements for Registration

This workshop was held four times during 2007-2008 to be organized by the selected members from 5 countries except from the Secretariats. The participants in this workshop satisfied the following condition (1), (2) and (3), and either (4) or (5).

1. Participant’s organization is registered as NARBO member and is responsible for policy-making or river basin management
2. Participant’s organization has an intention to organize this workshop.

3. Participants have their intention to take part in all workshops (4 times).
4. Participant is a regular staff of an organization, who has years of experiences in facility management for water resource infrastructure.
5. Participant is a regular staff of an organization, who has years of experiences in preparing manuals and guidelines of facility management for water resource management.

Duties of participants

Participants were sought to have responsibility for following items on;

- (1) Writing a report on each subject before each workshop is held.
- (2) Further discussion on the above subject in your organization after each workshop and reporting results of discussion in the next workshop.

In accordance with the “Guideline for implementation of NARBO training” announced at the NARBO Second General Meeting, Secretariat may support all necessary expenses where appropriate such as (a) Airfare, (b) Accommodation, (c) Traveling expenses for site visit, (d) Secretariat fee of the host organization.

How to apply

An applicant is subject to submit (1)Application Form, (2)Short report and (3)Members Annual Report to the secretariat no later than 15th April 2007 by fax or e-mail. If their organization already submitted annual report for 2006, an applicant does not need to submit (3) Members Annual Report.

Contact person: Masahiro Sugiura, NARBO Secretariat,

E-mail: narbo@water.jp, Facsimile: +81-48-600-6550

Selection of participants

The secretariat selected participants from applicants and notified the result to all the applicants. The participants will be chosen at maximum two persons from one country (one was chosen from organization that manages facilities for water resources, another was chosen from organization that is responsible for technical standards and guidelines for water resources).

Chapter 2 summarizes issues on sustainable management for water resources infrastructure collected and identified by seven participated organizations from five countries in the workshops. Chapter 3 proposes an action plan that elaborates key challenges among sustainable management for water resources infrastructure issues in each organization. Chapter 4 indicates a linkage on the identified issue, categorized solution and action plan to ensure sustainable management for water resources infrastructure. Chapter 5 provides future directions for governments and RBOs, reflecting the outcomes discussed at the thematic workshops.

Chapter 2 Collection of concrete issues regarding sustainable management for water resources infrastructure

The following is collected and identified issues on water resources infrastructure management in seven participated organizations from five countries:

Abbreviation in Chapter 2

BD1-L: Legal and institutional aspect of issues - identified by BWDB of Bangladesh -

BD1-T: Technical aspect of issues - identified by BWDB of Bangladesh -

BD1-S : Social/Customary aspect of issues - identified by BWDB of Bangladesh -

BD2-L : Legal and institutional aspect of issues - identified by IWM of Bangladesh -

BD2-T: Technical aspect of issues - identified by IWM of Bangladesh -

BD2-S: Social/Customary aspect of issues - identified by IWM of Bangladesh -

ID-L : Legal and institutional aspect of issues - identified by PJTI of Indonesia -

ID-T: Technical aspect of issues - identified by PJTI of Indonesia -

ID-S : Social/Customary aspect of issues - identified by PJTI of Indonesia -

LK-L : Legal and institutional aspect of issues - identified by MASL of Sri Lanka -

LK-T: Technical aspect of issues - identified by MASL of Sri Lanka -

LK-S : Social/Customary aspect of issues - identified by MASL of Sri Lanka -

TH-L: Legal and institutional aspect of issues - identified by DWR of Thailand -

TH-T: Technical aspect of issues - identified by DWR of Thailand -

TH-S : Social/Customary aspect of issues - identified by DWR of Thailand -

VN-L: Legal and institutional aspect of issues - identified by DWR & GORBOs of Vietnam -

VN-T : Technical aspect of issues - identified by DWR & GORBOs of Vietnam -

VN-S : Social/Customary aspect of issues - identified by DWR & GORBOs of Vietnam -

2-1 Legal and institutional aspect of issues

What is the Problem ?	What is the cause	Why does the problem occur?	Who are victims?	How does the problem occur?
BD1-L1 No Water Law	No initiative taken yet	Politicians does not think that this a serious issue. Moreover his initiative may go against his popularity	Peoples and stake holder of the project area.	At present every one can use irrigation water free. Industrial water user and drinking water user have to pay because they use water from govt owned water supply authority of the respective areas. If anybody is charged fe
BD1-L2 Pollution of river/stream water	Industries and factories along the banks of the rivers/streams	These industries and factories discharge effluents to the river	Water users	Industries and factories discharge polluting waste products and chemicals
BD2-L1 # Lack of appropriate institutional setup with cross-sectoral integration tools for interaction with stakeholder	# Water sector development activities are mainly sector based without consideration of impact on other sector and dominated by the agencies program	# Not serious in following water policy & guideline (if exist) # No mechanism for monitoring of activities of different agencies	# Stakeholders in Bangladesh	Complexity brings caos and confusion
BD2-L2 # Overlapping of water related activities	# Agencies work on a piece meal basis	# Available apex organisation does not have tools to evaluate and monitor the impact	People outside the project mostly	Projects with isolated objective cause adverse impact on the surrounding
BD2-L3 # Role of Water Resources Planning Organization (Apex Organisation) is not effective in project planning and monitoring	# Lack of appropriate institutional setup to assess impact and monitor	# Implementing agencies work independantly	People at large	Duplication occurs and adverse impacts remain unattended
BD2-L4 # Comprehensive water laws are not available	# Mis use of laws # Law makers' unwillingness to amend old laws	# People take advantage of the inappropriate laws	Disadvantageous group of the project	Upland people encroaches in the share of the downstream
BD2-L5 # Lack of regional cooperation among India, Nepal & Bangladesh	# Mistrust	Projects are designed without knowledge of upstream development "Comprehensive development remaining a far cry".	People of the Basin	Decisions are taken without knowledge of flood forecasting or water availability
ID-L1 Water service fee for public services can not be charged yet.(Government obligation)	Government public services obligation (PSO) is not implemented yet.	Not clearly regulation for government to allocated the budget.	The commercial users can not get the optimal services.	The O&M budget should be spread for all facilities (public services Or commercial services)
ID-L2 Water allocation for commercial users in irrigation system	In drought year when the water not meet the irrigation requirement, allocation for irrigation water to be rotated, the other hand water supply for domestic and industrial water to be continue.	Irrigation intake operate under others institution (Irrigation services) and no special facilities to supply domestic and industrial water	Water Supply Enterprise(PDAM) and industries can not take the water continue	Customer of PDAM and production of industry are interrupt
ID-L3 River water pollution	Industrial and domestic waste water	Controlling the waste water under provincial and regency/city agency	PDAM Surabaya	Drinking water for Customer of PDAM Surabaya is not fulfill the standard
LK-L1 Pollution of reservoir water	Building of factories and hotels in the reservoir periphery	These factories and hotels discharge effluents to the reservoir	Water users	Hotels discharge and discard kitchen and laundry waste. Factories discharge polluting waste products and chemicals
LK-L2 Lack of a River Basin Authority with legal power to control the activities	Government authorities and the general public have not realized the value of such an authority to control catchments activities	When not legally enforced persuasion of people to adopt river basin friendly water conservation practices is not effective	Water users	Water users and catchment dwellers tend to get the immediate benefits without heeding of the long time benefits obtainable through certain recommended practices

LK-L3	The financial authority of the Engineer in Charge of the dams of the Headworks Administration, Operation and Maintenance Division was curtailed recently causing it impracticable to manage the site in view of the dam safety.	Financial difficulties of the Government and the the higher authorities lacking knowledge of the significance of dam maintenance and their indifference.	Representations to make the higher authorities aware not sufficient or effective	All water users and people that could be affected by a dam breach	Dam maintenance affected for want of funds. Lack of maintenance leads to closures and breaches
LK-L4	Brain drain of technical staff	Lack of promotional prospects, job satisfaction and overburdening	Lack of training	Technical staff, Mahaweli Authority and eventually water users	Technical staff serve in remote sites far from cities. Therefore they cannot follow courses for higher education. They have no adequate training facilities within the organization. Their lack of technical knowledge of complex equipment put them under pressure having to be only responsible.
TH-L1	No Water Law	Misunderstand for the National Water LAW	Politician don't want water law. Because his vote think that if Thailand have Water Law, it will be water fee	Peoples and stake holder in Thailand,(65mil,peoples)	At present every one can use water for free. The Farmer was poor so the don't want water fee.
TH-L2	Many agencies concern with water in Thailand. (28 agencies in 5 ministry)	Institutional reform in 2002	Budget for one agency in some ministry is very high about 1,000 mil. USD. Department of Water Resources about 60 mil.USD.	Peoples and stake holder in Thailand,(65mil,peoples)	Before 2001 there 40 agencies in 9 ministry concern with water.
VN-L1	Lack of appropriate management mechanism:	<ul style="list-style-type: none"> - Absence of consistence in current state management mechanism for management and exploitation of hydraulic works; - Implicit management decentralization; - The development of human resource is not responding to current demands, - Allocation of human resource among different regions is not suitable. - Advantages in terms of structure, infrastructure, equipment, machinery and human resource are not well exploited to diversify activities by IMCs; - Management mechanism is still heavily subsidized 	<ul style="list-style-type: none"> - The organization and management pattern of these irrigation systems (specially in provinces) are developed differently; - Overload on function but less staff than actual human resources demand. - There is a lack of hydraulic engineering staff in many places, especially in midland and upland/mountainous provinces. - State management function and production management function are not clearly defined; - Management scope of IMCs is too broad leading to inefficiency; 	<ul style="list-style-type: none"> - Farmers (are not served all demands); - IMC's staff (low salary & unclear promotion of works) 	<p>Most of IMCs are overload, the number item of works are normally more than the function defined:</p> <ul style="list-style-type: none"> - Organization of management and exploitation of hydraulic works in many places is not cumbersome and inefficient. - Operational effectiveness of these hydraulic structures is not up to their potential and design capacity; - Management mechanism could not bring into play the creativity and flexibility of managers and staff. Otherwise, capacity and competence of management and working staff do not meet required standards of the process of industrialization and modernization of hydraulic works. - Allocation of human resource among different regions is not suitable. There is a lack of hydraulic engineering staff in many places, especially in midland and upland provinces. - The scope of IMC's management is too broad leading to inefficiency management;
VN-L2	Lack of appropriate ISF policies and the allocation of fund for O&M hydraulic works are not sufficient:	<ul style="list-style-type: none"> - The legal frame for collecting fee is low, inappropriate rate of ISF; - Farmer normally not willing to pay ISF cause late of water fee collection; - Budget structure for maintenance, O&M hydraulic works is inappropriate; 	<p>As regulated, the state budget will cover the big reconstruction and maintenance. However, the actual allocation from state budget for maintenance, O&M is not enough for covering actual needs.</p> <ul style="list-style-type: none"> - Number of works in the whole country too many. - The legal documents on punishments seem not come to effect. 	IMCs	<ul style="list-style-type: none"> + The budget from ISF collection can not afford all need of IMCs; - Level of irrigation fee is still low compared to regulation about 3-5% capacity; loss of revenue is due to people owe or appropriate fund to use for other purposes and input price (electricity, oil and material) varies following increasing direction while irrigation fee remains the same; this doesn't ensure that IMCs have enough fund for their activities; - Many companies haven't paid for overtime and meal allowance in shift etc. Mainly, they only have enough money to paid salary and one part of electricity fee, but can't cover cost for work maintenance. This causes life of IMC's staff difficult and works degrade day by day with low efficiency.
VN-L3	Water for free	New Decree on Water Fee exemption, No 154, dated 15th October, 2007	Government decided to pay water fee for farmers	Irrigation Company and Commune authorities	The budget allocate for all IMCs is not enough and the farmers have pay water fee under two different systems.
VN-L4	Many agencies concern with water in Vietnam. (5 ministries)	Institutional reform in 2003	Poor coordination between Ministries and Agencies	Peoples and stake holder in Vietnam (80mil,peoples)	Water related ministries and agencies do on their own functions
	What is the Problem ?	What is the cause	Why does the problem occur?	Who are victims?	How does the problem occur?

Where does the problem occur?	From when does the problem occur?	Think of Countermeasure for solution	Damage and Problem Picture	
In all the irrigation projects (around 300) so far completed in Bangladesh. The process of collecting irrigation water charge has been initiated in large irrigation projects namely Thakungson Deep Tubewell Project, Ganges-Kobadak Irrigation Project, Megh	Since water management issues come into effect in 1962 with the commissioning of Ganges-Kobadak Irrigation Project	To set Draft Water Law for the water management organisation of the project so that they can maintain the project smoothly as and when required out of that money. Only imposing water law, collection of irrigation charge is possible.		BD 1-L1
In the periphery of Dhaka city and some other divisional cities	Since industrialisation with no fixed known date	Approval of industries are granted only after examining the plans on safe disposal of effluent according to Environment Impact Assessment by the Environment Authority of Bangladesh	River water can not be used for domestic purposes, in some cases fish and other aquatic species do not survive. No picture	BD 1-L2
Within and in the impact zone	Soon after the implementation	# Institution for cross-sectoral integration tools for screening and monitoring	Pictures are at the paper submitted	BD2-L1
Mostly at immediate outside	Soon after the implementation	# Tools for visualisation of the upcoming impacts and action to be taken thereof		BD2-L2
wastage of fund	Soon after the implementation	Make WARPO effective with tools and manpower		BD2-L3
Among various group	Soon after the implementation	Put in place appropriate laws		BD2-L4
Countries of the basin	It is there and goes on	# Improve regional cooperation through SAARC		BD2-L5
hydro power generation at Senggunih and Wlingi dam and some river structures along the Brantus	When the river structures starting need major maintenance	Clearly the mechanism of government obligation for public services	Picture the garbage at Senggunih dam which disturb the power generation and broken the river structure	ID-L1
Irrigation Delta Brantus (Sidourjo Regency)	In drought year around 1(one) month	Agreement water allocation in the irrigation system with Irrigation services, construct special facilities to supply water	Picture of the water supply canal for PDAM managed by irrigation services.	ID-L2
Surabaya City	Some time specially in the beginning rainy season	Proposed the Governor decree to establish inspection /coordination team.	Picture the industrial pollution	ID-L3
In the periphery of the Victoria reservoir	From the inception of the reservoir	Approval was granted only after examining the plans on safe disposal of the factory effluent according to Environment Impact Assessment by the Environment Authority of Sri Lanka.	Drinking water poisoning and reduced farm yields. No picture	LK-L1
In Mahaweli Authority of Sri Lanka	Since its inception	Persuade government to institute the River Basin Authority through a parliamentary bill		LK-L2

All dams of Mahaweli	When the dams were taken over by the Mahaweli Authority common to all functions related to the Mahaweli				LK-L3
All dams of Mahaweli	From the inception of the Mahaweli Program in 1976				LK-L4
Thailand	Thailand try to propose 1st draft Water Law in 1996. Now 2007 are already Final draft Water Law.				TH-L1
Thailand	Before 2001 there 40 agencies in 9 ministry concern with water. After institutional reform in 2002, Thailand still have 28 agencies in 5 ministry concern with water.				TH-L2
Hydraulic system	Many years ago				VN-L1
IMCs	Many years.				VN-L2
Vietnam	June, 2007				VN-L3
Vietnam	2003				VN-L4
Where does the problem occur?	From when does the problem occur?				Damage and Problem Picture
	Think of Countermeasure for solution				

2-2 Technical aspect of issues

	What is the Problem ?	What is the cause	Why does the problem occur?	Who are victims?
BD1-T1	There in no specific guidelines for infrastructure management	More attention to execution than maintenance	There is no work specific budget fixed in advance. But there is fixed budget for specific work annually for execution	Project is not maintained properly. Hence, Peoples of the project area and related stake holders are the victims.Number of People and stakeholder varies projectwise.It cannot be ascertain right now.
BD1-T2	Untimely fund release	Bureaucratic process in allocation and release of fund. Also there limited fund.	There is lack of co-ordination between executive agency and the ministry (controlled by Bureaucrates). Also there might have some mistrust between them on account of improper use of fund sometime and somewhere.	People of project area/ Beneficiaries.
BD2-T1	# Performance of water resources projects rarely attain its design potential in Bangladesh. # Expected benefit is not achieved from the completed projects # Participation of stakeholder is not available to the extent necessary	# Absence of holistic approach in planning of a project # Lack of decision support tool for multi sectoral impact assessment and decision making # Lack of involvement of stakeholder in planning and formulation of a project # Lack of people's participation in maintaining infrastructures # Not follow standard & timely maintenance # Lack of sufficient O&M budget for the maintenance & monitoring	# Less regrads for Integrated approach and quality control # Unplanned human intervention # Absence of routine monitoring & maintenance # Constraint of agency's financial resources # manager fails to foresee and support in decision making in a complex situation	Stakeholders get frustrated and becomes victim
ID-T1	Hang of water intake and other river structure	Excessive the sand mining	Agency can not control the sand miner	2(two) sugar factory (PG)
ID-T2	Controlling water abstraction	Not all the industrial water intake are completed by water meter and illegal abstraction for irrigation	Water meter for industries are expensive and frequently broken, water for irrigation no need licence (difficulty to control the people to take the water for irrigation)	Others user
ID-T3	Discharge measurement is not accurate	Discharge table not calibrate	Difficulties to calibrate the the discharge table for the gate in the main river	users
ID-T4	Late of data Information from others agency.	Management Information system(MIS) between related agency not establish	Lack of budget for others agenciesfor MIS	PJT I as operator of water management and stakeholders
ID-T5	Hardware and software for Flood Forecasting and warning System (FFWS) is not produced	FFWS is generally designed for 10 to 15 years	FFWS was installed in 1989	
LK-T1	Lack of training in modern engineering practices and trends	No training centre is available and no opportunity for bilateral links with similar organizations of developed countries	The Mahaweli Authority cannot afford a well equipped Training Centre	The technical staff
LK-T2	Lack of updating of knowledge of new replacement applications for old operating systems	Lack of association with international institutions and experts	The Mahaweli Authority cannot afford to send the engineers and other technical staff abroad for further education and training	The Technical personnel of MASL

LK-T3	The hydraulic system of the Victoria spillway gates need improvements	The radial gates are counterweighted and a hydraulic pressure must be maintained to keep the gates closed. The technical staff have no confidence to make a modification because of lack of knowledge and training	In a sudden burst of a hydraulic hose oil of the hydraulic system leaks continuously until oil tank is emptied.	The site staff and the water users
TH-T1	Don't have the center of decision support system(DSS) in water management.	There are many agencies to build and operate dam and reservoir.	Every agencies have their own plan to operate dam and reservoir.	Peoples and stake holder in Thailand.
VN-T1	Changing land use to adapt the new trends of production	<ul style="list-style-type: none"> - The country is on the process of industrialization and modernization; - The economic condition of the whole country is getting higher, some areas need to change crop pattern with more efficiency; 	<ul style="list-style-type: none"> - Management mechanism for existing hydraulic schemes is not promptly reformed in accordance with renovation process of the Farmer economy; 	
VN-T2	High number of violation cases of regulation on hydraulic works exploitation and protection	<p>The power of the specialized inspection agencies system on water resources was not formed strongly;</p> <ul style="list-style-type: none"> - Lack of legal document system on punishment of violation; - Management assignments, decentralization between the State Owned Enterprises and the agricultural cooperatives are not clear, lack of farmers' roles in irrigation management, many secondary canals have no real owners. 	<ul style="list-style-type: none"> - Educational level of staff working in IMCs is still low and uneven among different regions; (Please tell us, composition of educational background and speciality of staff) - Low awareness of people living nearby the hydraulicworks; - IMCs have not enough staffs to observe all violation activities in the scheme. - The legal system on punishment 	
VN-T3	Works failure frequently	The Norms and Standards are not revised since long time	Meteo-Hydrology changed	All Vietnamese citizen.
	What is the Problem ?	What is the cause	Why does the problem occur?	Who are victims?

How does the problem occur?	Where does the problem occur?	From when does the problem occur?	Think of Countermeasure for solution	Damage and Problem Picture	
Because the budget is allocated by the govt centrally	In all the 588 projects including FCD, FCDI, RBPP, CERP and LRP)	During Flood and cyclone period..	Specific guideline and project wise budget allocation for Water Management. After completion of a project, there should be a guideline containing component wise maintenance budget annually.	-	BD1-T1
Breach of embankment, erosion near important installations during flood. Lack of maintenance of gates and hoisting system and removal of sludge and water hyacinth	In FCD, FCDI, RBPP, CEP and polder projects.	After completion of the projects and seriously after 1980.	Allocation of fund should be well ahead of the working season and release should be ensured as and when required		BD1-T2
# Water logging, flooding, irrigation shortage, bank erosion, conflict of different groups of people etc	within and in the impact zone	soon after implementation	# Need to develop a DSS considering multi-sectoral impact where solutions for different options/scenarios need to be formulated; and decisions need to be made on the basis of evaluation of various scenarios/options based on multi-criteria analysis. # DSS is also required for communication between different stakeholders, different departments of public institutions. # Strong local government to pursue the sufficient fund for O&M. # Organization & participation of beneficiaries in maintaining infrastructures		BD2-T1
Factory can not fulfill the requirement	PG Ngadirejo and PG Lestari	from 1990 (in dried season)	Construct the ground sill	Hang of the river structure	ID-T1
Not all users can enough water.	in the basin	In dried season	All intake industries must be installed the water meter, and controlling the water abstraction by people (proposed regulation)	No picture	ID-T2
Water allocation not accurate	Lodoyo and Lengkong Barrage	Discharge table has been used since starting operation	Carried out reseach	No picture	ID-T3
PJT or stakeholders can not get information quickly	in the basin		Establishment the Management Information System	No picture	ID-T4
			Proposed the new FFWS facilities	Control room of FFWS	ID-T5
Technical staff of the MASL serve in remote areas and cannot improve their skills	All Mahaweli dams	From the inception of the Mahaweli Program in 1976	Establish a Training Centre with facilities to conduct training courses. Incorporate a exchange program between Sri Lanka and other Narbo countries to this training Centre	Bad maintenance of dams leading to repeated rehabilitation of equipment	LK-T1
-	In Mahaweli Authority of Sri Lanka	From the inception of Mahaweli dams	Establish a Training Centre to train Engineers as trainers. Incorporate a exchange program between Sri Lanka and other Narbo countries to this training Centre	Site staff is unable to propose replacements or improvements for troublesome equipment with critical reliability	LK-T2

When there is a leak the automatic hydraulic pump continues pumping oil until all the oil gets leaked making the system the system unable to keep the gates closed.	Victoria dam	From the time of installation of the equipment	A Failure Modes, Effects and Criticality Analysis was carried out for the spillway gate system of Victoria dam and based on the findings the Weekly Inspection and Maintenance Schedule was updated.	All the gates would open uncontrollably creating a flood equivalent to the 1000 year flood. Pictures of equipment.	LK-T3
When Thailand have a crisis in water. Integrated of operation doesn't well.	Thailand (Chaopraya River Basin)	Drought and Flood period.	Setting operation center for Water Management.	-	TH-T1
<ul style="list-style-type: none"> - Urbanization is inevitable because of productivity gaps among the production sectors; and that would lead to fewer entrants to the agriculture workforce putting focus on productivities in agriculture. At the same time, mixed land uses of farm land, industrial land and residential land would expand. That would give additional complexity to the management of agricultural water control systems; - According to this Decision of the Prime Minister regarding the approval of program on development of aquaculture during 1999- 2010, it is expected by 2010, total aquaculture production will be 2 million tons and export turnover USD4 billion. More jobs will be created and incomes of 2 million people will be increased. Many breed production establishments have procured and prepared equipment for inspection and verification. So that the land of cultivation will be replaced by aquaculture areas. - Resolution No. 09/2000/NQ-CP dated June 15, 2000 by the Government relating to policy and advocates for the shift in economic structure and consumption of agriculture products, many rice land, rush land and salt production areas having low productivity in flood plains have been turned into water sa - Economy is increasing continually, water demand of socio-economic sectors will be increased more and - the pressure of population and life quality will be increased in several future decades. In 1999, populatio 	Cultivated areas	1999	Appropriate plan should be approved with comment from related sector and widely informed in the regions.	VN-T1	
An investigation report at the end of 2005 show that, there are 2.782 hydraulic works are violated in 31 provinces of the country with total 89.845 violated cases (2.898 cases/province on average). The main violated activities can be listed are: illegal construction, encroachment of hydraulic protection areas, and discharge waste water or rubbish into water-body or on the surface of hydraulic works	In the protection area of hydraulic works	1995 (especially)	Continuing and pushing up the IEC activities on protection of hydraulic works:		VN-T2
Flood control gate and dam failure	Central area of VN	Flood period.	Revised Norms and Standards	Please bring picture.	VN-T3
How does the problem occur?	Where does the problem occur?	From when does the problem occur?	Think of Countermeasure for solution	Damage and Problem Picture	

2-3 Social/Customary aspect of issues

	What is the Problem ?	What is the cause	Why does the problem occur?	Who are victims?
BD1-S1	Women participation limited and discouraged	Socio-religious	There is wage disparity and religious feelings	Stakeholders such as project affected people(PAP), destitute women, fishermen
BD1-S2	Resettlement	No resettlement policy	Resettlement issue is not taken seriously in the project formulation to keep the project cost less. Traditionally costly projects are discouraged by the Govt. and the Donor agencies.	people of the project area
BD1-S3	People do not want to pay water fee	Social tradition and attitude	People have the impression traditionally that irrigation water is free of charge .Also they are misguided by local leaders	Operation and Maintenance of the project. The authority responsible for O & M.
BD2-S1	# Encroachment of floodplain, irrigation & drainage canal by local people and embankment cut, gate operation for some group benefit	# Poor awareness of the people	# Poverty & shortage of land	People of the project
BD2-S2	# Conflict between different groups of stake holders	# Looking for own benefit at the cost of others	# Since alternative livelihoods are not available, people shows unwillingness to sacrifice their own benefit	Mostly weaker section of the society
ID- S1	Flowing the garbage to the river	The settlement along the river side not have temporary disposal	The Cleaning Agency not construct the temporary disposal due the topographic condition (steep)	People along river in the downstream site
ID- S2	Straightened settlement in river corridor	Government not enough budget and some people refuse to relocation	Difficulty to make agreement with community of river corridor.	The user of the river
ID- S3	Domestic water pollution	The settlement along the river side not have septic tank	No space to construct the individual septic tank	The user of the river water especially the domestic water user (drinking water and industrial water)
LK-S1	Human activities in the catchments	Catchment dwellers clear extensive areas of catchment slopes	Denuded catchment slopes are prone to large scale erosion	Mahaweli Authority and water users
LK-S2	Siltation of reservoirs	Sediment flow	Sediment carried down along with inflows	Mahaweli water users
LK-S3	Hopeless level of knowledge of the technical staff	Lack of training to international standards on complex equipment	The Mahaweli Authority cannot afford a well equipped Training Centre	The technical staff

LK-S4	Lack of modern technical knowledge	Lack of dam experts	The Mahaweli Authority cannot afford to send the engineers and other technical staff abroad for further education and training	The Technical personnel of MASL
TH-S1	River basin committee (RBC) didn't have real power to decide to do their own need of project.	No Water Law	Thailand didn't have water law to give power to RBC decide to implement project	29 River Basin Committee and stake holder in THAILAND.
TH-S2	Budget for management less than 2% 2001 = 0,54% 2007 = 1,43% The cabinet set a budget frame for development 55% maintenance 43% and management 2%.	Government agency want money to Development. 2001 = 78% 2007 = 65%	In 2001, Thailand still need new development project. Now Irrigation area in Thailand are 32 mil.rai. and the appropriate area to develop Irrigation area are less than 20 mil.rai. So the budget transfer from development to maintenance.	Peoples and stake holder in Thailand.(65mil.peoples)
TH-S3	Problem with sharing information and used a lot of money for get the same data in many agencies.	Many agencies concern with water.	After institutional reform in 2002, Thailand still have 28 agencies in 5 ministry concern with water.	Peoples and stake holder in Thailand.(65mil.peoples)
TH-S4	Lack of modern technical knowledge	Lack of dam experts	The Mahaweli Authority cannot afford to send the engineers and other technical staff abroad for further education and training	The Technical personnel of MASL
VN-S1	Poor awareness of the people (farmer & IMCs staff) in O&M hydraulic works	- The implementation of Law on water resource, Decree on exploitation and protection of hydraulic works in many provinces is not as good as desired; - WUOs are operating in form of an agricultural cooperative with various services including irrigation service at village level mainly; the relationship to IMC through the commune PC (section of water and transport), farmers have not really participated in irrigation management.);	-Lack of measurement for encouraging people to take part in hydraulic works protection activities; - Management mechanism is still heavily subsidized and could not bring into play the creativity and flexibility of managers and staff. - Management assignments, decentralization between the State Owned Enterprises and the agricultural cooperatives are not clear; lack of farmers' roles in irrigation management, many secondary canals have no real owners; - The role of local community in management and exploitation of hydraulic works is not brought into full play;	
VN-S2	River basin organization (RBO) do not have real power to decide to do their own need of project.	They are coordinated body	The Law regulated	8 RBOs
VN-S3	Miss allocating budget for O&M strengthening	One body take responsibility	Irrigation systems are constructed long time ago and it need upgrade and extension	all farmer in Vietnam, about 70 million
VN-S4	No integrated implementation between projects and programmes	Lack of coordination between agencies and Ministries	Some agencies have the same duty.	Peoples and stake holder in Vietnam
	What is the Problem ?	What is the cause	Why does the problem occur?	Who are victims?

How does the problem occur?	Where does the problem occur?	From when does the problem occur?	Think of Countermeasure for solution	Damage and Problem Picture
There is no national guideline for wage distribution and motivation. As per Guidelines for Participatory Water Management (GPWM), project embankment and canals should be maintained by forming WMO and LCS each comprising at least 30% women member since the	In all the projects including FCD, FCDI, Irrigation, Drainage and Irrigation and CERP (around 550 projects).	Since women participation in management issues came into effect after 1982.	There should be law prohibiting wage disparity between men and women and also programme for social motivation by Govt - itself and NGOs	BD1-S1
There is a prevailing attitude that resettlement is not a project component.	Mainly river bank protection projects and coastal embankment projects	Since independence in 1971	Strong resettlement policy and guideline to include resettlement issue in project formulation.	BD1-S2
There is a prevailing attitude that irrigation water is free of charge.	In all the irrigation projects (around 300) so far completed in Bangladesh.	Since 1962 with the commissioning of Ganges-Kobadak Irrigation Project.	Motivation of local leaders and people using irrigation water. Officials responsible for collection of irrigation charge must have law and law enforcing power.	BD1-S3
Smooth functioning hampers leading to depriving the share of benefit of other group	Specific project site	From implementation	# Resettlement of people # Extensive motivational works through meeting # involve stake holders in decision making process using decision making tool	BD2-S1
Improper use of the project facility deprives the right of the weaker section	Tail end low lying area or very high areas	soon after project implementation	# Arrange appropriate land use, compensation for alternative livelihood, motivation & training, facilitate discussions using decision making tool showing options	BD2-S2
The water quality in the river decrease	Senggunth Reservoir for garbage and Surabaya river for quality		Developing the garbage processing unit in the site.(composting)	ID-S1
People is low income category	Surabaya river		Preparing the design of river improvement, and issued the provincial regulation.	ID-S2
The water quality in the river decrease	Surabaya river		Developing waste water communal.	ID-S3
Catchment dwellers are poor and subsist on chena type farming using rain water. They clear and burn forests preferring virgin forests. Such burning escalates to other vast areas they are not prepared to farm.	Because the catchment dwellers lack awareness of the damage they are causing	From the inception of the Mahaweli Program in 1976	Establish a Training Centre with facilities to conduct awareness programs for protecting catchment slopes	LK-S1
Sediment gets collected in the reservoirs	Mahaweli reservoirs	From the inception of the Mahaweli Program in 1976	Awareness programs should be carried out for catchment dwellers on methods of slope protection such as the SALT method	LK-S2
Technical staff of the MASL serve in remote areas and cannot improve their skills	All Mahaweli dams	From the inception of the Mahaweli Program in 1976	Establish a Training Centre with facilities to conduct training courses and sharing expertise with international institutions and sharing expertise with international institutions. Incorporate a exchange program between Sri Lanka and other Narbo countries to this training Centre	LK-S3

LK-S4	The existing staff do not have the knowledge sufficient to tackle problems of the dams and equipment. Pictures of sophisticated dam equipment	Establish a Training Centre to train Engineers as trainers	From the inception of Mahaweli dams	In Mahaweli Authority of Sri Lanka	
TH-S1	-	Water Law. Give power to RBC to get decision what project do they want.	In 2000, at the first beginning of setting RBC.	Thailand	Take times to transfer power and budget to Local Organization (RBC)
TH-S2	-	Give every one understand, how management is important. Push the government agencies to set more budget for maintenance and management.	In 2001 the cabinet set a budget frame for development 55% maintenance43% and management2%.	Thailand	Budget for management still didn't reach the target(2%). Because all of the measure are Non-construction. Even it can be the sustainable of development, but it give less money for management. So the agency dont like it. They families with big budget.
TH-S3	-	Institutional Reform again by setting Ministry of Water Resources. Or setting water resources in formation center.	Before 2001.	Thailand	Every agencies need data and information.
TH-S4	The existing staff do not have the knowledge sufficient to tackle problems of the dams and equipment. Pictures of sophisticated dam equipment.	Establish a Training Centre to train Engineers as trainers. Incorporate a exchange program between Sri Lanka and other Narbo countries to this training Centre	From the inception of Mahaweli dams	In Mahaweli Authority of Sri Lanka	-
VN-S1	-	- Setting up the legal regulation of operation for all hydraulic schemes, reservoir; - Continuing and pushing up the IEC activities on protection of hydraulic works; - Unifying the pattern of WUC; - To keep going and strengthening the policy "The State and people do together" on investment, construction and repair of hydraulic works;	Many years	Hydraulic schemes	- The operation staffs do not follow the regulation of operation; - Hydraulic works are getting deteriorate and degradation; - Many reservoirs do not have the regulation of operation. - WUC in some provinces is unavailable for local governments fail to pay attention to this form of water user organization;
VN-S2	-	Revised the Law	2001	Vietnam	No decentralization
VN-S3	-	Right decentralization	2004	Vietnam	O&M capacity building under taken by PMU who do not have experience in term of O& M.
VN-S4	-	One thing managed by one Ministry or agency	1999-2005	Vietnam	Two or more projects and programmes do the same thing at the same place
	Damage and Problem Picture	Think of Countermeasure for solution	From when does the problem occur?	Where does the problem occur?	How does the problem occur?

Chapter 3 Action plan

The following is an action plan that elaborates key challenges for each organization:

3.1 Comprehensive South Comilla and North Noakhali drainage - proposed by BWDB, BD -

1. Project Title: Comprehensive South Comilla and North Noakhali Drainage Project (SCNNNDP)

2. Implementing Agency: Bangladesh Water Development Board (BWDB)

3. Background of the Project:

The South Comilla and North Noakhali is located in the southeast region of Bangladesh, which experiences almost the same climate of the country, but it differs hydrologic ally. Characteristically, the project area is flood-affected during the pre-monsoon season and is affected by soil moisture deficits in the dry season. Flooding in the monsoon season is caused by a combination of (i) large inflow volumes from external rivers in the east which originate in the Tippera Hills of India (ii) heavy local rainfall, (iii) high Meghna and Lower Meghna River stages at the west and (iv) siltation and accretion in the south (Topographically, the North Noakhali is almost flat forming flood basins in Laksham and Begumgonj depressions. These depressions are deeply flooded during the monsoon season, which restricts crop production particularly the aman rice).

The pre-monsoon season is characterized by flash floods and unstable weather conditions, including the occurrence of intense tropical depressions and “Nor-Westers”, which generates heavy local rainfalls. During the pre-monsoon season, the project region is also subjected to larger floods spill through the Sonaichari Khal. New dakatia river near Bagmara and Old Dakatia/Little Feni and Kakri as well as some other rivers, which originate in the Indian Hills in the east. The floods are relatively flushy and may last from a few days to about few weeks. Flush floods and drainage congestion cause major crop damage in the region. These rivers also carry large amount of sediment load and a substantial amount of this sediment is deposited in the river channel bed.

Over the years, the project region is subjected to large scale hydro-morphological changes due to manmade activities and natural processes, which in turn largely, disrupted the drainage patterns. The region at present mainly drains through the three drainage channels. These are New Dakatia, WAPDA-Rahmatkhali Khal and Little Feni river. Channel bed sedimentation and accretion of new char lands in the south have significantly reduced the carrying capacity of Noakhali Khal thereby seriously changing the flow patterns in the area. In addition, the smaller khals have also been silted up specially in their out-falls. As a result, some of the area remains water logged round the year.

The South Comilla North Noakhali Drainage Project (SCNNNDP) is a large water management project. Project Gross Area 320000 ha. Net Area is 240000ha. Because of impeded drainage and water logging, about 2,11,779 ha (about 70%) of land remain flooded during the monsoon (1 in 5 yr return period).

The Project is Bounded by Chandpur-Comilla Road in the north, Char Baggadona and Shudharam Project and Sandwip Channel in the South, Indo-Bangladesh Border and Kazirhat Road in the East and Meghna River and Chandpur Irrigation Project In the West.

A significant portion of the project area grows no rice crop in the aman season owing to the flood status of the land. Boro is the principal rice crop of the area and even its production becomes uncertain because of unreliable water sources. As flood starts receding, People construct earthen dams across the channels to retain water for irrigation. Successive construction and demolition of dams creates competition and conflicts among people. Also there is conflict of interest in the operation of gates with fishermen.

Embkts built across the project area and embkt built to make small polders causes drainage congestion and W.L. outside rise. As flood starts receding, People construct earthen bunds across the channels to retain water for irrigation. This impedes drainage of remote areas causing delayed drainage affecting transplantation of Boro seedlings. Among other causes of drainage are:

- Flat land area and foreland accretion by siltation
- Low Gradient of Conveyance System- Flat bed level gradient of different canals
- Human Interference - Making growth centre -bazar, shops, godown and fish barriers within different canals.
- Hydrometeorological- Excess rainfall due to south-west monsoon

4. Outline of the Project:

(1) Overall Goal :

- Increase agricultural Productivity
- Improve living standard of the people
- Remove conflict of interest among people

(2) Project Purpose :

- Improvement of the drainage conditions throughout the year
- Improved irrigation supplies to as large an area as possible
- Augment agricultural productivity and accelerate other economic activities
- Increase fish production in the area
- Create navigational facilities
- Explore supporting facilities to people against vulnerabilities
- Explore potential for recreation
- Training of CBOs/LGI

(3) Outputs :

- Flood free area will increase from the present 1,08,241ha to 1,86,944 ha (78,703 ha).

- Improvement in the drainage congestion and cropping area accordingly.
- Sedimentation inside the project area will be stopped.
- The channels within the project can be maintained with minimum cost and the drainage efficiency will be sustainable
- Irrigation coverage will be increased significantly, 76,800 ha in dry season.
- Fisheries development very prospective
- Recreation facilities can be created in the embankments near Bamni Regulator facing the Sandwip Channel
- Safety against vulnerabilities will be increased

(4) Project Activities: In order to derive the output to achieve the project objectives; the physical activities to be executed are :

- ❖ Channel Improvement : 357.83 km
- ❖ Drainage Regulator : 2 nos
- ❖ Loop Cuts : 2 nos
- ❖ Earthen Closure : 2 nos
- ❖ Bank Protective work : 1800m
- ❖ Pump Station : 2 nos
- ❖ Rubber Dam : 2 nos

- Design of components :BWDB has its own design cell with sufficient expertise to prepare hydraulic and structural design of the components.
- Cost estimate of components :Cost estimate of the components as well as total cost of the works to be procured will be calculated by the concerned officials of the procuring entity. There is well organized set up of field offices to procure and supervise the execution of works.

Component Name	Quantity	Cost in Million Tk.
• Channel Improvement	357.83 km	373.00
• Drainage Regulator	2 nos	504.00
• Loop Cuts	2 nos	8.00
• Earthen Closure	2 nos	86.00

3	Loop Cuts									20 % work will be implemented after 3 rd year
4	Earthen Closure									
5	Pump Station	Will be Started in 4 th year								
6	Rubber Dam	Will be Started in 4 th year								
7	Bank Protective work									40 % work will be implemented after 3 rd year
8	Infrastructure	will be implemented after development of drainage components								
9	Operation & Maintenance	Will be Started after 3 rd year								
10	Monitoring									Continue

7. Role of Related Implementation Agency :

- Department of Fisheries can train fishermen of the project area to culture fisheries.
- Department of forestry can take up afforestation project along the Embankments in and around Bamni Regulator and Little Feni River.

8. Related Activities:

After the plantation, the area can be turned into picnic as well as tourist spot and also some arrangement can be made to safeguard local people against disasters.

9. Beneficiaries:

All types of stakeholders including Farmers, Fishermen, Local contracting society (LCS), landless and destitute as well as the people of the project area.

10. Others:

There is scarcity of water supply for household use in the area since the ground water in most of the areas are saline. Though the project cannot supply required amount of water for all required purposes, some purposes will be served by the canal/river water during dry period. Livelihood and living standard of the people of the project area will be enhanced.

3.2 Development of decision support system for integrated water resources management - proposed by IWM, BD -

1. Project Title: Development of Decision Support System (DSS) for Integrated Water Resources Management

2. Implementing Agency: Institute of Water Modeling (IWM), Bangladesh Water Development Board (BWDB), Water Resources Planning Organization (WARPO) & Local Government Engineering Department (LGED)

3. Background of the Project:

Bangladesh lies in the northeastern part of South Asia. It is located in the delta of three of the greatest rivers of the world – the Brahmaputra, the Ganges and the Meghna. Together these rivers drain through Bangladesh around 113 million hectare-metre of water to the sea. Around 90% of the water comes from the upper catchments in India, Nepal, Bhutan and China. The total area of the drainage basin is around 1.72 million sq. Km. The country has to provide drainage facilities to catchments of an area of about 13 times larger of its own due to it lie in lower riparian rivers. The geographical location of the country has turned it into a flood prone zone. However, drought is another common phenomenon in this country. Floods during monsoon and water scarcity during dry period have made water management a complex issue in Bangladesh. Accordingly, the need for improved water management is particularly acute due to growing demand for water in agriculture, minimizing flood hazards during flood and increasing conflict between alternative uses.

In Bangladesh, a series of disastrous floods in the 1950s and 1960s, explosive population growth and the introduction of high-yielding rice varieties preceded to develop infrastructures for flood control and later flood control, drainage and irrigation (FCDI) on a national scale. Most of the FCDI infrastructures are implemented 30 to 40 years ago. Numerous evaluations of these infrastructures have concluded that expected benefit was not achieved rather several adverse impacts and issues have been observed after implementation of these FCDI infrastructures. The impacts of these infrastructures have been further compounded by unplanned human intervention of other sectors such as construction of road networks, human settlement, industrial activities, water pollutions etc, since cross-sectional integration and holistic approach was not considered during planning and implementation of these FCDI infrastructures. Moreover, these FCDI infrastructures were implemented on an isolated manner, without any interaction amongst the stakeholders. To minimize the adverse impacts, an integrated approach to water resources management is needed, where cross sectional issues can be accommodated. Cross-sectional issues include multi-dimensional interactions between the various aspects of human activities, their impact on natural systems and the corresponding influence of natural responses upon the human domain.

The present institutional framework in Bangladesh has evolved a shape conducive for implementing an integrated approach to water resources management. Policy makers, planning bodies and implementing and monitoring agencies need decision making tool to support them in implementing integrated water resources management (IWRM). The complexity and inter-linkages in time, space and between sectors requires availability of reliable decision making tool to support proper planning and efficient management of water resources. Considering that as development would progress and more projects are completed, the problem of interdependence and impact assessment would grow more severe and costs of correcting adverse impacts will increase. In addition, the decision-making tool is needed to interact with stakeholders, help to understand each other's requirement, support to continuously monitor the processes, understand their impacts and help to adapt and adjust.

In this context, a Decision Support System (DSS) has been planned to develop. DSS will be based on mathematical model for solving problems that are too complex for traditional method of analysis. Modeling technique can provide sustainable solution considering impacts of different scenarios for flood control, drainage and irrigation related infrastructural improvements. The proposed model based DSS will be effective in making use of ever-increasing detailed digital data and knowledge related to the resources and the processes through which they can be utilized. The concept of DSS will be particularly useful in considering different aspects of sustainable development of watershed where solutions for different options/scenarios need to be formulated; and decisions need to be made on the basis of evaluation of various scenarios/options based on detailed resource analysis, resource allocation and impact assessment. Some important outcome of DSS will be that it will act as a means for participation of stakeholders, communication between different stakeholders or even different departments of public institutions and transparency, which are the key problems in today's water management practice.

Overall Goal

Multi-sectional impact assessment is a pre-requisite for sound and sustainable development of water resources. In Bangladesh, multiple objectives of different sector complicate the task of decision-making, especially when the objectives of different sector conflict. Accordingly, the ultimate goal of the proposed DSS will be to provide support to the decision-makers and other stakeholders through the task of considering all objectives and then evaluating options to identify a solution that best solves an explicit problem while satisfying as many objectives as possible.

Existing Development

The DSS will consist of mathematical models, GIS, a database containing multidisciplinary data, and user-friendly interfaces that connect decision-makers directly to the models and data they need to make informed, scientific decisions. GIS will be used to store, analysis and processing of spatial data. Mathematical model will be used to simulate hydrological aspect of different scenarios in an integrated way.

The existing tools available at Institute of Water Modeling (IWM) have been developed with state-of-art process modeling technologies. These models are sufficient to predict changes to the state parameters for any proposed interventions at regional level. These models will be interfaced with impact models (agriculture, fisheries, environment etc.) and Multi-criteria analysis (MCA) models to form a complete DSS for IWRM. Impact models (agriculture, fisheries, environment, economic) will be developed in consultation with sectional experts. MCA models will be developed which would assess the impact of various development and management options. The multi-criteria analysis model will allow a comparison of the scenarios and provide a good basis for a decision.

Project Purposes

The proposed DSS will provide support to develop regional water resources management plans, adaptable operating rules for flood control, drainage and irrigation related infrastructures, long-term regional water supply plans, resources assessment and real-time strategies for flood, irrigation and drainage improvement. However, major applications of DSS are given below;

DSS for Irrigation Management

Performance of an irrigation project rarely attains its design potential in Bangladesh. A few of the possible reasons include insufficient water at the source, inadequate conveyance of the irrigation system, deterioration of the irrigation system, incorrect operation of check structures, excess withdrawal at head end or simply social conflicts. Whatever the reasons are, there is a deviation from the target and the effect is a decrease in yields or crop production. To improve the irrigation system, the causes of such deviations are to be determined first. Determining the causes allows formulation of solutions. If it is known that water is a constraint, then supplementary amounts are to be investigated. Should the soil be of poor fertility, then appropriate fertilizers are to be used. If the

irrigation system has deteriorated too much, it has to be rehabilitated. Should the problem arise due to social conflicts, water user groups or association may need to be formed to resolve such crisis. All the above problems are due to lack of irrigation management. For improved irrigation management, a tool to assist the irrigation manager to monitor field irrigation activities, to perform necessary adjustments in irrigation scheduling by gate and pump operation, to open fuge plug for excessive drainage release, to redirect water from the areas in case of dyke failure and to optimize water use and resources by sharing groundwater and surface water in the field becomes vital. The DSS will be one of such tool.

DSS for Flood & Drainage Management

To reduce flood damages and hazards during flood period, accurate and confident decision taking is essential. Accurate and confident decision taking during flood period will be possible by real time flood forecast. Real time flood forecast for a sufficient time-period in advance enable the local authorities to warn for possible evacuate the local inhabitants of flood-prone areas at the basin which will minimize the loss of life and property due to flood. In addition effective operation and maintenance of flood control and drainage infrastructures is necessary, which require lot of information and data. Participation from different level of stakeholders like public representatives, government employees, professional groups, voluntary groups including NGOs and community-based organizations during flooding situation is also essential for effective management of flood. Better understanding of the flooding problem and probable extent of inundation due to flood is needed for communication with public representatives; government employees, NGOs, and rural communities, which will greatly facilitates mutual understanding and decision-making efforts.

In this context, development of a tool, which will be capable to forecast flood for a sufficient time period in advance and can produce flood map for better understanding of flood will be crucial. The DSS will be such tool.

DSS for Water Supply

Many water authorities in Bangladesh often derive their water supplies from several sources, which may include surface water, groundwater or combinations of these sources. To identify the best combination of supply sources in the long term, or to determine the most effective way of managing existing systems, decision-makers need a lot of information to account for all of the hydrologic, hydraulic, water quality, and economic relationships within the system.

A DSS in this situation will be a suitable tool.

Output

The DSS will be much more comprehensive than traditional methods of decision-making in water resources management. The DSS will organize and process information, and then translates the results into management plans that are comprehensive and justifiable. Output of DSS will be based on scientific data and models and can account for all stakeholder objectives, cause/effect relationships, risks, costs, and reliability, whereas traditional decision processes have had difficulty aggregating all of these considerations.

Some specific outputs of DSS are as follows;

- Resource assessment and Water Demand or Requirement
- Operation rule of flood control, drainage and irrigation infrastructure
- Flood Forecast
- Flood Depth Map
- Crop damage assessment
- Irrigation Scheduling

- Crop diversification
- Socio-economic and ecological impact assessment
- Multi-criteria Impact analysis
- Packaging of the developed tools to form the DSS for IWRM

The DSS will be capable of aggregating all competing objectives to identify the best strategy--that is, a strategy that is truly optimal. Moreover, as a process, decision support techniques will involve the decision-makers/ stakeholders in defining the problems and the objectives. This will give the stakeholders the knowledge that their values are important, and they can see that their qualitative and quantitative input is being used.

Project Activities

Major activities for developing DSS are given below;

- Development of Interfaces between existing process models of the country;
- Development of interfaces between process models and GIS for flood inundation analysis, crop damage assessment, water shortage area etc;
- Development of Socio-economic impact models and interfaces with existing process models
- Optimization and development of MCA models

The project will be partitioned into three phases. The activities of each phase have been given below;

Phase-I: (3 years Duration)

- The DSS will be developed at regional and national level excluding coastal and hilly region of Bangladesh

Phase-II: (2 years Duration)

- Coastal region will be included in this phase
- DSS will be custom-designed for specific systems to help achieve system-specific management objectives (Project Level).

Phase-III: (5 years Duration)

- Application and adaptation of DSS at Project Level
- Human Resource Development (HRD) through training

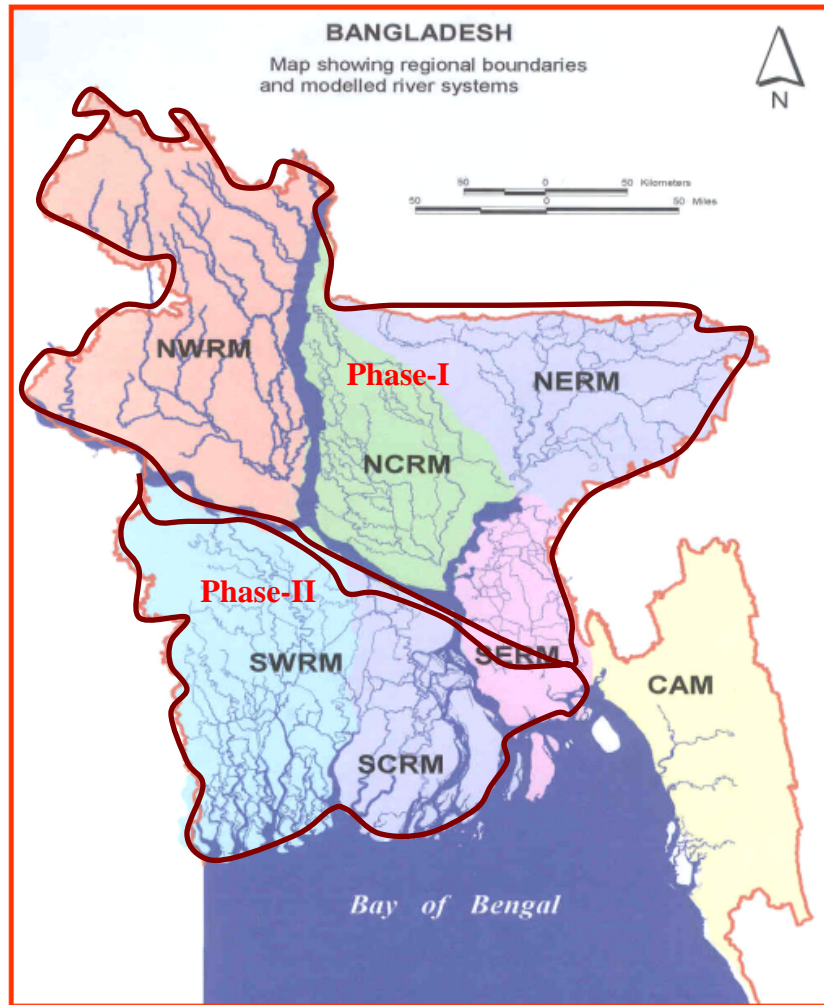




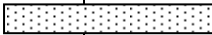
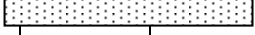
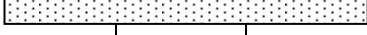
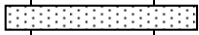

Figure 1: Phase Wise Study Area

4. Activity Schedule

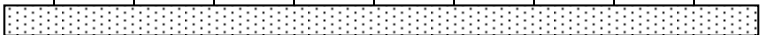

Phase I

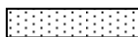
Activity	Year 1	Year 2	Year 3
1. Project conceptualization, requirement analysis	■		
2. Quality Checking of different types of data including model result	■		
3. Programming, coding, development of interfacing of database, model, uploading of data & GIS based maps		■	
4. Analysis of DSS output: flood inundation, crop damage assessment, impact assessment etc		■	
5. Development of Socio-economic impact models and interfaces with existing process models		■	
6. Multi-criteria Impact analysis			■
7. Documentation			■

Phase II

Activity	Year 4		Year 5	
1. Project conceptualization, requirement analysis for coastal areas and project level				
2. Quality Checking of different types of data including model result for coastal areas				
3. Programming, coding, development of interfacing of database, model, uploading of data & GIS based maps				
4. Analysis of DSS output: flood inundation, crop damage assessment, impact assessment etc				
5. Development of Socio-economic impact models and interfaces with existing process models for coastal areas and project level				
6. Multi-criteria Impact analysis				
7. Documentation				

Phase III

Activity	Year 6		Year 7		Year 8		Year 9		Year 10	
1. Application and adaptation of DSS at Project Level										
2. Human Resource Development (HRD) through training										



Intermittent Input

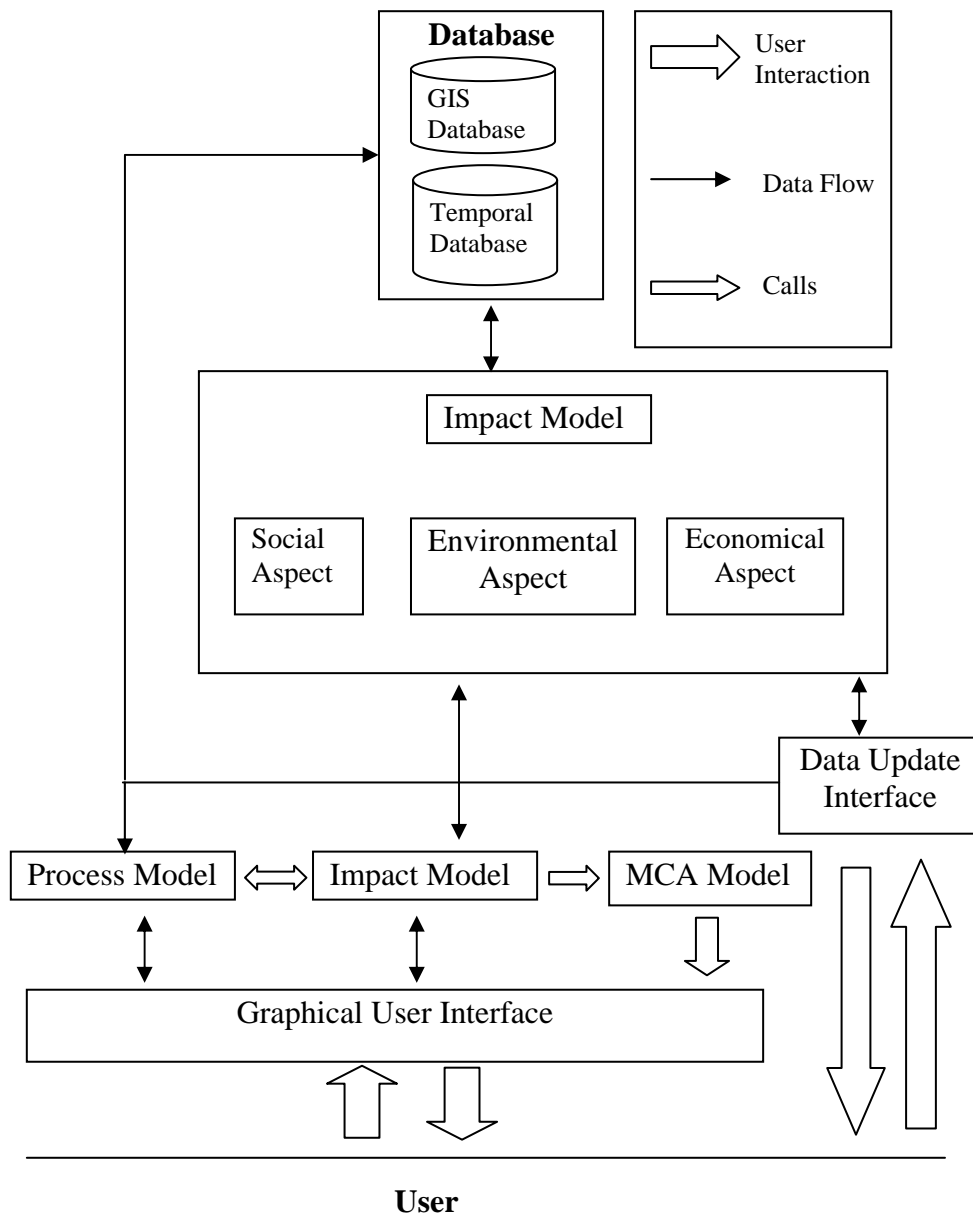


Figure 2: DSS Architecture

5. Role of related Implementation Agency

ssIWM

- Requirement Analysis
- Programming, coding, design and development of interfacing between processes model, Socio-economic impact models and MCA models.
- Uploading of data & GIS based maps
- Capacity building of professionals from BWDB and LGED

BWDB, WARPO & LGED

- Involvement in requirement analysis, design and quality checking of different types of data, make necessary arrangement for providing available data
- Application of DSS

6. Related Activities

- Field Testing of DSS
- Evaluation of the performance of DSS

7. Beneficiaries

Water resources stakeholder groups have very diverse goals and values, including environmental, economic, and ecological interests. Water resources managers must try to achieve numerous and often conflicting objectives, such as achieving sustainable yield, minimizing environmental impact, managing costs, maintaining adequate water supply and quality, controlling floods, minimizing energy use, and providing recreational opportunities. The proposed DSS will be an efficient decision making tool to understand the complex situations for finding out an optimal solution considering social, agricultural, economical and environmental aspects in an integrated way. Through adopting a series of options and demonstrating their effective outcome to the beneficiaries will save lot of efforts in resolving conflicting issues and complex situations. Output of DSS will produce a base for reasoning together, collaboration and consensus building among stakeholders.

The DSS will open up a new frontier for empowerment of the stakeholders with knowledge and information so that they can have direct access to decision making on water resources development initiatives.

3.3 Strengthening of water resources management information system in the Brantas river basin - proposed by PJTI, ID -

- 1. Project Title :** Strengthening of water resources management information system in the Brantas river basin
- 2. Implementation Agency :** Jasa Tirta I Public Corporation – Indonesia
Directorate General of Water Resources, Ministry of Public Works

3. Background of The Project

(1) Description of the Brantas River Basin

The Brantas River basin, one of the largest river systems in Indonesia, is located in the eastern part of the Java Island, Indonesia, between 110°30' and 112°55' East Longitude and 7°01' and 8°15' South Latitude. It covers catchment area of 11,800 km² in total and its main stream, the Brantas River, runs about 320 km long. The basin contains two active volcanoes: Mt. Semeru (3,676 m) to the East, and Mt. Kelud (1,724 m) near the basin center. Volcanic ash is both a major source of soil fertility and a primary cause of reservoir sedimentation within the basin.

Population in the basin is quite dense, closing to 15.6 million people in the year 2004. This counts for 42.6% of East Java population. Population is concentrated in the lower basin, in the major metropolis of Surabaya and surrounding communities; and in the upstream communities of Malang, Kediri and Blitar. Industry is also concentrated in the downstream and delta regions. Important water-using industries in the Brantas include sugar processing, pulp and paper, leather and food products.

Comprehensive water resources development in the Brantas river basin is carried out based on the comprehensive plan commences in 1961 and is based on a series of master plans that involves stage-wise planning in accordance to the national development requirements. Development in the basin resulted into 8 (eight) reservoirs (Sengguruh, Sutami, Lahor, Wlingi, Lodoyo, Selorejo, Bening and Wonorejo), four river-improvement-schemes, four barrages, and three rubber dams. Total investment in water resources infrastructure is priced Rp 7.63 trillion based on the year 2003 price level (US\$ 0.097 billion, Yen 78.8 billion, Rp. 258.9 billion).

(2) Institutional and Water Allocation

The major agencies concerned with the water resources management in the Brantas river are mainly implemented by Brantas River Basin Institute (Balai Besar Wilayah Sungai Brantas) as the representative office of Ministry of Public Works (MPW), Provincial Water Resources Services (Dinas PU Pengairan). Some authorities are delegated to agencies related to the water resources services at the regency/city government level and Jasa Tirta Public Corporation (PJTI) by the government regulation.

In order to avoid conflict among water users in the Brantas River Basin, a provincial Water Resources Management Committee (*Panitia Tata Pengaturan Air/PTPA*) was established based on the East Java Governor's Decree No. 59 of 1994 on the Establishment of Water Resources Management Committee in East Java Province. The committee, which is responsible to its

respective Governor, are supposed to be a coordination body where decision on all management aspects in water resources (planning, implementing, supervising, controlling and funding) in its respective area is made.

PTPA members are currently from the water resources related agencies and the water user companies (State Electric Power Company and Regional Water Supply Enterprises); other water users are represented by the related local government agencies, such as Irrigation, Industrial and Agricultural Services. However, it is planned to include all the stakeholders, such as farmers association, industrial association, etc.

Issues and problems on water extraction use:

- i. All of gate discharge calculation table for the irrigation intakes, which are the elements for measurement of the accurate intake discharges, have never been revised since their installation.
- ii. Some intakes and canals are operated by the agencies other than PJT 1. PJT1 gets information on intake discharge, but PJT 1 does not measure intake discharge themselves.
- iii. There are many industrial and domestic water intakes without measurement devices. This situation will not result in the efficient water use.
- iv. Difficulty to justify the water allocation in dry season when the estimate discharge in the pattern (POLA) less than the actual condition due to the above condition.

(3) Flood Control Management

Agencies involved in the flood control management are almost the same as those seated in Water Resources Management Committee which discuss at least every dry season. Coordination were conducted through the committee by means of planning the reservoir operation rule for the rainy season. Should be there any natural disaster due to flooding, the Natural Disaster Mitigation Task Force (Satkorlak Penanggulangan Bencana Alam – PBA) will take over the salvaging action.

The Flood Forecasting and Warning System (FFWS) of the basin was completely installed and established at the end of at the end of 1990 and started its operation from the beginning of 1991.

Flood Forecasting and Warning System is telemetering system that measure and has the ability to predict incoming flood. This system is equipped with a public announcement mechanism to inform inhabitants that might be affected by the flood, in order reduce the loss affected by flood.

Issues and problems on flood control management:

Depreciation time of FFWS is generally designed for about 10 years and one for spare parts is about 15 years. The hardware and software for the existing FFWS is the first generation and equipment for the existing FFWS has not been produced since 1996.

(4) Water Quality Management

The water quality management can be divided into in-stream water quality management and off-stream water quality management for the pollution sources. The activities of the water quality management are mainly implemented by the Ministry of Environment (Kementerian Negara

Lingkungan Hidup/MenLH) at the state level, Bapedal of EJP at the provincial government level, and the environment related agencies at the regency/city government level.

The ministry of environment is in charge of formulating the policy of water quality management including the national water quality standards. Bapedal of EJP is in charge of determination of the provincial water quality standards for rivers and waste water and monitoring and controlling the water quality in the inter-regency river. On the other hand, the licencing and permission of discharging domestic and industrial waste water is done the agencies at the regency/city government level. Hence, the coordination of the provincial and regenciesgovernment become a key requirement to conserve the river water quality in the Brantas River basin.

Issues and problems on water quality management:

The problem of water quality primarily occurred on lower Brantas reach, where water quality deterioration is very serious and surface water, as main water resources for Surabaya PDAM are limited.

The problem has occurred in the Brantas river basin areas which cross with border of regency/city. The water quality management is carried out by the provincial Bapedal, but the controlling the wastewater discharge is under Environmental regency/city agency. This situation brings about the difficult in making the coordination among upper regency/city government and lower regency/city government and also between provincial government and city/regency governments.

4. Objective of the Project

(1) The Project Proposed

Improvement of the management information system, upgrade the management information system, and formulation of inter-agency management system.

(2) Overall goal/medium and long-term objectives

- (a) The medium and long term objectives are to properly conduct the integrated and effective water management in the Brantas River Basin which is to be established by the proposed project, so as to cope with flood hazard, increasing water demand and limited exploitable resources as well as degradation of river water quality.
- (b) Sustainable operation of the existing river facilities in the basin would be attained through structural and non-structural measures to be proposed in the course of the proposed project.

5. Outline Of The Project

(1) Outputs

This project covers all water-related matters in the river basin in view of water supplies, flood control, hydropower generation, and water quality control, so on. Therefore, most of all population in the river basin will get some benefits from the project. The population in the river basin is approximately 16 million.

Expected social and economic effects (itemize concretely):

- Steady water supply to all demand sectors based on the effective and efficient use of water resources in the Brantas River basin
- Contribution to the national and regional socio-economic development based on improvement of water resources management function in the river basin
- To sustain flood control effect in the river basin by improvement of the existing telemetering system and management information systems.
- Conservation and improvement of river water quality and environment.

(2) Project Activities

The outline of the project consist of :

(a) Strengthening of the existing Flood Forecasting Warning System (FFWS)

The following improvement of the existing system is required to reinforce the water management in the basin:

- i. Installation of additional telemeter water level/rainfall/water quality monitoring stations especially for Low Water Management System,
- ii. Installation of radar equipment for weather monitoring
- iii. Improvement of existing flood forecasting program
- iv. Up grading of the existing computer system and master station, Engineering services at least shall consist of and not be limited to:
 - i. Evaluation of the function of existing facilities,
 - ii. Design of the proposed improvement of FFWS

(b) Upgrade of the Management Information System (MIS)

The existing Jasa Tirta I's Management Information System shall be improved faced water management problems in the basin.

(c) Formulation of the inter-agency water management information system

The idea of an inter-agency information system is to create an environment in which various water-related organizations, both public and private, can share the information on water resource and related issues through linking by a computer system. Further, a prompt and reliable information system is required for a regulator to settle issues among the agencies concerned. At the moment, there are many agencies carrying out monitoring related with water management in the Brantas River basin.

Sometimes, there is duplication among monitoring activities since similar study or investigations under different agencies have been conducted. The cooperation among related agencies is important to improve the water management, as well as to minimize the operation costs of those monitoring activities.

Furthermore, all the information related water resources should be opened to the stakeholders, such as water availability, water quality, and flood control including flood disaster information.

The engineering service shall coordinate the requirement of each agency and overall water management in the basin, and establish the effective management information system, which refers to the Japanese experiences and knowledge.

Engineering services at least shall consist of and not be limited to:

- i. Review of present condition of data collection by each agency,

- ii. Clarification of issues concerning data collection by each agency, such as duplication among their monitoring activities and data unavailability.
 - iii. Clarification of Jasa Tirta I's position as data accumulated center,
 - iv. Assistance for consensus among the agencies,
 - v. Study for practical use of accumulated information among the stakeholders,
 - vi. Design of the Inter-agency Information System
- (d) Technical transfer for the operation and maintenance of the said system
 - (e) Provision of manuals for the operation and maintenance of the said system
 - (f) Equipment to be supplied

Equipment for proposed systems and modification or improvement of the existing systems to be supplied is as follows. The equipment shall be specifically designed in the course of the engineering services:

- i. The upgraded FFWS including radar system
- ii. The upgraded Management Information System
- iii. The Inter-agency Information System

(3) Rough request amount

Between US \$ 5,000,000 and US \$ 10,000,000

(4) Benefits/beneficiaries and expected results of the project/program

This project aims at an improvement of effective water management, as well as strengthening the Jasa Tirta I operations. Water management shall have benefits not only to the whole the Brantas River Basin but also some area of the East Java Province. However, definite area that will benefit by the project is the Brantas River Basin (Approx. 11,800 km²)

This project covers all water-related matters in the river basin in view of water supplies, flood control, hydropower generation, and water quality control, so on. Therefore, most of all population in the river basin will get some benefits from the project. The population in the river basin is approximately 16 million.

Expected social and economic effects (itemize concretely):

- Steady water supply to all demand sectors based on the effective and efficient use of water resources in the Brantas River basin
- Contribution to the national and regional socio-economic development based on improvement of water resources management function in the river basin
- To sustain flood control effect in the river basin by improvement of the existing telemetering system and management information systems.
- Conservation and improvement of river water quality and environment.

6. Implementation Schedule

(1) 10 years work plan

For 10(ten) years will be done the operation and maintenance of the project

(2) 3 years work plan

Work Items	1 st year	2 nd year	3 rd year
------------	----------------------	----------------------	----------------------

1. Overall Schedule			
a. Engineering Studies	██████████		
b. Implementation of the System		████████████████████	
2. Engineering Services			
a. Formulation of the inter-agency water management information system	██████████		
b. Formulation of the information services for the watershed residents	██████████		
c. Modification of water related monitoring system	██████████		
d. Upgrading of the water management information system		████████████████████	
e. Establishment of the water management information system			

Detail Schedule as Attachment 1&2

7. Role of Related Implementation Agency

Directorate General of Water Resources, Ministry of Public Works

8. Related Activities

(1) Development study

The proposed scheme has been recommended as the results of the JICA Study (February 1997 to October 1998) titled “The Study on Comprehensive Management Plan for the Water Resources of the Brantas River Basin”.

The other assistance scheme of Japan’s ODA which is on going project and has relation to this project is “Water Resources Existing Facilities Rehabilitation and Capacity Improvement Project” (JBIC LOAN NO. IP-510) – Strengthening of the Operation and Maintenance System for Jasa Tirta I Public Corporation (TOR 7).

(2) Technical cooperation (expert, training, equipment)

No technical cooperation (expert, training, equipment) currently conducted in the Brantas River basin.

9. The Detailed Content of the Project

(1) Facility

a) Site address

Master station will be located in the existing site at Head office of Jasa Tirta I Public Corporatin. Sub-master and monitoring stations will be located in the existing sites.

b) Rationale for the selected sites (Please specify the priority of the candidate sites)

c) The number and the size of the facility

The number and size of the facility will be determined later on.

d) Cost of construction (Cost breakdown)

See cost breakdown in the **Attachment 3**.

e) Lay out plan (if available)

Not available yet

f) Specification of construction materials (if any)

Not any

(2) Equipment

- a) Site address to be installed
All equipment will be installed in the existing sites and the proposed agencies.
- b) Function
All equipment will be functioned within framework of water management information system which consist of collecting, transmitting, and saving data.
- c) Names of main equipment
Multiplex Radio Communication System (Broadband Communication), telemetry system, X-band Micro Raingauge Radar System, computer networks and database system, etc.
- d) Cost of purchase (Cost breakdown)
See cost breakdown in the **Attachment 3** .
- e) Specifications, the numbers, and unit prices (if available)
- f) Invoice (if available)

(3) How to operate and maintain the facility / equipment, including the staff and technical level of the responsible organization

Since Jasa Tirta I conducts the operation and maintenance works of the existing management information system, the present staffs of the Jasa Tirta I will undertake the operation and maintenance works of the upgraded management information system. Hence, they will be trained during the engineering services period as well as manufactures operation and maintenance guidance services period.

(4) Preparation and environment of site

- 1) Land secured or to be secured

Water management information system

Equipment of the water management system will be installed in the buildings or lots of the related agencies' office.

Telemetering system

Most of equipment of the water management system will be installed in the buildings or lots of the related agencies' offices, or along the river channels, which are within the river right-of-way.

- 2) Leveling, drainage, availability of electricity, water, and telephone
Leveling and drainage works will be done based on the situation at sites. The existing facilities where proposed equipment will be installed have had the constant electric power supply, drinking water and telephones. Telemeter station where power supply is not available will have a solar panel battery system.

- 3) Natural condition

Topography

The Brantas River in the East Java lies between 110°30' and 112 ° 55' east longitudes and between 7°01' and 8°15' south latitude. The Brantas river basin is bounded by Mt. Bromo (EL.2,392 m)-Mt. Semeru (EL.3,676) in the east, a series of low Kidul ridges (EL.300 - 500 m) in the south, Mt. Wilis (EL.2,169 m) and its families in the west and Kedung ridges and the Madura strait in the north. The Arjuno Mountain Complex which consists of Mt. Arjuno (EL.3,339 m), Mt. Butak (EL.2,868 m) and Mt. Kelud (EL.1,731 m) is located in the center of the basin.

Climate and Hydrology

The climate in the basin is dominated by tropical monsoons. In the normal years, the rainy season is about 6 months long from November to April, and the dry season prevails from May to October. The yearly mean temperature in the basin ranges from 24.2°C in Malang to 26.6°C in Porong. The average annual rainfall over the basin is around 2,000 mm, of which more than 80% occurs in the rainy season.

Variation of annual rainfall is large; 2,960 mm in a rainy year and 1,370 mm in a drought year. The average annual rainfall in the high elevation areas is generally high,

3,000 through 4,000 mm especially in southern and western slopes of Mt. Kelud. The yearly mean relative humidity in the basin ranges from 75% to 82% depending on the location.

4) Security condition

No security problem is foreseen in the project area.

10. Beneficiaries

Benefits/beneficiaries and expected results of the project/program

This project aims at an improvement of effective water management, as well as strengthening the Jasa Tirta I operations. Water management shall have benefits not only to the whole the Brantas River Basin but also some area of the East Java Province. However, definite area that will benefit by the project is the Brantas River Basin (Approx. 11,800 km²)

This project covers all water-related matters in the river basin in view of water supplies, flood control, hydropower generation, and water quality control, so on. Therefore, most of all population in the river basin will get some benefits from the project. The population in the river basin is approximately 16 million.

Expected social and economic effects (itemize concretely):

- Steady water supply to all demand sectors based on the effective and efficient use of water resources in the Brantas River basin
- Contribution to the national and regional socio-economic development based on improvement of water resources management function in the river basin
- To sustain flood control effect in the river basin by improvement of the existing telemetering system and management information systems.
- Conservation and improvement of river water quality and environment.

11. Others

Aid by third countries or international organizations in the related field

At present, there are 23 on-line water quality monitoring stations, 7 rainfall stations and 7 water level gauging stations constructed by Indonesian Institute of Science (Lembaga Ilmu Pengetahuan Indonesia, LIPI) in cooperation with the Government of Austria. The project period was implemented from March 1999 until March 2004.

3.4 Provision of Asian centre for dam safety training, a training centre for the technical staff of Mahaweli Authority of Sri Lanka and affiliated organizations and those of Asia - proposed by MASL, MADAS, LK -

1. Project Title : Provision of Asian centre for dam safety training, a training centre for the technical staff of Mahaweli Authority of Sri Lanka and affiliated organizations and those of Asia

2. Implementing Agency: Mahaweli Authority of Sri Lanka

3. Background of the Project

The Headworks Division of the Mahaweli Authority of Sri Lanka is its most important agency which is entrusted with operation and maintenance of the dams constructed during the accelerated program, viz., Kotmale, Victoria, Randenigala, Rantembe and Maduru Oya and the dams previously constructed under Mahaweli Development Board, viz., Polgolla and Bowatenna. These contribute 640 MW of power (30% of total Sri Lankan production) and 270,000 ha. of agricultural land (1/3rd of the total agricultural land) Operation and maintenance of these dams are very important because of the dam safety considerations and control of water for the national needs agriculture and electricity are involved.

Most of these dams have **electrical, electronic, hydraulic** and essentially **mechanical** control equipment which needs special skills to operate and maintain. Most of these dams are also equipped with modern sophisticated instruments to monitor their behaviour relevant to **dam safety** considerations. Service of **young talented and well trained Engineers** and technical personnel at each site is a must to operate and maintain the above electro mechanical and hydraulic equipment and to read and analyze the instrumentation data to warn of any impending dam related disasters as practiced in similar organizations in developed countries.

Therefore, the normal functions of the Headworks Division differ from those of the other agencies of the MASL, but closely resemble the functions of the Ceylon Electricity Board requiring high technical skills to operate and maintain. Any lapses in operation and maintenance of the Headworks Division due to reduction in reliability, safety or stability of dams would invariably affect CEB and the Department of Irrigation as they are closely linked functionally. ID controls thousands of medium and small scale dams and reservoirs. CEB too controls about ten medium scale dams and reservoirs.

However, at present the Headworks Division, after twenty years of its existence, such technically skilled personnel as Engineers, Engineering Assistants and Technical Officers have dwindled to a very limited number. These personnel have gained such skills working on the job in the Headworks Division for many years. Therefore, prompt and stern action has to be taken to replenish the depleted technical staff of the Headworks Division. Action should also be taken to encourage, strengthen with proper training targeting USBR standards and requirements and enhance opportunities for promotion to prevent their exodus from the organization.

Most of these sites are located far away from cities and they cannot satisfy their career development prospects such as training and promotions. Therefore the management is facing difficulties in retaining the technical personnel within the organization.

From a social point of view schools and other infrastructure facilities compared to those available to staffs of other organizations located in urban areas are not accessible to them.

Even though these needs could be compensated by increased remuneration and incentives the Mahaweli Authority cannot afford such increased spending.

In addition, most of the dams have modern sophisticated equipment, the maintenance of which should be handled only by well trained technical personnel in order to prolong the life span of the dams and equipment and expect reasonable reliability of operation.

The proposed Training Centre should focus its functions on enhancing the knowledge and skills of the technical personnel to the standards of the international training institutions.

The proposed Training Centre can be further expanded on a self sustainable commercial basis by making available its training facilities to other organizations with similar functions such as the Department of Irrigation and the Ceylon Electricity Board and ID of which a few hundred technical personnel serve. Even organizations of neighboring countries in the Asian region could be served depending on the resources available in the Training Centre.

The staff of the Training Centre invariably will comprise experts and would ideally serve as consultants to technical staffs of the dams in day to day technical problems encountered in maintenance.

Another important area where this Training Centre could be of immense service is the need of having awareness programs within the respective river basins for catchment dwellers whose subsistence farming and other activities such as denuding the forest cover cause erosion and eventual siltation of reservoirs reducing the effective life and educating them on the service of O & M cost incurred by the Government to provide a reliable service to them .

The determination of the nature, extents, staffing and equipping of the Training Center shall be in the hands of experts.

The approximate numbers of Engineers, Engineering Assistants and Technical Officers of the MASL, Ceylon Electricity Board and the Irrigation Department requiring training are tabulated below.

Organization	Engineers	Engineering Assistants	Technical Officers	Others
MASL	150	75	250	
CEB	100	150	200	
ID	100	200	100	
Water Board and Agrarian Services	25	15	75	
Private power producers	Not ascertained yet			

4. Outline of the Project:

Overall Goal

A well trained and job wise satisfied technical staff in Sri Lanka and all Asian regions for effective execution of duties and the exodus of technical staff from the organization prevented.

To have the school children and farming society and the people living in the catchments and river basins educated through awareness programs to conserve water and save the catchments from fires and 'chena' cultivation (subsistence farming). The said stakeholders shall be made aware of sedimentation, difficulties, high cost of operation and maintenance, the meagre income and funds available, and the efforts of the MASL in managing the river basins to yield a reliable supply of water and electricity.

*Initially, until the Centre for Dam Safety Training facilities are made available, an **exchange program** could be implemented for Engineers and Technical Staff, with Japan.

Project Purpose

To establish a well equipped and organized Centre for Dam Safety Training for the Asian region to fulfill the above needs.

Outputs

Initial program of exchanging Engineers and Technical staff
Training courses associated with USBR Guide Lines for Engineers, Engineering Assistants and Technical Officers in Sri Lanka and all Asia
Awareness programs for downstream water users, catchment dwellers, and school children
Consultancy to technical staffs in on-the-job maintenance problems

Project Activities

- A) Feasibility study
- B) Define equipment and staff
- C) Plan the buildings for the Training Centre and its staff
- D) Determination of location and acquisition of land
- E) Exchange program for Engineers and technical Staff*
- F) Define course contents and durations
- G) Obtain any consent required from relevant Governmental organizations
- H) Obtain funds for infrastructure and equipment
- I) Build the Training Centre
- J) Equip the Training Centre with staff and equipment
- K) Begin functioning
- L) Evaluate the effect of the courses and redefine them if necessary
- M) Study viability of extension of the services of the Training Centre to relevant local and foreign organizations
- N) Extend services to relevant local organizations
- O) Extend services to relevant foreign organizations
- P) Continue functioning

Training functions

5. Implementation Schedule

10 years work plan (Attached)

3 years work plan (Attached)

6. Role of Implementation Agency

The Mahaweli Authority of Sri Lanka will

- Assist in the feasibility study
- Assist in the determination of location and acquisition of land
- Assist to define course contents and durations
- Obtain any consent required from relevant Governmental organizations
- Assist to begin functioning
- Assist to evaluate the effect of the courses and redefine them if necessary
- Assist to study viability of extension of the services of the Training Centre to relevant local and foreign organizations
- Assist to extend services to relevant local organizations
- Assist to extend services to relevant foreign organizations
- Assist to continue functioning

7. Related Activities: None

8. Beneficiaries:

The Engineers, Engineering Assistants, Technical Officers
Downstream water users of Mahaweli reservoirs and catchment dwellers
Mahaweli Authority of Sri Lanka
Other related organizations
Eventually Sri Lanka and Asian countries associated with NARBO activities will benefit

9. Others: Proposed location

The Kotmale dam premises are selected as the tentative location for the Asian Centre for Dam Safety Training.

The ideal location would be Kotmale where the Engineers' camp of the staff during construction has about five underutilized three-room houses, which can be improved for this purpose at little cost.

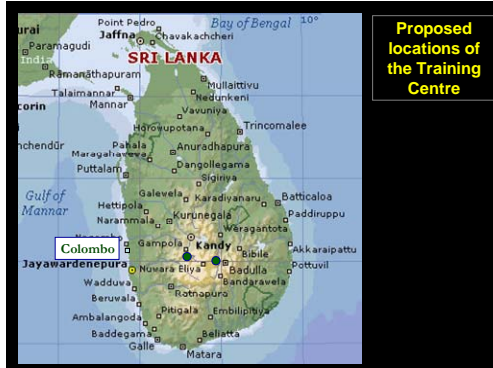
This camp has the infrastructure such as a swimming pool and a club house and recreation facilities. In addition, the Dam Site and the D/S area are available for prompt demonstrations and practical sessions of the training courses. This place is central to all the dams, downstream areas and river basins. As such, field study tours could be arranged to visit them in a few hours.

Attachments:

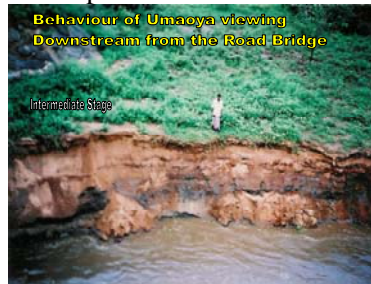
- 1) Summary of Training Schedule Module based on USBR Dam Safety Regulations
- 2) Work Plan 3 year and 10 year

Photos

Location of Sri Lanka



Sedimentation due to catchment misuse Photos will be presented at the Workshop



Burning forest cover of catchment for subsistence farming



Building refuse being dumped into the reservoir periphery



Sediment at Polgolla Reservoir



**Three Year Plan
Training Centre for Mahaweli Authority of Sri Lanka**

Task	Year											
	2008				2009				2010			
	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter
	1	2	3	4	1	2	3	4	1	2	3	4
Exchange program for engineers												
Feasibility study												
Define equipment and staff												
Plan the buildings for the Training Centre and the its staff												
Determination of location and acquisition of land												
Define course contents and durations												
Obtain any consent required from relevant Governmental organizations												
Obtain funds												
Build the Training Centre												
Equip the Training Centre with staff and equipment												
Begin functioning												
Evaluate the effect of the courses and redefine them if necessary												
Study viability of extension of the services of the Training Centre to relevant local and foreign organizations												
Extend services to relevant local organizations												
Extend services to relevant foreign organizations												
Continue functioning												

**Ten Year Plan
Training Centre for Mahaweli Authority of Sri Lanka**

Task	Year																																							
	2008				2009				2010				2011				2012				2013				2014				2015				2016				2017			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Exchange program for engineers																																								
Feasibility study																																								
Define equipment and staff																																								
Plan the buildings for the Training Centre and the its staff																																								
Determination of location and acquisition of land																																								
Define course contents and durations																																								
Obtain any consent required from relevant Governmental organizations																																								
Obtain funds																																								
Build the Training Centre																																								
Equip the Training Centre with staff and equipment																																								
Begin functioning																																								
Evaluate the effect of the courses and redefine them if necessary																																								
Study viability of extension of the services of the Training Centre to relevant local and foreign organizations																																								
Extend services to relevant local organizations																																								
Extend services to relevant foreign organizations																																								
Continue functioning																																								

3.5 Water Resources Management Center - proposed by DWR, MONRE, TH -

1. Project Title : Water Resources Management Center

2. Implementation Agency : Department of Water Resources

3. Background of The Project

(1) Thailand's Water Situation

Thailand is still faced with water-related problems whether they are water shortage, flood and water quality. All these problems have caused severe damages and adverse impacts on the economy and people's way of life. To deal with the recurring calamities, Thailand is divided into 25 major river basins and 254 sub-basins, with total coverage areas of 512,000 sq.km. The total annual rainfall is 804,372 million cubic meters (MCM) while average rainfall is 1,573 mm./year. Average runoff is 213,423 MCM/year or equivalent to 3,425 mm./person/year.

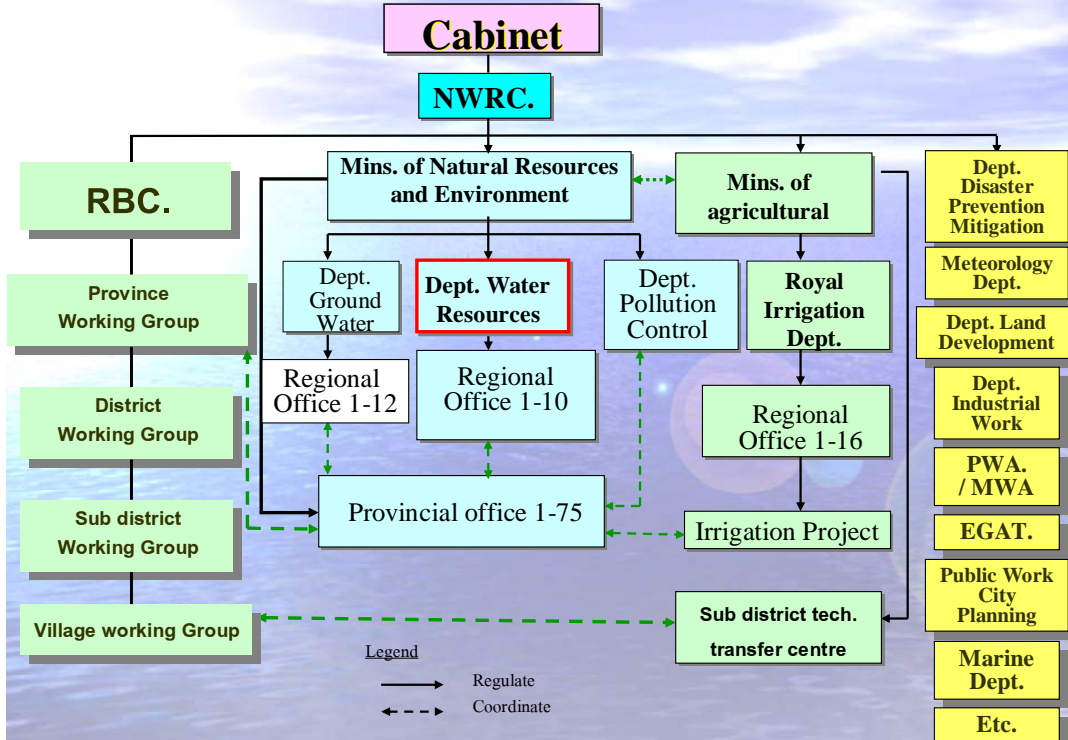
In 2005, water storage available in dams and reservoirs all over the country reached only 51,110 MCM which is not sufficient to meet current water demand of 92,736 MCM and to cope with future water demand of 114,487 MCM in 2009. Due to free utilization and accession to water in the country, the problems of inefficient water utilization and conflict during dry season among water users from different sectors are prevailing. Continuous loss of watershed forest areas causes flood, landslide in rainy season and drought in dry season. In addition, the integration of water resources management is still lacking.

Regarding water quality, it was found that in 2005 water quality in only 20% of water resources is good; 48% fair and 27% deteriorated. Within the past three years, water resources with good water quality tended to decrease by one fold. The worst water quality was found in large scale river basins urban communities, i.e., Lower Chao Phraya, Lower Tha Chin, Lower Lam Takong and Songkhla Lake. The government has invested by constructing total 87 community wastewater treatment plants in the municipalities which are able to serve 34% of total service areas, but treat only 25% of total wastewater quantity.

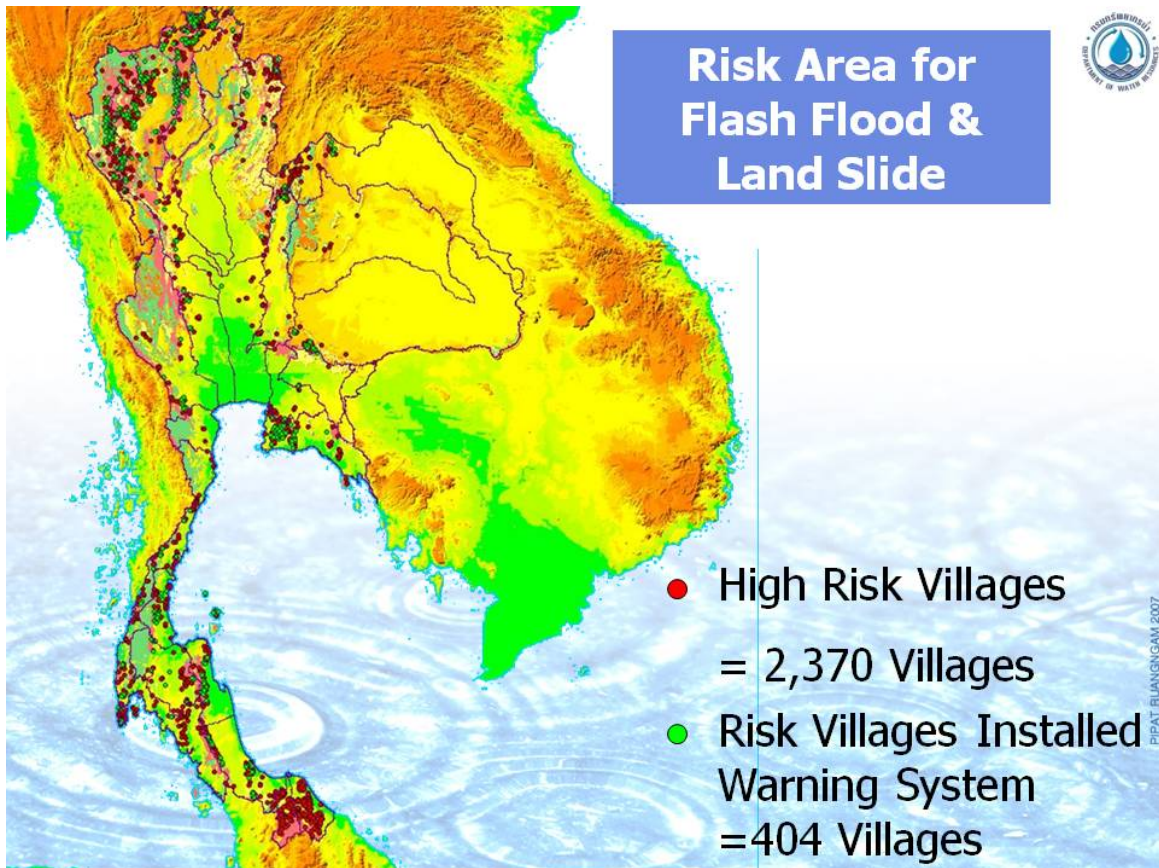
(2) National Institutional Reform 2002

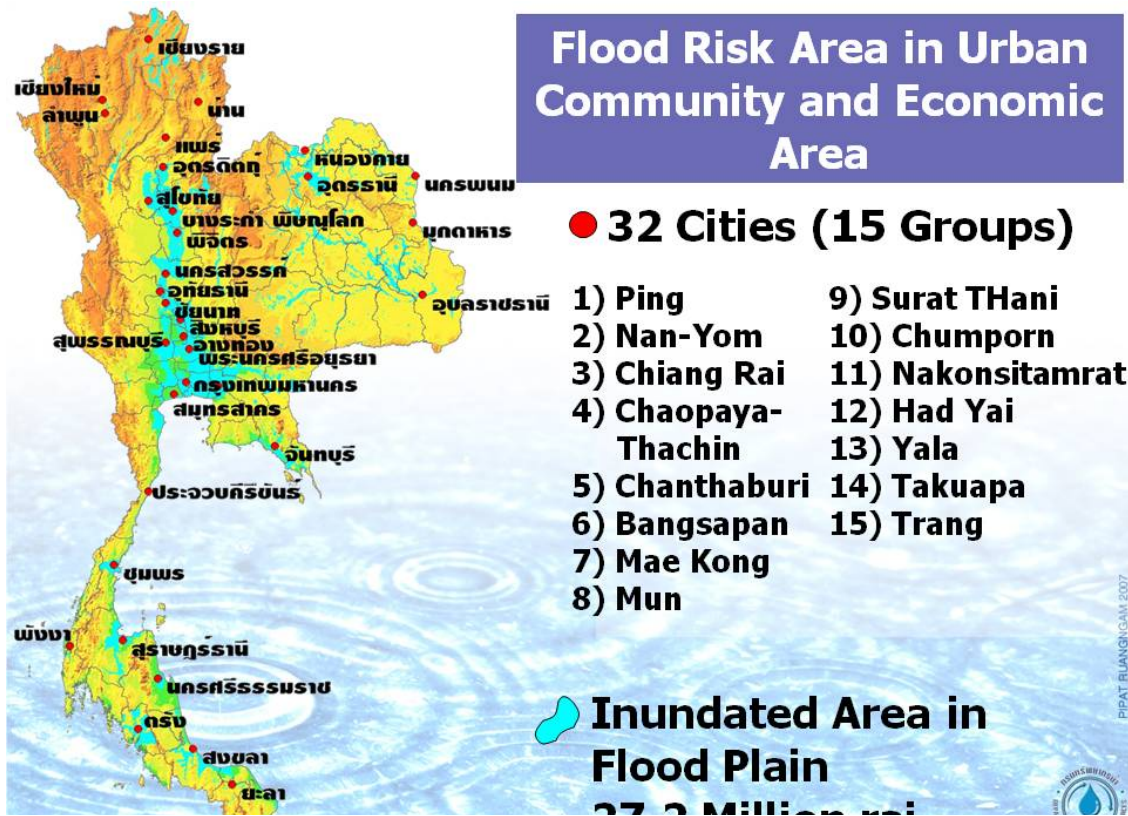
Before 2001 there were 40 agencies of 9 ministries to concern with water management in Thailand. After the National Institutional Reform 2002, 28 agencies under 5 ministries are responsible for water resources development and management, such as Department of Water Resources (DWR), Department of Groundwater Resources (DGR) and Pollution Control Department under the Ministry of Natural Resources and Environment; Royal Irrigation Department under the Ministry of Agriculture and Cooperatives; Provincial Waterworks Authority and Metropolitan Waterworks Authority under the Ministry of Interior. Each agency has its own plan for water resources development and management. Some projects are in the same area of respective agencies. So, there is no Integrated Water Resources Management Center for river basin management.

National Institutional Reform 2002

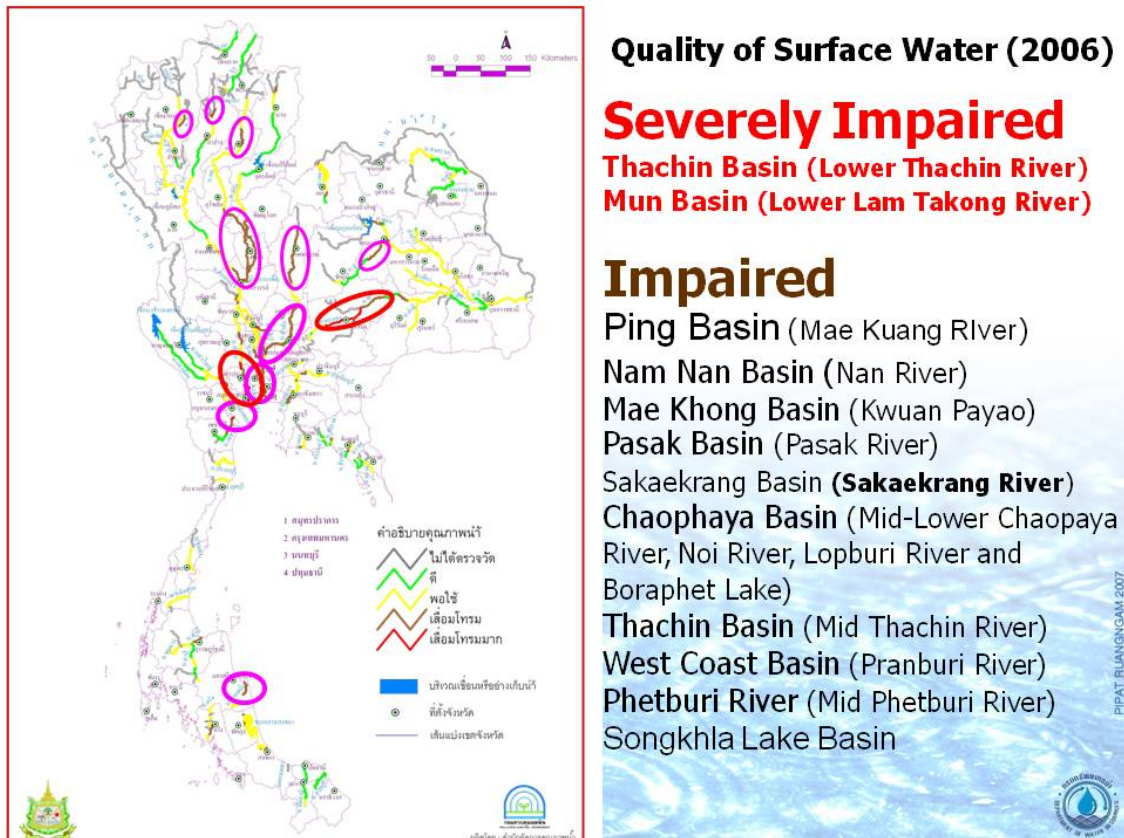


(3) Flood





(4) Water Quality



4. Outline Of The Project

(1) Overall goal

Thailand will have Water Resources Management Center to collect and analyze water resources data for flood, drought and water quality problem management.

(2) The Proposed Project

(1) To be the center for data collection and analysis for determining risk area; and investigating and monitoring the water situation of the country.

(2) To be the center for determination of work plan and protective measures for water crisis in order for cooperative implementation or to support the implementation of related agencies in long term period.

(3) To be the center for investigation, protection, warning and management of water crisis in terms of quantity and quality.

(4) To be the center for control, evaluation and monitoring of the implementation of work so as to develop and improve the approach of water disaster protection and mitigation.

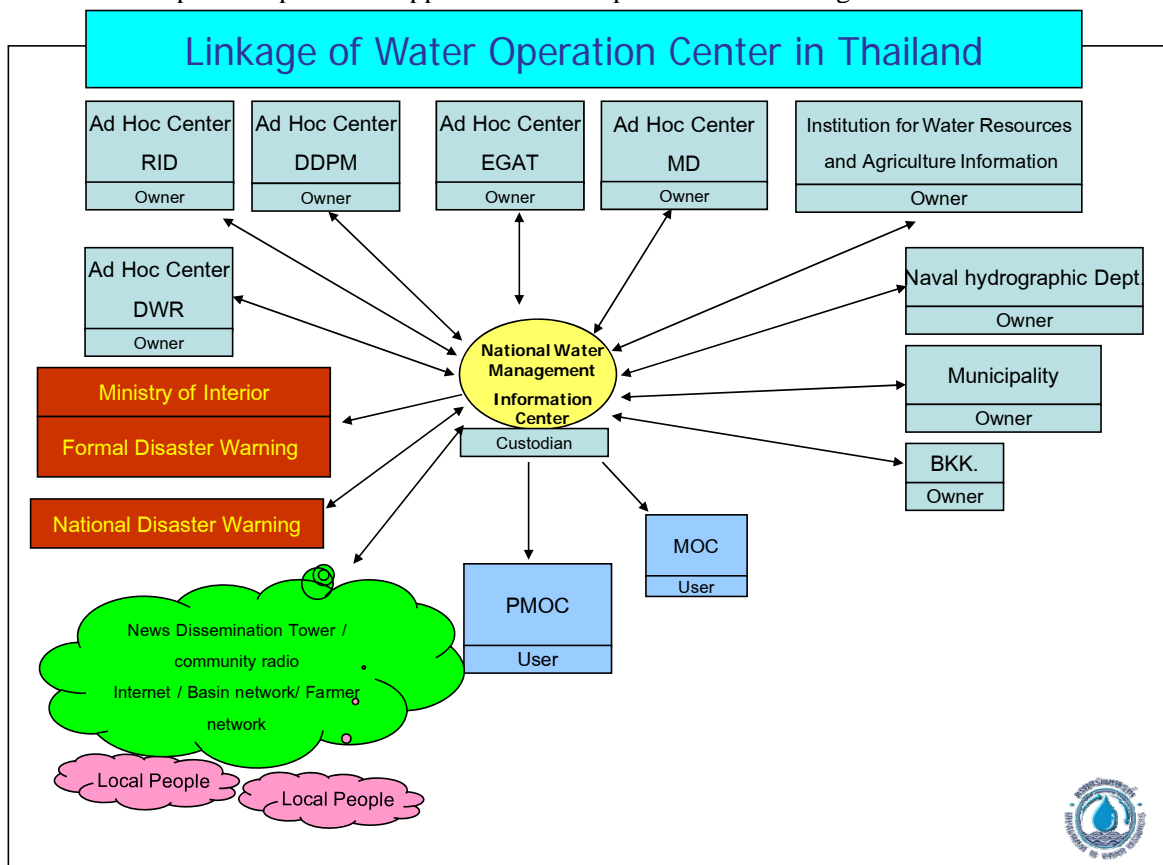
(3) Outputs

(1) To have disaster risk map for water situation monitoring of the country and investigation and data analysis.

(2) To have the work plan and measures for water crisis protection and mitigation clear enough for submission to the executives (cabinet) and bringing it into practice.

(3) To have a center for investigation, protection, warning and management of water crisis both in terms of quantity and quality by submitting the information to executives for making decision when disaster prevails.

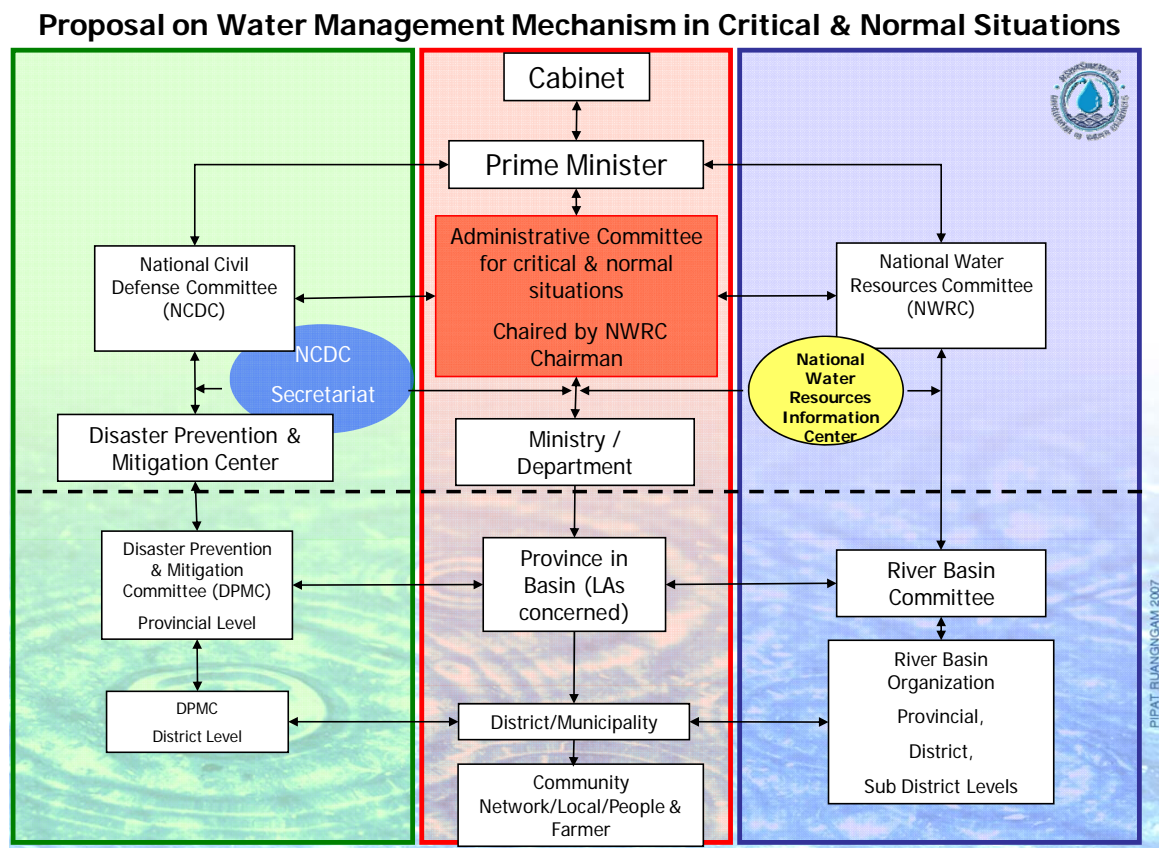
(4) To have a center for control, monitoring and evaluation of the work performance in order to develop and improve the approach of flood protection and mitigation.



(4) Project Activities

1. Mechanism for Center Management

The center will serve the National Water Resources Committee with data of water situation for making decision. Parts of data are derived from the river basin committees, linking to the Ad Hoc Centers of DWR, RID, DDPM, EGAT and MD, Institution for Water Resources and Agriculture Information, Naval Hydrographic Department of Royal Thai Navy, Bangkok Metropolis, provinces and municipalities, Operation Center of Ministry of Natural Resources and Environment, Operation Center of Offices of Prime Minister, news dissemination towers and community radios.



2. Operation Center comprises

- 2.1 Data and Forecasting Section : responsible for collection of water situation data; and meteorological forecasting.
- 2.2 Analysis and Recommendation Section : responsible for water situation data analysis and evaluation; carrying out mathematical model; and preparing summarized recommendation for decision making on water crisis management.
- 2.3 Design and Water Crisis Control : responsible for study, analysis of hydraulic impacts from structures; and control of water quantity and quality by structural modeling.
- 2.4 Disasters Warning, Coordination and Monitoring Section : responsible for receiving and sending data, disasters warning through communication

systems; and monitoring and evaluation of conditions after warning in each occurrence.

2.5 Research, Development and Operation Support Section : responsible for research and development for preparation, protection and solution of water crisis problems; management of instrument and equipment to have suitable and modern technology; and public relations on water situations.

5. Implementation Schedule

(1) 10 years work plan

For operation and creation of people participation in decision making

(2) 3 years work plan

Work Items	1st year	2nd year	3rd year
1. develop and link the network for water crisis management of the country			
2. report the water situation from areas systematically			
3. appoint the personnel to be responsible for data at area level and extend data base management in the future			
4. create the mechanism for people participation in decision making for water crisis resolution of water crisis problems.			

6. Role of Related Implementation Agency

Department of Water Resources, Ministry of Natural Resources and Environment

7. Related Activities

Linking the operation of works with DWR, RID, DDPM, EGAT, Meteorology Department, Institute of Water Resources and Agriculture Information, Naval Hydrographic Department of Royal Thai Navy, Bangkok Metropolis, provinces and municipalities.

8. Beneficiaries

- 1) Having systematic water management with speedy and correct data and covering all significant river basins and reservoirs of the country.
- 2) Being able to link to disaster warning systems of other agencies, or coordinate with directly responsible agencies timely and efficiently; and solve the water shortage

and

- flood problems in communities on time.
- 3) Having a systematic water resources management center by integrating data from relevant agencies at all level in order for protection and solution of water resources problems.
 - 4) People and various agencies can be informed of the water crisis that may occur in order to protect and solve the problem on time.

9. Others

-

3.6 Capacity Improvement for Irrigation Sector

- proposed by DWR, MARD, VN –

1. Project title: Capacity Improvement for Irrigation Sector

2. Governing Agency: Ministry of Agriculture and Rural Development (MARD)

3. Implementing Agency: Department of Water Resources (DWR)

I. Introduction

1. So far, nationally there are 75 large irrigation systems, 800 large & medium dams, 3,500 reservoirs with capacity of over 1 million m³ & 10 m high, over 5,000 large irrigation drains, over 10,000 large & medium pumping stations with total capacity of 24.8x10⁶m³/h and thousands of large & medium irrigation schemes.

2. Aggregate capacity of such irrigation systems: irrigation for 3.45 million ha, provide water course for 1.13 million ha, drainage of 1.4 million ha, salt intrusion prevention of 0.87 million ha and improvement of acid sulphate soil for 1.6 million ha. Irrigated areas of rice, subsidiary crops and short-term industrial plants have been continuously increased.

3. In 2003, irrigation schemes served for over 1 million ha of subsidiary crops & industrial plants, 7.61 million ha of rice (2.89 million ha of Winter-Spring rice, 2.25 million ha of Summer-Autumn rice and 2.51 million ha of winter crop). More than 5 billion m³/year was provided for domestic and industrial use and rural domestic water supply covered 70% of rural population.

4. For management of such irrigation infrastructure, there are currently almost 130 State irrigation companies, excluding independent irrigation management boards and stations. About 10,000 agricultural cooperatives and over 2,000 groups provide irrigation services, which function as a “bridge” among companies, local authorities and households in the delivery of water supply, and implementation of such policies/guidelines on the exploitation of irrigation schemes.

II. Background and challenges

5. The management of irrigation schemes currently is facing with new opportunities and challenges, particularly in the process of Vietnam’s extensive integration with global economics. Irrigation works, and management and exploitation of the irrigation works have not met the multi-purpose water supply services such as development of industry, urbanization, and strong diversification of agriculture, forestry, salt production and fishery. There are shortcomings and constraints in the management of irrigation schemes, which have not corresponded with invested

resources, and promoted capacity of the existing works; it is required to have adjustment and innovation to meet demands of industrialization and modernization in present time.

6. Previously, irrigation schemes were designed in the condition of not significant changes of service purpose, service objects and global climate. In the new condition, the designed capacity of the schemes can hardly be suitable for adaptation, thus lead to the down-gradation. Consequently, it is necessary to find out appropriate measures for the operation of irrigation schemes.

7. With the issuance of Decree No.154/ND-CP on ISF abolishment numerous macro issues are needed to have adjustments. It is not limited within financial issue, which requires amendments in the whole policy system promulgated previously, among of which are strategic development framework and development strategy of PIM in Vietnam.

8. In parallel with industrialization, modernization and urbanization, water source pollution in irrigation schemes is becoming a hot & urgent issue in the society. Although irrigation scheme border is not administratively divided, water pollution not only creates negative impact on a certain administrative region/area, but with systematic character, on inter-provinces, inter-districts; and agriculture and people's life, especially the pollution in irrigation schemes of the Red river delta like Nhue river irrigation scheme, Bac Duong scheme, Bac Hung Hai scheme. The impact become more serious when global climatic change badly effects on water sources day by day, which result in serious droughts, extreme floods, increased sea-water level, and serious salt intrusion.

9. Currently, the global climate change has become an urgent issue to the whole man-kind which creates direct impacts to all socio-economic, political activities of countries. As per an assessment of UNDP, Vietnam is one of the countries with most serious impacts due to climate change (about 20% of nation population and 40% of the area in Red River Delta and Mekong River Delta). This is one of the most potential impacts to Vietnam in the next period.

10. The impacts of industrialization, modernization, urbanization and climate change has reduced the upstream forest areas; annual rainfall in recent years in river basins is lower than the average annual one; storage capacity of reservoirs is just 75-80% in compared with the previous years; the process of water storage and supply of big dams have been adjusted in disadvantageous way for water exploitation and usage in downstream areas, not only for agriculture but also other sectors.

11. Water resources development strategy for 2005-2010 and 2020 vision have not been approved by the Government. Moreover, the strategy has not covered updates on socio-economic variations and changes of service demand and negative consequences of climate change. As a result, the irrigation sector has not had a comprehensive strategy which provides thorough guidance to the sector with accountability for climate change.

12. Over the past time, investment in irrigation sector mainly focused on physical works, not yet O&M and human resources development. The operation and management of schemes are mostly based on experience, without sufficient demand driven approaches. Infrastructure and equipment used for operation and management are not sufficient and outdated and inadequacy of skilled work-force. All these constraints result in low efficiency in irrigation operation and management.

13. From central to local level, human resource for management, operation of irrigation schemes is inadequate and poor, particularly at provincial and district levels, and in some districts, there is even no irrigation staff. Staff capacity does not meet the required demand because they do not receive retraining and capacity building, which consequently limits during the process of making proposed policy/mechanism for better effectiveness.

14. Currently, there is no separate M&E system for water resource sector, information system as well as sector database have not been finalized or established. Thus, the evaluation of current system can hardly meet the actual conditions which results in inappropriate decisions, either far from real requirement or need further review, re-evaluation.

III. Project proposal

15. The project will provide comprehensive support based on reviewing, updating, and developing policy framework for irrigation sector to be suitable with new status.. Results brought about by project will provide irrigation sector a comprehensive policy system which counts on potential impacts from country's integration, socio-economic development, and climate change. The project comprises 2 components:

Component 1: Capacity building for irrigation sector

- Review current situation of the irrigation policies, propose policy amendments and new documents;
- Review and update strategy for water resources development for 2009-2015 phase and 2025 vision;
- Develop action plan for the irrigation sector in 2010-2015;
- Review and update strategic development framework of PIM in Vietnam;
- Develop policy on environmental management within the irrigation scheme system;

Component 2: Development of information system for irrigation sector

- Develop database and I&D information management models to facilitate operation and management practices;
- Develop information system with the application of GIS system in the management of large irrigation schemes;

- Develop M&E system for irrigation sector;
- Develop regulations on the irrigation related information management, dissemination;

IV. Expected output

Expected outputs of this project will include:

Component 1:

- Status report on legal documents of irrigation sector;
- Draft irrigation development strategy for 2008-2015 and 2025 vision and action-plan of irrigation sector;
- Draft PIM development strategy framework in Vietnam and implementation road-map;
- Draft Decree on the environment management in irrigation schemes.

Component 2:

- Irrigation information management system established, with a Decree on data collection, management and dissemination;
- Irrigation database developed and ready for usage;
- M&E system established and implemented.

IV. Implementation arrangements

17. MARD is the Governing Agency. DWR is the Implementing Agency. The Vietnamese government confirms to have distribution of counterpart budget for the project staff, working office for consultants. Project counterpart personnel are sourced from DWR, who have good experience in project management, irrigation sector regulations/policies development and good English.

18. These two components will be carried out in parallel and divided into 2 phases: the first phase cover period from April 2008 to 30 June 2009 and the second phase starts in July 2009 to the end of 2010.

V. Benefit agencies

The project beneficiaries are:

- Ministry of Agriculture and Rural Development (MARD) and Department of Water Resources (DWR);
- Provincial Agriculture and Rural Development Department (DARD);
- Irrigation Management Companies
- All farmers and the poor.

3.7 Dam safety management strengthening program in Vietnam - proposed by GORBOs, MARD, VN -

1. **Project Title :** Dam Safety Management Strengthening Program in Vietnam

2. **Implementing Agency :** Ministry of Agriculture and Rural Development.

3. **Background of the Project:**

Vietnam needs and possesses favorable natural conditions for construction and exploitation of reservoirs.

Reservoirs are built in 42 out of total 64 provinces and cities of the country

According to the recent statistics, number of reservoir and storage capacity is detailed hereunder:

No.	Storage Capacity	Nos. of Reservoir
1	From 200.000 m ³ to 1 mil. m ³	1370
2	From 1 mil. m ³ to 5 mil. m ³	439
3	From 5 mil. m ³ to 10 mil. m ³	66
4	Over 10 mil. m ³	81

1) **Inadequate flood release capacity:**

Causes:

- Design: + *Inadequate documents, limited knowledge on flood rains in river basins*
 + *New designing standards and norms not yet met.*
- Severe deforestation.
- Poor planning management ⇒ uncontrolled cascade development

Ve Vung reservoir (Nghe An) with storage capacity of 18 million m³; and flood regulation capacity of 4.5 million m³.

In upstream, there are 16 reservoirs spontaneously built by local people with total storage capacity of 7.5 million m³.

- In past year, the Ministry invested in rehabilitation and upgrade of 25 large-scale reservoirs (of which 14 reservoirs with flood spillways expanded).

2) **Serious infiltration at some reservoirs:**

Causes:

Design: - Improper earth-filled dams; - Poor foundation treatment (Laterite, tray);
- Material quality.

Construction: - bad foundation compression (manual and mechanical); - Bad material quality;
- Inappropriate filling techniques

- The Ministry invested in rehabilitation and upgrade of 25 large-scale reservoirs (of which 17 reservoirs with serious infiltration through earth-filled dams).

3) Poor upper side slope consolidation:

- 12 out of 25 reservoirs were strengthened because the upper side slope had been not well consolidated
- Upper side slopes of most of small reservoirs were not paved with a consolidation layer so they are seriously eroded.
- Poor management ⇒ without regular maintenance ⇒ slide down

4) Termites:

5) Bad masonry and casting quality at some reservoirs:

- *Many reservoirs have been operated for more than 25 ÷ 30 years*

Cấm Sơn Phú Ninh Yên Lập Đá Bàn

Dầu tiếng Suối Hai Cẩm Ly

- *Intakes of many reservoirs are of bad quality*

Tà Keo (Lạng Sơn), Đồng Mô (Hà Tây), Dầu Tiếng (Tây ả inh), Ea Bông, EaKnốp (Đăk Lăk), Kê Gổ (Hà Tĩnh), PaKhoang (Lai Châu), Đá Bàn (Khánh Hòa), Yên Lập (Quảng ả inh), Dầu Tiếng (Tây ả inh), Vệ Vừng (ả ghệ An), Liệt Sơn (Quảng ả gãi),...

- *Spillways of small reservoirs are made of natural rock:*

6) Shortcomings in management:

- *Poor physical conditions*
 - Bad service roads, no access to structures
 - Inadequate communication
 - Degraded and bad quality service houses
 - Lack of in situ local spare materials
 - Lack of other facilities and equipment
- *Inadequate management capacity, lack of training and education*
 - Irrigation and drainage management companies
 - Users' management
- *Weak state management*

- Poor performance
- Responsibility decentralization: hydropower reservoirs are managed by central authorities ↔ local authorities ↔ managers
- Inadequate management regulations;
- Inappropriate attention paid to education and training;
- Lack of information campaigns on dam safety
- *Insufficient funds for maintenance*

4. Outline of the Project:

(1) Overall Goal: Dam Safety Strengthening management

(2) Project Purpose:

- ❖ Investments in physical facilities: - service roads; - service houses; - communication; - measurement equipment; - spare materials.
- ❖ Modernization of document storage and archive
- ❖ Training for technical staff, management staff, operation workers and farmers
- ❖ Enhancing state management in construction and management of reservoirs

(3) Outputs:

1. Strengthening bodies in charge of dam safety from central to local levels: intensifying check and supervision for dam safety

+ Establishing the national Dam Safety Unit – the DSU under the Department of Water Resources. The Unit helps the Department and Ministry in monitoring safety inspection, in preparation and implementation management of legal framework relating to dam construction and management, provides technical support to organizations responsible for management, operation and inspection of dams, and disseminate information on dams in Vietnam. Coordination units in ministries; Management arrangement for dam safety in localities

2. Strengthening the preparation of legal regulations relating to dam safety management

Preparation of legal documents and regulations, guiding documents and technical standards for dam safety management in realizing state management function of the Ministry:

- Government Decree stipulating dam safety
- Technical standards on dam safety management
- Relevant circulars and technical guides
- Regulations on dam safety are enforced at both central and local levels.

3. Training, capacity building to reservoir owners, managers and operation workers

- a. To provide support and help to the National Dam Safety Unit so that the Unit can be sufficiently capable for coordinating the monitoring of safety, preparation implementation management of legal framework relating to dam construction and management, provides technical support to organizations responsible for management, operation and inspection of dams, and disseminate information on dams in Vietnam.
- b. To provide refreshment training to improve qualifications for management staff and engineering working in the field of reservoir management.
- c. To train source staff for localities, expand scale and scope of trainings, provide capacity building on infrastructure safety management.

4. Building and maintaining a reservoir database, providing facilities and equipment to the National Dam Safety Unit

To systematize and archive relevant information and data on reservoirs and dams for the sake of safety management; build capacity in application of information technology to dam safety management for easy, effective and focused management; facilitate export of information on dams/reservoirs serving state management of the Ministry and Department of Water Resources.

5. Information dissemination, awareness raising on dam safety in Vietnam

Raising awareness of managers and people, especially of those living downstream of large dams on dam status and dam safety management, and measures to prevent risks and reduce damages in case of dam breaks.

(4) Project Activities:

1. Strengthening bodies in charge of dam safety from central to local levels: intensifying check and supervision for dam safety
2. Strengthening the preparation of legal regulations relating to dam safety management
3. Training, capacity building to reservoir owners, managers and operation workers
4. Building and maintaining a reservoir database, providing facilities and equipment to the National Dam Safety Unit
5. Information dissemination, awareness raising on dam safety in Vietnam

5. Implementation Schedule

(1) 10 years work plan

(2) 3 years work plan

6. Role of Related Implementation Agency:

- The program is implemented through investment projects in conformity to prevailing regulations of the Statute on Investment and Construction
- Chairman of the program: A Vice minister of Agriculture and Rural Development
- Standing office: Departments of Plan, and Water Resources

7. Relation Active:

- Dam safety is of particular importance. After the programme is approved, a good coordination is required among forestry and agriculture agencies during the implementation in order to restore and protect watersheds.
- For the successful implementation of the programme, participation, direction and support of central ministries and agencies as well as local governments are important. At the same time with rehabilitation and upgrade of reservoirs, it is necessary to prepare and issue policies and regulations to prevent deterioration of structures; regular check is recommended to ensure safety of structures against floods and good performance of structures.

8. Beneficiaries:

- Rehabilitation and upgrade of reservoirs are investibility manage.
- All reservoirs are technical manage.
- Engineers and management staff of provincial Departments, Branches, and Irrigation and Drainage management companies are professionally train.
- Middle vocational staff, workers and farmers in charge of reservoir management are train.

Chapter 4 Linkage among identified issues, categorized solution and action plan

The following is a linkage on the identified issues, categorized solution and action plan:

Abbreviation in Chapter 4

Bangladesh Project 1 : Comprehensive South Comilla and North Noakhali drainage

Bangladesh Project 2 : Development of decision support system for integrated water resources Management

BD1-L : Legal and institutional aspect of issues - identified by BWDB of Bangladesh -

BD1-T : Technical aspect of issues - identified by BWDB of Bangladesh -

BD1-S : Social/Customary aspect of issues - identified by BWDB of Bangladesh -

BD2-L : Legal and institutional aspect of issues - identified by IWM of Bangladesh -

BD2-T : Technical aspect of issues - identified by IWM of Bangladesh -

BD2-S : Social/Customary aspect of issues - identified by IWM of Bangladesh -

ID-L : Legal and institutional aspect of issues - identified by PJTI of Indonesia -

ID-T : Technical aspect of issues - identified by PJTI of Indonesia -

ID-S : Social/Customary aspect of issues - identified by PJTI of Indonesia -

Indonesia Project : Strengthening of water resources management information system in the Brantas river basin

LK-L : Legal and institutional aspect of issues - identified by MASL of Sri Lanka -

LK-T : Technical aspect of issues - identified by MASL of Sri Lanka -

LK-S : Social/Customary aspect of issues - identified by MASL of Sri Lanka -

Sri Lanka Project : Provision of Asian centre for dam safety training, a training centre for the technical staff of Mahaweli Authority of Sri Lanka and affiliated organizations and those of Asia

Thailand Project : Water resources management center

TH-L : Legal and institutional aspect of issues - identified by DWR of Thailand -

TH-T : Technical aspect of issues - identified by DWR of Thailand -

TH-S : Social/Customary aspect of issues - identified by DWR of Thailand -

Vietnam Project 1 : Capacity improvement for irrigation sector

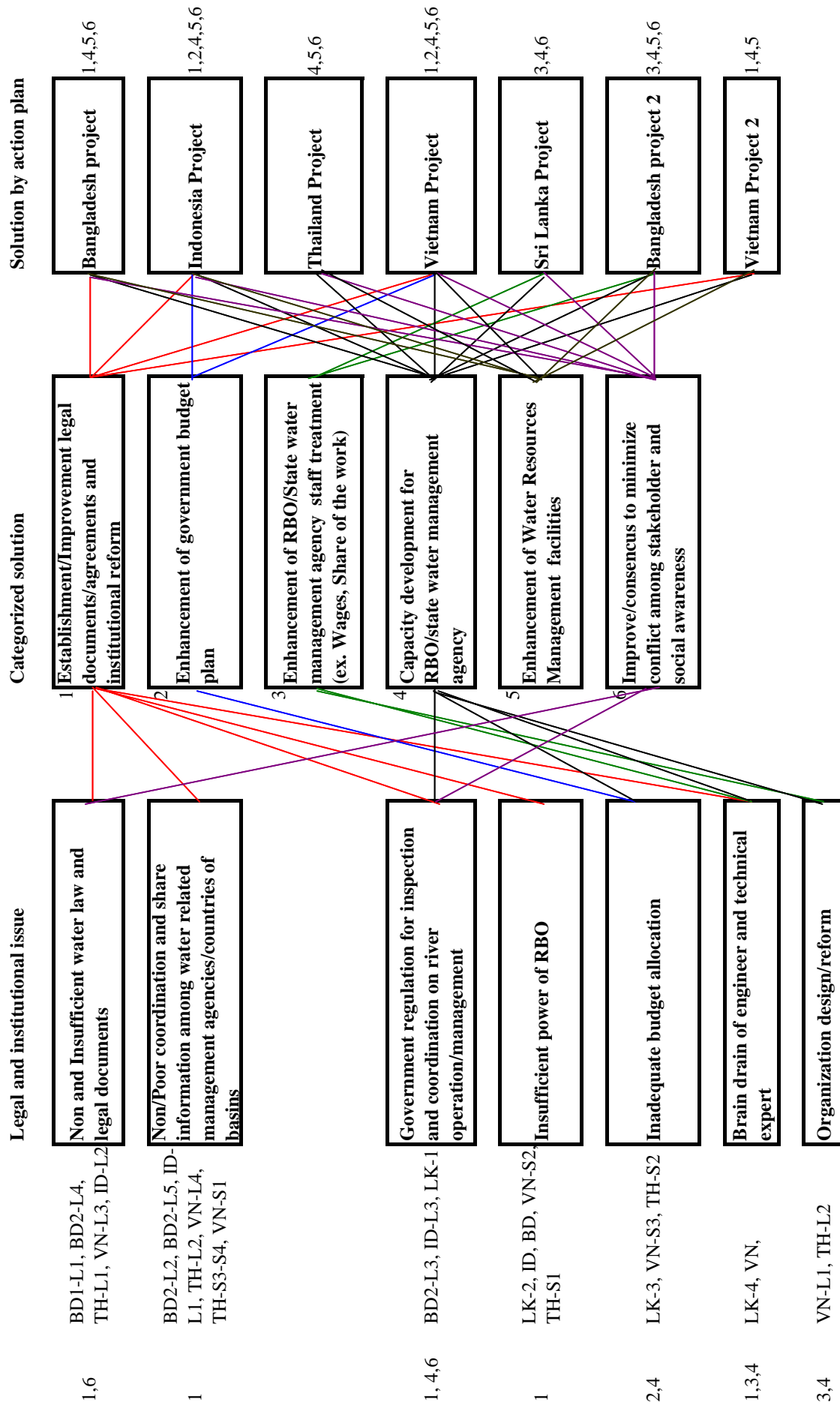
Vietnam Project 2 : Dam safety management strengthening program in Vietnam

VN-L : Legal and institutional aspect of issues - identified by DWR & GORBOs of Vietnam -

VN-T : Technical aspect of issues - identified by DWR & GORBOs of Vietnam -

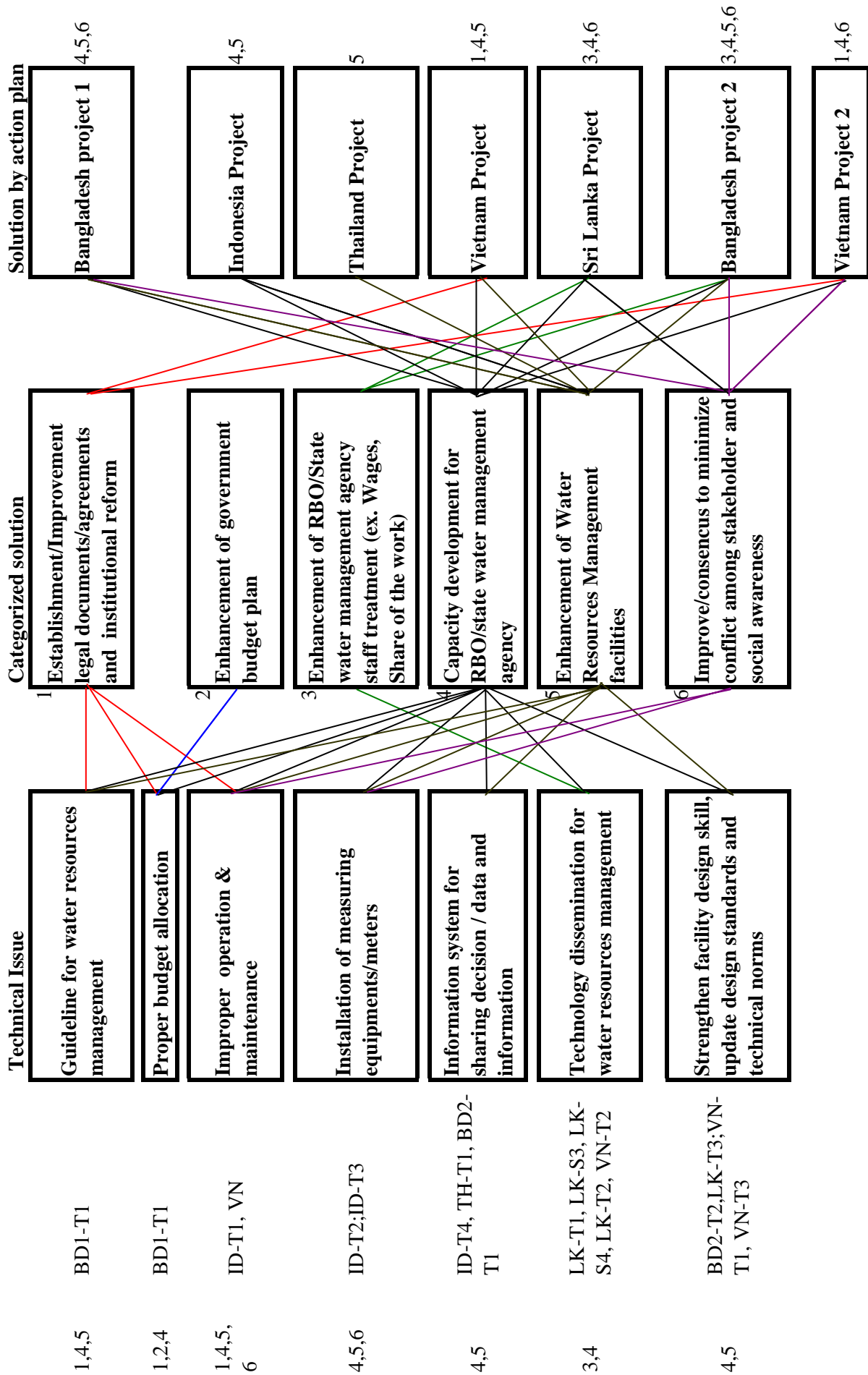
VN-S : Social/Customary aspect of issues - identified by DWR & GORBOs of Vietnam -

4-1 Legal and Institutional aspect of Linkage



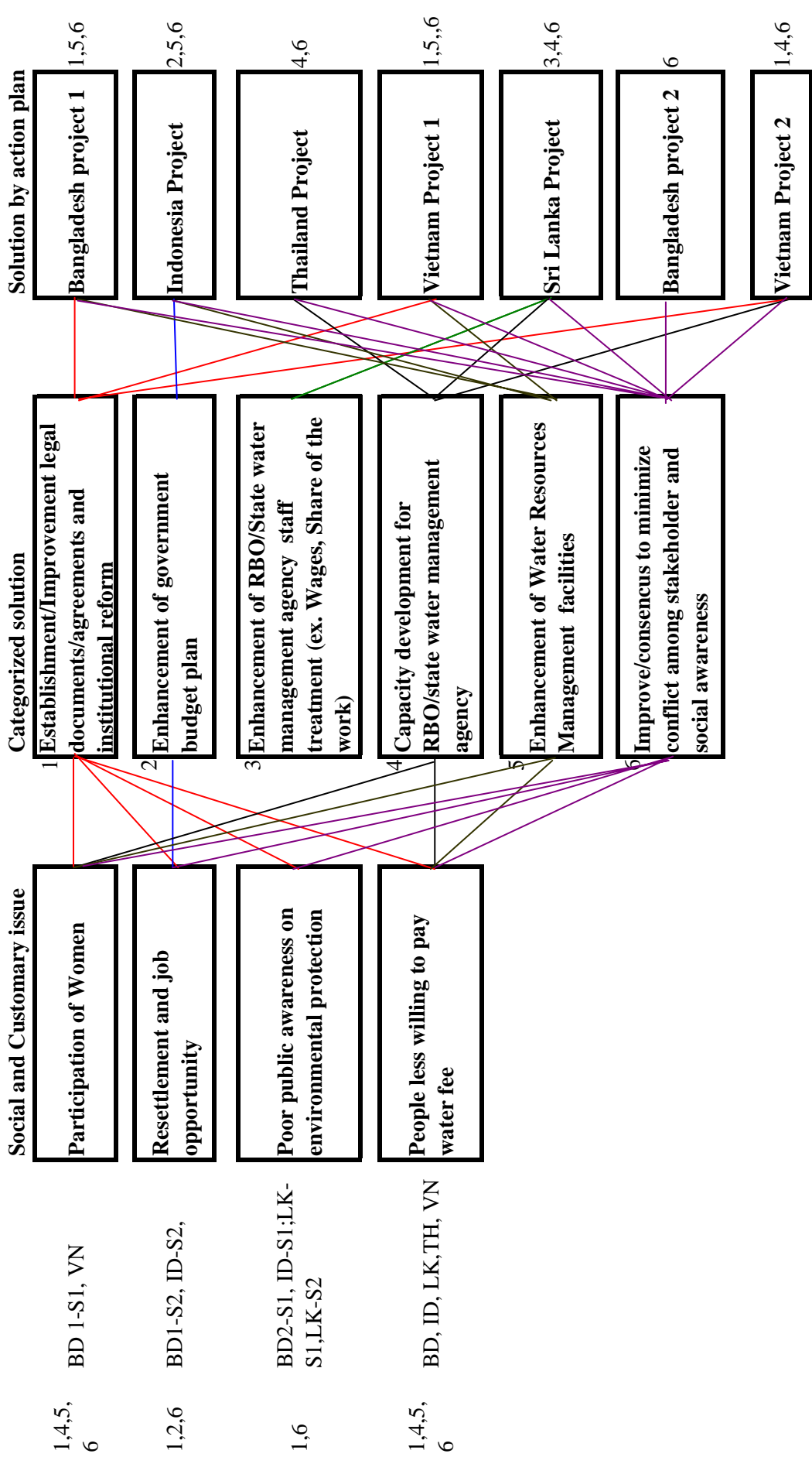
BD : Issue(as data/information) is not collected but also issue exists in Bangladesh.
 ID : Issue(as data/information) is not collected but also issue exists in Indonesia.
 VN : Issue(as data/information) is not collected but also issue exists in Vietnam.

4-2 Technical aspect of Linkage



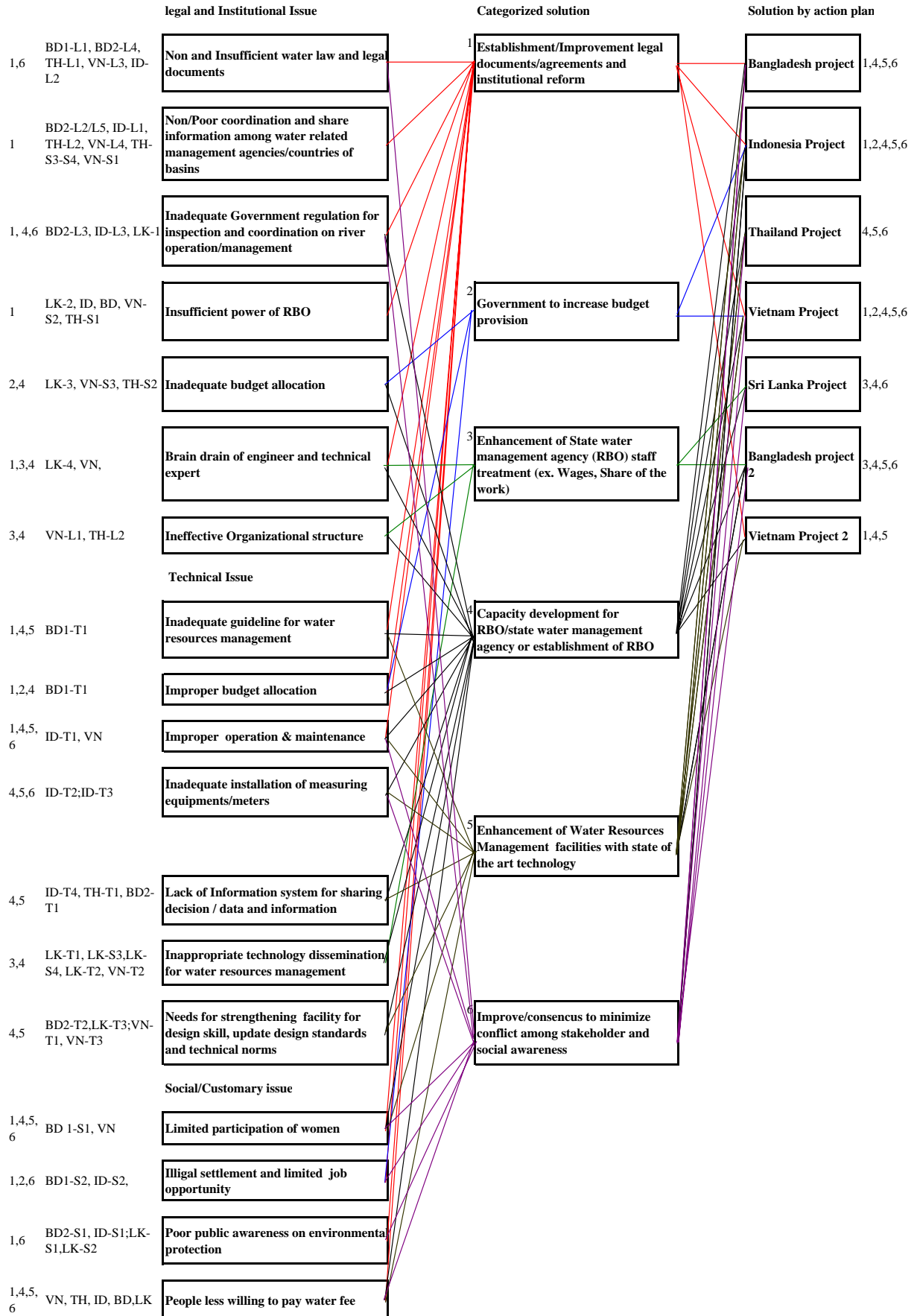
VN : Issue(as data/information) is not collected but also issue exists in Vietnam.

4-3 Social/Customary aspect of Linkage



BD : Issue(as data/information) is not collected but also issue exists in Bangladesh.
 ID : Issue(as data/information) is not collected but also issue exists in Indonesia.
 LK : Issue(as data/information) is not collected but also issue exists in Sri Lanka
 TH : Issue(as data/information) is not collected but also issue exists in Thailand
 VN : Issue(as data/information) is not collected but also issue exists in Vietnam.

4-4 Linkage among three aspects, categorized solution and action plan



BD : Issue(as data/information) is not collected but also issue exists in Bangladesh.
 ID : Issue(as data/information) is not collected but also issue exists in Indonesia.
 LK : Issue(as data/information) is not collected but also issue exists in Sri Lanka
 TH : Issue(as data/information) is not collected but also issue exists in Thailand
 VN : Issue(as data/information) is not collected but also issue exists in Vietnam.

Chapter 5 Conclusion

All the participants discussed thoroughly to find out the appropriate solutions to sustainable management for water resources infrastructure in river basin, focusing on prior three aspects of legal and institutional, social and customs and technology. Based on the discussion the workshop, the participants indicated a linkage on the Identified issues, Categorized solution and Action plan. We came to conclusion that it is important to deepen understanding of water, land and other natural resources and strengthen cooperation with related organizations, so as to minimize the friction among stakeholders due to increased diversified water demand and social needs. We identified the following matters that Governments and RBOs are requested to do;

1. Activities to achieve sustainable water resources management by Governments;

- 1) Governments should formulate a master plan concerning integrated development and management of water resources in river basin that reflects situations and sense of values across the region.
- 2) In order to implement IWRM obtaining the trust and belief from the community, Governments should implement appropriate water allocation for water users and regions, and provide water rights by strengthening institutional capacity and legislation.
- 3) Governments should secure the financial and human resources for 1) and 2), and collect necessary information/data and improve technology to promote capacity development of RBOs in implementing water resource management.
- 4) Government should provide stabilization and develop the region through appropriate water resources management, respecting local tradition/water culture and scientific knowledge. To do so, Government should endeavor to obtain the trust and the belief from the local community and provide funds to water sectors.
- 5) Government should play as a think tank in the nation to solve water issues in a coordinated manner.

2. Activities to achieve sustainable water resources management by RBO;

- 1) RBO as a leading water sector should be established to implement appropriate water resources management.
- 2) In order to implement IWRM obtaining the trust and belief from the community, RBO should implement promotion of stakeholder participation and play an extremely important role that coordination for stakeholder.
- 3) RBO should be capable of managing water resources to implement it. RBO should also strengthen water-related educational activities for stakeholders and achieve capacity development in RBO. To do so, RBO should provide sound financial support and secure human resources

- 4) RBO should provide stabilization and develop the region through appropriate water resources management, respecting local tradition/water culture and scientific knowledge. To do so, RBO should endeavor to obtain the trust and the belief from the local community.
- 5) RBO should play an extremely important role that operate flood control, coordination for water allocation, management of water facilities, water resource management in river basin, and preservation of catchment area/wetland/fishery resources.

We will continue to strive to achieve the proposed action plan for sustainable management for water resources management.

-END-