Royal Irrigation Department
Ministry of Agriculture and Cooperatives
Kingdom of Thailand

PREPARATORY SURVEY REPORT
ON
THE FLOOD PREVENTION PROJECT OF
EAST SIDE OF THE PASAK RIVER IN AYUTTHAYA
IN
THE KINGDOM OF THAILAND

October 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

CTI ENGINEERING INTERNATIONAL CO., LTD.
ORIENTAL CONSULTANTS CO., LTD.
NIPPON KOEI CO., LTD.
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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Joint Venture consist of CTI Engineering International Co., Ltd., CTI Engineering Co., Ltd., Oriental Consultants Co., Ltd. and Nippon Koei Co., Ltd..

The survey team held a series of discussions with the officials concerned of the Government of the Kingdom of Thailand, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Kingdom of Thailand for their close cooperation extended to the survey team.

October, 2012

Masami FUWA
Director General,
Global Environment Department
Japan International Cooperation Agency

SUMMARY

(1) **Overview of the Kingdom of Thailand**

The Kingdom of Thailand (hereinafter referred to as "Thailand") is located at central of Indochina and borders on Cambodia at east, Laos at north, Myanmar at west and Malaysia at south. The total land of Thailand is about 514,000 km^2. The population is about 65,900,000 in 2010. Tropical monsoon contribute largely to the rainfall in Thailand from middle of May to October.

Ayutthaya Province where the Project is located is plain area facing the Chao Phraya River and about 70km far from Bangkok, the capital of Thailand. In Phra Nakhon Si Ayutthaya Province, there are about 780,000 populations in 2009 and the historic city of Ayutthaya Dynasty which was registered to the UNESCO World Heritage. Moreover, there are many industrial estates in/surround Ayutthaya Province and many Japanese factories operate. The annual mean low and high temperature are 21.9 degrees Celsius and 32.4 degrees Celsius, respectively. The annual average rainfall is 1,424 mm during last 30 years and 88% of annual rainfall concentrates during May to October.

Thailand has undergone a rapid economic development since the late1980s as a result of the promotion of export promotion policy through the industrialization of the underlying direct foreign investment in Japan and others.

After the Asian economic crisis occurred late 1990s, the Government of Thailand (GOT) has strived to economic reconstruction with the assistance of the international community. Therefore, the continuously sluggish economic performance in Thailand was recovered. As a result of the export-led as ever and the expansion of domestic demand policy, the economic growth in Thailand was relatively high until year 2007. The economy in Thailand was sluggish to slow down of exports that affected from the recession of external demand by the global economic crisis stemming from the collapse of Lehman Brothers in 2008. The Gross Domestic Production (GDP) growth rate in 2008 and 2009 was 2.5% and -2.3%, respectively. Thereafter, the economy in Thailand was recovered and GDP growth rate was recorded at 7.8% due to the economic recovery of overseas export markets. However, the GDP growth rate in 2011 fell 0.1% because of serious flood damage.

(2) **Background, History, Outline of the Requested Project**

More than 61 provinces in the Kingdom of Thailand have been extensively flooded in 2011 due to rainfalls intermittently continued since July 2011 which was caused by more than 100-year probable rainfall estimated. The extent of flood damages in the Chao Phraya River Basin with area of 160,000 km^2 were about 1,200,000 households (3.2 million people) inundated, 446 dead, and about 17,000 km^2 farmland inundated at 25 provinces in Basin, according to the announcement of GOT on 5 November 2011. The flood damage has

extensively expanded to Bangkok, Phra Nakhon Si Ayutthaya Province in where many industrial estates are located, including urban areas in Nonthaburi Province and Pathum Thani Province located at northern area of Bangkok.

There are two canals connecting to the Pasak River; Han Tra Canal and Kra Mang Canal. These two canals join and become Khao Mao Canal. These canals function as drainage channel to lead drainage water in the low land area at the left bank of the Pasak River to the Pasak River. During the 2011 flood, the floodwater of the Pasak River has entered into the Han Tra Canal and Kra Mang Canal. Hence, the gates of the existing Khao Mao Floodgate (regulator) were closed to prevent the floodwater of the Pasak River. However, the gate height was not enough against the flood water level of the Pasak River. Then, the floodgate became structurally dangerous situation. Then, the gates were opened. The flood flowed into the Khao Mao Canal and overtopped on the bank. Finally, the southern area of the Khao Mao Canal in where major industrial estates are located including many industrial estates was inundated.

It was understood that the prevention of floodwater of the Pasak River into the canals on left bank contribute to the safety of residents in this area and the flood mitigation in the industrial estates downstream. In view of this, the Government of Japan has decided to carry out the preparatory survey for protection of the Flood Prevention Project of East Side of the Pasak River in Ayutthaya.

(3) **Outline of Study Results and Contents of the Project**

JICA dispatched the preparatory survey team to Thailand from 25 December 2011 to 31 August 2012. In Thailand the survey team held a series of discussions with the officials concerned of the GOT on the request of GOT, and conducted the field investigations (topography, geology, and underground water) and surveys for social conditions, buried facilities at sites, and procurement conditions of construction equipment/materials, etc. Based on the results of survey, analysis and design conducted in Thailand and Japan, a mission for the briefing on the detail design was dispatched by JICA and held discussions regarding the direction of the detail design and the burden of the GOT, etc. Both governments confirmed the survey results.

The outline of the final plan is as described below.

・ **2-phased Implementation**

After the 2011 flood, the RID has planned the flood protection works for the left bank area (east area) of Pasak River by construction of the Han Tra Floodgate and Kra Mang Floodgate, and construction of flood wall along the left bank of Pasak River between two proposed floodgates and flood wall along the Han Tra Canal up to the existing national road No. 3053.

However, some stakeholders expressed disagreement on the RID’s plan to construct the proposed Kra Mang Floodgate and flood wall in the public consultation meeting held

because of social problems such as necessity of relocation of residents at the proposed locations of floodgate and flood wall. In order to mitigate the flood damage such as the 2011 flood, construction of floodgates and flood walls are indispensable. In view of this situation, the phased implementation was proposed by JICA survey team and accepted.

1st Stage: Han Tra Floodgate is constructed at just downstream of the bridge of road root 3053 and Kra Mang Floodgate is constructed at just upstream of the railway bridge. These floodgates and existing bridges are connected with flood walls. As a first stage implementation of flood wall along the Han Tra Canal, the river bank protection works with a top elevation of EL.+4.5 m MSL are constructed. 1st stage implementation covers the 90% of the project area. Direct construction cost and cost for consultant services will be covered by Japan Grant Aid. On the other hand, the GOT covers costs for land acquisition and compensation, relocation of existing utilities, extension of electric power line to the site, etc.

2nd Stage: The flood damage of the remaining 10% area between the Pasak River and road no. 3053 are mitigated by the construction of flood walls, including flood wall along the left bank of the Pasak River between the Han Tra Floodgate and Kra Mang Floodgate and flood wall along the Pasak River on the north of Han Tra Canal. Moreover, flood wall with EL.+6.5 m along the Han Tra Canal is constructed on the river bank protection to be constructed under the 1st stage implementation. All necessary cost is covered by the GOT.

- **Floodgate Construction Plan**

Design high water level (EL.+6.00 m MSL) of proposed two floodgates is determined based on the recorded highest water level of the Pasak River at the Ayutthaya Water Level Gauging Station. Floodwater such as the 2011 flood can be prevented by the proposed floodgates. Regarding the material of hydraulic gate leaves, guides and wire ropes, stainless steel which does not require painting work for corrosion-resistance is utilized to minimize the maintenance cost.

The river bank protection with a top elevation of EL.+4.5 m along the low Han Tra Canal downstream from the proposed Han Tra Floodgate to the Pasak River is to be constructed as a first stage implementation, taking the difficulty of necessary land acquisition within the limited time and the social environmental consideration into account.

- **Drainage Pump Vehicles**

The reverse flow from the Pasak River will be prevented by closing gates of proposed Han Tra and Kra Mang Floodgates and existing Khao Mao Floodgate during the flood. In this case, it is required to drain mechanically rainwater in the area enclosed by the floodgates. Hence, the utilization of drainage pump vehicle with a capacity of 30 m^3/min is proposed

taking the necessary mobility and drainage capacity into account. A total of 10 pump vehicles are to be provided to the RID Ayutthaya Irrigation Project Office.

During the 2001 flood, the floodwater in Ayutthaya area and industrial estates was drained by using the 10 drainage pump vehicles which were urgently conveyed from Japan as an international relief assistance. These drainage pump vehicles have showed the excellent result for drainage. In view of this situation, it is proposed to use widely the drainage pump vehicles even in the jurisdiction of RID Regional Irrigation Office 10.

＜Facility Overview＞

Items		Dimensions
1. Han Tra floodgate	Gate Type	Curtain walled type 4 sided watertight stainless steel fixed wheel gate
	Dimension of Gate	6.0 m clear span x 7.1 m effective height
	Number of Gates	3 nos.
	Hoist	Wire rope winched 1 motor 2 drum type hoist (3 phase x 380 V x 50 Hz)
	Top Elevation of Gate	EL. +4.6 m MSL
	Bottom Elevation of Gate	EL. -2.5 m MSL
	Top Elevation of Floodgate	EL. +7.5 m MSL
	Hoist Deck	4.5 m width x 26 m long, EL.+15.0 m MSL
	Stoplog	6.0 m clear span x 1.0 m effective height x 5 pieces x 2 sides (downstream and upstream). Telpher rail. Manual chain hoist. Lifting beam.
	Main Civil Structure	Reinforced concrete base, pier, deck.
	Maintenance Bridge	Reinforced concrete slab type. 3 m wide at upstream side. 2 m wide at downstream side.
	Backup Power Supply System	Diesel engine generator: 1 phase 220 V/3 phase 380V x 50Hz x 20kVA
	Incidental Equipment	2-Water level gauge. Lighting facility. Lightning rod.
	Hoist Room	Shaped steel frame with roof without wall
	Foundation Type	PC Pile (600 mm diameter)
	Cut-off Wall	Steel sheet pile
	Wing Wall	Reinforced concrete retaining wall
	Apron	Reinforced concrete, 6 m long upstream/downstream, respectively.
	Riverbed Protection	Gabion mattress; 14 m long upstream/downstream sides respectively
	Floodwall	Double PC corrugated sheet piling with soil filling
2. River Bank Protection in Lower Han Tra Canal	Structural Type	Slope protection consisting of PC corrugated sheet piles, Concrete crib work and Stone facing
	Length	212 m (Left) + 272 m (Right) = 484 m (Total)
	Elevation of Pile Coping	EL. +2.5 m MSL
	Top Elevation of Embankment	EL. +4.5 m MSL
	Slope	1:2.0
	Miscellaneous Works	2 drainage outlets with flapgates. 484 m long ditches along slope protection. 10 stairs for access.

Items		Dimensions
3. Kra Mang Floodgate	Gate Type	Curtain walled type 4 sided watertight stainless steel fixed wheel gate
	Dimension of Gate	6.0 m clear span x 5.1 m effective height
	Number of Gates	3 nos.
	Hoist	Wire rope winched 1 motor 2 drum type hoist (3 phase x 380 V x 50 Hz)
	Top Elevation of Gate	EL. +4.6 m MSL
	Bottom Elevation of Gate	EL. -0.5 m MSL
	Top Elevation of Floodgate	EL. +7.5 m MSL
	Hoist Deck	4.5 m width x 26 m long, EL.+13.0 m MSL
	Stoplog	6.0 m clear span x 1.0 m effective height x 3 pieces x 2 sides (downstream and upstream). Telpher rail. Manual chain hoist. Lifting beam.
	Hydraulic Gate Works for Drainage	4 sided watertight stainless steel fixed wheel gate, 2.0 m width x 1.5 m height. Manual racked gate hoist.
	Backup Power Supply System	Diesel engine generator: 1 phase 220 V/3 phase 380 V x 50 Hz x 20 kVA
	Incidental Equipment	2-Water level gauge. Lighting facility. Lightning rod.
	Main Civil Structure	Reinforced concrete base, pier, deck.
	Maintenance Bridge	Reinforced concrete slab type. 3 m wide at upstream side. 2 m wide at downstream side.
	Hoist Room	Shaped steel frame with roof without wall
	Foundation Type	PC Pile (600 mm diameter)
	Cut-off Wall	Steel sheet pile
	Wing Wall	Reinforced concrete retaining wall
	Apron	Reinforced concrete, 6 m long upstream/downstream, respectively.
	Riverbed Protection	Gabion mattress; 14 m long upstream/downstream sides respectively
	Floodwall	Double PC corrugated sheet piling with soil filling and U-type retaining wall
4. Drainage Pump Vehicle	Drainage capacity	0.5 m^3/sec/unit (30 m^3/min/unit)
	Total head	10 m
	Pump type	Submersible motor driving pump
	Pump power source	3 phase x 440 V x 60 Hz
	Generator	125 kVA diesel generator
	Truck capacity	GVW 10,000 kg or less
	Number of vehicles	10

(4) **Implementation Schedule and Project Cost Estimate**

Under the Grant Aid of Japan, the Project is scheduled to complete in 21 months consisting of 4-month tendering and 17-month construction. Cost to be born by Thailand is estimated at 19.0 million Baht.

(5) **Project Evaluation**

The Project will provide the following benefits as shown in table below to the local resident at east area of the Pasak River and industrial estates in Ayutthaya:

<Project Effects and Degree of Improvements>

Present Situation and Problems	Measures Taken by the Project	Direct Effects/Benefits	Indirect Effects/Benefits
In case water rise up to EL.+6.0 m which is the same as 2011 flood, not only local residences but also industrial estates suffer serious flood damage.	(1) Construction of Han Tra Floodgate, Kra Mang Floodgate and Riverbank Protection at downstream of Han Tra Canal (2) Procurement of Drainage Pump Vehicles	(1) Direct Effects The Project prevents floodwater of Pasak River, which is the same water level as 2011 flood, into Han Tra and Kra Mang Canals. (2) Benefit The Project mitigates flood damage due to the reverse flow of Pasak River into both Canals.	(1) Mentally helpful for local residents and the concerned of industrial estates during flood event. (2) Increasing the stable business operations and enhancing the reliability of the GOT.

Implementation of the Project will contribute to the protection of the east side of the Pasak River from the flood and mitigation of flood damage of the industrial estates in the downstream area. Through executing the Japan grant aid project, further enhancement of the friendly relations between two countries is expected.

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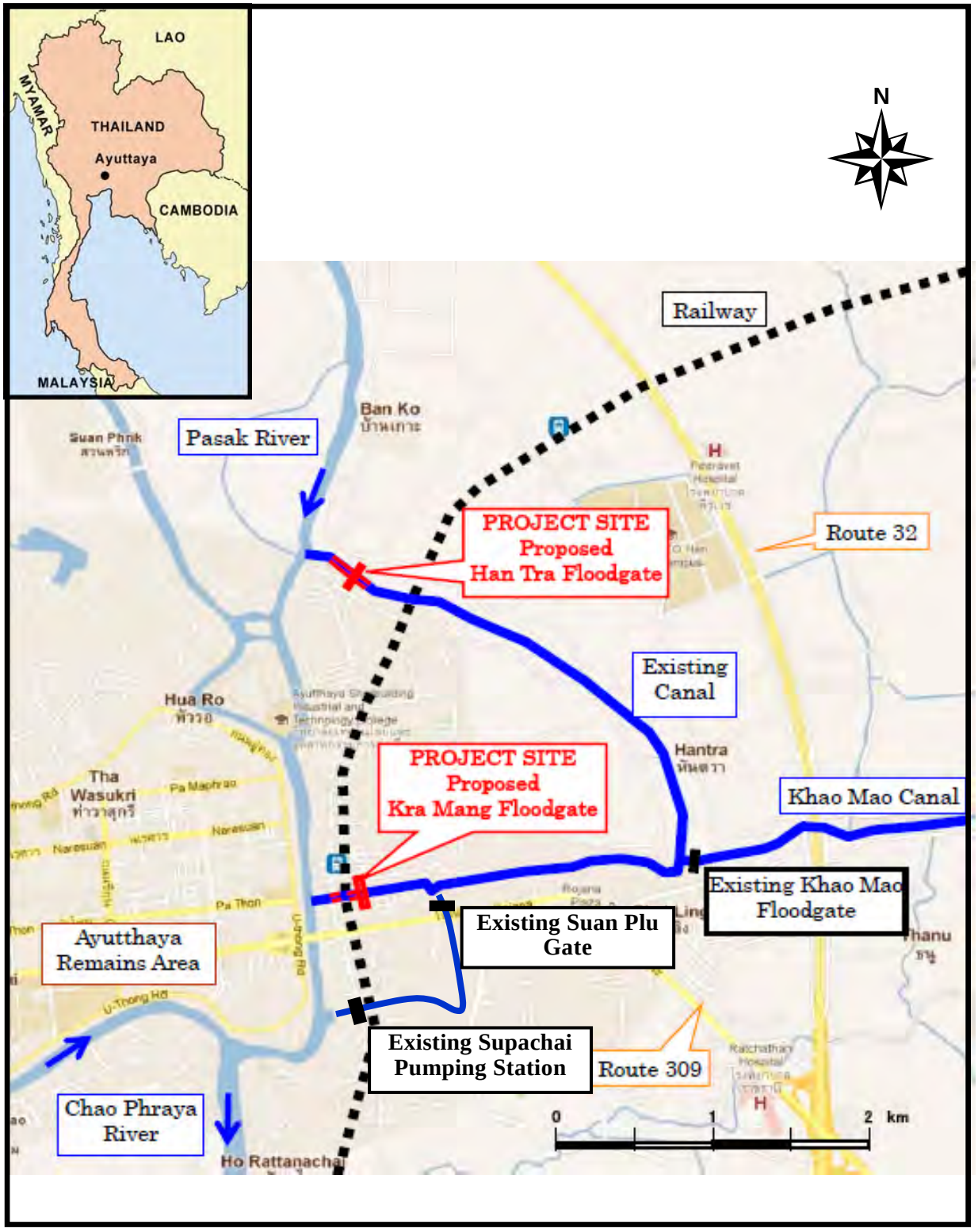

Location Map

Perspective


Kra Mang Floodgate

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Abbreviation

ADB	Asian Development Bank
ASEAN	Association of Southeast Asia Nations
ASTM	American Society of Testing and Materials
BMA	Bangkok Metropolitan Authority
BS	British Standards
DIW	Department of Industry
EGAT	Electric Generating Authority of Thailand
EIA	Environmental Impact Assessment
E/N	Exchange Note
FDI	Foreign Direct Investment
G/A	Grant Agreement
GDP	Gross Domestic Product
HWL	High Water Level
ICEM	International Centre for Environment Management
IEAT	Industrial Estate Authority of Thailand
IEE	Initial Environmental Examination
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation
JIS	Japan Industrial Standard
LWL	Low Water Level
MNRE	Ministry of Natural Resources and Environment
MOAC	Ministry of Agriculture and Cooperative
MOI	Ministry of Industry
MOSTE	Ministry of Science, Technology and Environment
MSL	Mean Sea Level
NEB	National Environmental Board
O&M	Operation and Maintenance
OEPP	Office of Environmental Policy and Planning
ONEP	Office of Natural Resources and Environmental Policy and Planning
PCD	Pollution Control Department
RAP	Resettlement Action Plan
RID	Royal Irrigation Department
SRT	State Railway of Thailand
TCA	Thai Contractors Association
TICA	Thailand International Development Cooperation Agency
TIS	Thai Industrial Standard
UNESCO	United Nation Educational, Scientific and Cultural Organization
WB	World Bank

CHAPTER 1. BACKGROUND OF THE PROJECT

1-1 CURRENT STATUS AND ISSUES OF SECTORS INVOLVED

1-1-1 Current Status and Issues

The flood occurred in 2011 in the Kingdom of Thailand began when the tropical storm 'Nock-ten' hit Northern Vietnam after the monsoon season. It caused heavy rainfalls at northern and northeastern areas in Thailand and many provinces suffered flush floods since 31 July 2011. Within one week, it was confirmed that 13 people were killed, and the inundation in many provinces at northeastern area has spread. The upper-central provinces were also flooded due to overflows of Yom River and Na River.

Most of all lower central provinces were affected by the flood until 19 September including Metropolitan Bangkok and its neighboring northern provinces. Since some floodgates were damaged, the floodwater of the Chao Phraya River flowed into irrigation canals and huge areas of paddy fields were inundated. These paddy fields have functioned as natural retarding basins.

From the end of September to the beginning of October, 3 tropical storms hit Indochina. Since most of the existing dams in Thailand were already near- or over- storage capacity, the release discharges from the dams were increased, even though the flood potential in the downstream area became worse.

The flood in Phra Nakhon Si Ayutthaya Province became worse and the Ayutthaya Historical Park was inundated. On the other hand, the dikes protecting industrial estates were breached by floodwater. Urban areas in Nonthaburi Province and Pathum Thani Province located at northern area of Bangkok also suffered extensively flood inundation damage.

More than 61 provinces have been extensively flooded in 2011 which was caused by more than 100-year probable rainfall estimated. According to the announcement of Government of Thailand (GOT) on 5 November 2011, the extent of flood damage is as follows: about 1,200,000 households (3,200,000 people) inundated, 446 dead, and about 17,000 km^2 farmland inundated at 25 provinces in the Chao Phraya River Basin. The Government of Japan (GOJ) provided emergency assistance (relief items) and additional relief goods including dispatch of specialist teams.

World Bank estimated at about 1,360 billion Baht of total direct flood damages and losses as shown in Table 1-1.1, and 88% of direct damages and losses was occurred in the production category because many industrial estates were inundated and damaged by the flood.

Table 1-1.1 Direct Damages and Losses by 2011flood

(Unit: million Baht)

Category	Direct Damage	Loss	Total	
Infrastructure	42,174	18,769	60,943	4.49%
Water Management	8,715	-	8,715	0.64%
Transportation	22,878	6,263	29,141	2.15%
Communication	1,290	2,020	3,310	0.24%
Electric power	3,191	5,321	8,512	0.63%
Water supply system, Water resources	3,538	2,104	5,642	0.42%
World heritage, historic sites	2,562	3,061	5,623	0.41%
Production	536,857	656,001	1,192,858	87.92%
Agriculture, Animal husbandry, Fishery	17,842	34,027	51,869	3.82%
Industry	513,881	417,025	930,906	68.61%
Tourism	5,134	89,673	94,807	6.99%
Finance, Bank	-	115,276	115,276	8.50%
Social	60,643	41,815	102,458	7.55%
Public health	1,684	2,128	3,812	0.28%
Education	13,051	1,798	14,849	1.09%
Housing	45,908	37,889	83,797	6.18%
Relation of all categories	375	176	551	0.04%
Environment	375	176	551	0.04%
Total	640,049	716,761	1,356,810	100.00%

Source：Estimation by WB

As indicated in the table above, the direct damage and loss of the agriculture, animal husbandry, and fishery are about 52,000 million Baht or 3.8% shear of the total direct damages and losses. Out of these sectors, the damage of agriculture is shown in Table1-1.2 below in details. Most of the affected farmland is the paddy that is main agricultural production in Thailand. The affected population of agricultural sector is about 1.9% in total population of Thailand (69 million).

Table1-1.2. Affected Agricultural Population and Farmland Area by 2011 year Flood

Affected Agricultural Population	1,299,668
Affected Farmland Area (km^2)	20,403
Paddy	16,128
Field Crops	3,002
Garden produce, Others	1,273

Note: Data at 29 December, 2011 Source：Ministry of Agriculture and Cooperatives

After the flood disaster in 2011, the urgent flood protection measures have been executed by the GOT

against the possible flood in next year 2012. However, it is strongly desired to take the countermeasures not only as short-term measures such as the temporary rehabilitation and improvement works but also medium- and long-term measures considering the possible flood risk which has the same level of 2011 flood in the future. Especially, since the industrial sector suffered the huge amount of flood damage and losses, this sector has strongly requested GOT to take necessary permanent flood protection measures. The private companies in the industrial agglomerations have driven economic development of Thailand. The flood control of the Chao Phraya River Basin is one of the most important issues of GOT. In particular, the effective flood control measures are required for the left bank of the Chao Phraya River/Pasak River because the industrial estates and central area of Metropolitan Bangkok are located.

The Pasak River is a major tributary and joins with the Chao Phraya River at Ayutthaya Island. On the left bank of lower Pasak River in Ayutthaya, there exist two canals, Han Tra Canal and Kra Mang Canal, connecting to the Pasak River. These canals function as drainage channel to lead water in low land area to the Pasak River. Han Tra and Kra Mang Canals joint and become the Khao Mao Canal. During the 2011 flood, the existing Khao Mao Floodgate (Regulator) located in the Khao Mao Canal were closed to prevent the floodwater of the Pasak River through both Han Tra Canal and Kra Mang Canal. However, the existing gate height of Khao Mao Floodgate was not sufficient for the rise of floodwater of Pasak River. Then, the floodgate became structurally dangerous situation and these gates were opened. At last, the floodwater flowed into the Khao Mao Canal and overflowed on banks. Finally, inundation extended to the southern area of the Khao Mao Canal including the major industrial estate areas.

Ministry of Agriculture and Cooperatives - Royal Irrigation Department (MOAC-RID) has carried out the urgent works at the existing Khao Mao Floodgate. The works compose of heightening gate leaves by one (1) meter and construction of 70m long floodwall using prestressed concrete corrugated sheet piles (see photograph below). However, the works are the only urgent work for the flood season in 2012. Therefore, it is necessary that the permanent measures against the floodwater of the Pasak River into canals.

	
Gate Heightening of Khao Mao Floodgate	**Constructed Floodwall Upstream of Khao Mao Floodgate**

1-1-2 Development Plan

(1) Five-Year Economic and Social Development Plan

The GOT has prepared a 5-year economic and social development plan; 10th Economic and Social Development Plan (2007 to 2011) with seven objectives and five strategies as follows:

Seven Objectives:

1. To provide opportunities for learning combined with integrity and morality by creating linkages between families, religious institutions, and educational institutions; to enhance health services, balancing among health care, promotion, prevention, treatment and capacity rehabilitation; and to improve the security of life and property.
2. To increase the potential of communities by linking them in networks to serve as the foundation for developing the economy and quality of life; to conserve, rehabilitate, and utilize the environment and natural resources in a sustainable fashion to achieve sufficiency and reduce poverty.
3. To reform the production structure for goods and services for value creation on a foundation of knowledge and innovation; to promote linkages among production sectors to increase value-added.
4. To build safety nets and risk management systems for the sectors of finance, banking, energy, factor markets, the labor market, and investment.
5. To ensure fair competition in trade and investment for national benefit; to create mechanisms for fair distribution of the benefits of development to all segments of the population.
6. To preserve natural resources and biodiversity, along with safeguarding the quality of the environment to be a secure foundation of national development and livelihood for both current and future generations; to create mechanisms to safeguard national benefit in a fair and sustainable manner.
7. To promote good governance in government administration, the private business sector, and the people's sector; to expand the role and capacity of local government bodies; to promote mechanisms and processes of participation in development; and to nurture a culture of democracy for peaceful coexistence.

Five Strategies

1. Strategies for development of human quality towards a knowledge-based and learning society.
2. Strategies to strengthen community and society as basis of national security.
3. Strategies to reform the structure of the economy for balance and sustainability.
4. Strategies for development of biodiversity and conservation of the environment and natural resources.
5. Strategies to promote good governance aiming at social justice and sustainability.

Among the seven objectives, the first objective stresses "to improve the security of life and property"

and the second objective stresses “reduce poverty”. In the seven strategies, “a good investment atmosphere will be cultivated to attract foreign investment” has also been stressed. In view of these objectives and strategies, it can be said that the Project is in conformity with the government policy. The Project will protect the life and property from flood and strengthen the flood barrier for affected industrial estates, resulting in good investment atmosphere.

(2) Plans on Water Resources Management

After the flood in 2011, the GOT has prepared (1) a master plan for flood control of the Chao Phraya River in addition to short-term action plan which was approved by Government Cabinet on 27 December 2011, and (2) Proposal of Five Strategies for Reconstruction and Future Development.

1) Master Plan for Flood Control of Chao Phraya River

In the plan, the upper stream basin should focus on reforestation and provision of regulation ponds; the midstream basin on protection of road network and retarding floodwater; and downstream basin on protection of important economic zones and construction of floodways. In addition, other measures are also planned such as regulation of land use and development, flood warning system, etc.

2) Five Strategies for Reconstruction and Future Development;

a) Water resource management

b) Restructuring of manufacture and service sectors

c) Development of new economic block

d) Development of infrastructure

e) Development of insurance system

On the above a), the following are in relation with the Project:

a) Rehabilitation and capacity improvement of existing and planned structures, and

b) To take measures in the specific areas.

The Project which is to prevent the floodwater of Pasak River into the Kra Mang and Han Tra Canals is in conformity with the policy of “10th Economic and Social Development Plan (2007 to 2011)”, “Master Plan for Chao Phraya River Flood Control”, and “Five Strategies for Reconstruction and Future Development”.

1-1-3 Socio-Economy

Thailand has undergone a rapid economic development since the late 1980s as a result of the export promotion policy through the industrialization of the underlying direct foreign investment from the foreign countries including Japan. After the late 1990s’ Asian economic crisis, the GOT strived to

economic reconstruction with the assistance of the international organizations/other countries. The continuous sluggish economic activities in Thailand were recovered. As a result of the export-led as ever and the expansion of domestic demand policy, the economic growth in Thailand was relatively high until year 2007. In 2008, the economy in Thailand was sluggish to slow down of exports that were affected from the recession of external demand by the global economic crisis stemming from the collapse of Lehman Brothers. The Gross Domestic Production (GDP) growth rates in 2008 and 2009 were 2.5% and -2.3%, respectively. In 2010, the economy in Thailand was recovered and GDP growth rate was recorded at 7.8% due to the economic recovery of overseas export markets.

GDP in Thailand is USD 4,992 per person in 2010. Agricultural population ratio is about 40% covering 12% of GDP. On the other hand, industrial population ratio is 15% covering 34% of GDP and industrial export values accounted for 90%.

However, the 2011 flood has severely damaged the economy of Thailand as follows:

1) Negative impact of flood on production activities such as supply chain of manufacturing industries and logistic network.
2) Shrinkage in household expenditure due to inflation, reduction of farmers' income and lowering reliability for investors.
3) Investment shrinkage in sector of construction equipment and heavy machinery.
4) Shrinkage in export amount of Thailand and negative impact of flood on economy of other external trade countries.
5) Reduction of number of international tourism.

Due to the damage of 2011 flood, the GDP growth rate in 2011 fell 0.1%.

1-2 BACKGROUND, HISTORY AND OVERVIEW OF THE GRANT AID

As part of disaster restoration for the flood occurred in 2011, the urgent flood prevention projects in the Chao Phraya River Basin have been implemented since December, 2011. Among these projects, the Flood Prevention Project of East Side of the Pasak River in Ayutthaya has been proposed as one of the urgent and effective projects. Based on the recommendation of the JICA survey/study result, the RID has requested the GOP for grant aid for implementation of this Project. The components of request of the GOT are as follows:

Table 1-2.1 Contents of Request

(1)	Construction of Han Tra Floodgate and Kra Mang Floodgate
(2)	Construction of River Bank Protection along the lower Han Tra Canal
(3)	Supply of Drainage Pump Vehicles

CHAPTER 2. CONTENTS OF THE PROJECT

2-1 BASIC CONCEPT OF THE PROJECT

2-1-1 Overall Goal and Purpose of The Project

The Kingdom of Thailand had been promoting 10th Economic and Social Development Plan for 2007 to 2011. It has seven (7) objectives and five (5) strategies. Especially, the followings are closely relation to the Project:

- To ensure the safety of peoples' lives and assets, and
- Strengthen the foundation for economic investment to attract the foreign direct investment.

In addition, the GOT has decided the Chao Phraya River Flood Control Master Plan (M/P) in December 2011. It consists of the urgent/short-term plan for the 2011 flood, and mid- and long term-countermeasures. The countermeasures in the M/P are proposed to restoration of land and forestry and construction of reservoir(s) in the upper basin, flood protection works of the local cities and artificial flood inundation in the middle basin, and the flood protection of important economic areas, construction of the floodway and diversion in the lower basin.

The 2011 flood has damaged the residents and assets in the target area on the left bank of the Pasak River in Ayutthaya. Also, the industrial estates located downstream of the Pasak/Chao Phraya Rivers have extensively suffered serious flood damage. In accordance with the GOT’s policy mentioned above, in order to mitigate the flood damage for the safety of residents and industrial estates in the area, it is proposed to construct floodgates in the Kra Mang Canal and Han Tra Canal which connect to the Pasak River on the left bank.

The overall goal and purpose of the Project are as follows:

Overall Goal

1. To ensure the safety of people's lives and assets
2. Strengthen the foundation for economic investment to attract the foreign direct investment.

Purpose of the Project

1. Flood prevention to left bank (East side) of the Pasak River in Ayutthaya
2. Reduction of flood damage in the industrial estates located at left bank of Chao Phraya River

2-1-2 Contents of The Project

For realization of the overall goal above, the Project is planned to construct the Han Tra Floodgate and Kra Mang Floodgate in the canals connecting to the Pasak River under the Japan Grant Aid Project. It is expected that the Project mitigates the flood damage in the area between left bank of Pasak River and Provincial Road Route 3053 and industrial estates in the downstream area.

(1) Construction Work

1) Han Tra Floodgate

Hydraulic Gate Works	Gate leaf	Curtain walled type 4 sided watertight stainless steel fixed wheel gate: clear span 6.0 m x effective height 7.1 m x 3 gates.
	Hoist	Wire rope winched 1 motor 2 drum type hoist (3 phase x 380 V x 50 Hz).
	Stoplog	Clear span 6.0m x Effective 1.0m x 5 pieces x 2 sides (downstream and upstream). Telpher rail x 2 sides (downstream and upstream). Manual chain hoist x 2 sides (downstream and upstream). Lifting beam x 2 sides (downstream and upstream).
	Backup power supply system	2 units - Diesel engine generator: 1 phase 220 V/3 phase 380 V x 50 Hz x 20 kVA.
	Incidental equipment	Water level gauges x 2 sets. Lighting facility. Lightning rod.
Civil Works	Main structure	Reinforced concrete bottom slab, pier, and deck.
	Hoist room	Shaped steel frame with roof without wall.
	Maintenance bridge	Reinforced concrete slab type; 3 m wide at upstream and 2 m wide at downstream.
	Foundation type	PC pile (600 mm diameter).
	Cut-off wall	Steel sheet pile.
	Side wall and Wing wall	Reinforced retaining wall for seepage.
	Apron	Reinforced concrete: 6 m long at upstream and 6 m long at downstream.
	Canal bed protection	Gabion mattress: 14 m long at upstream side and 14 m long at downstream side.
	Floodwall	Double PC corrugated sheet piling.

2) River Bank Protection along Lower Han Tra Canal

Civil Works	Structural type	PC corrugated sheet piling with tie rod and concrete crib work with stone filling.
	Length of bank protection	484 m long in total: 272 m at the right bank and 212 m at the left bank.
	Elevation of top of cap concrete of PC corrugated sheet pile	EL. +2.5 m MSL.
	Elevation of top of embankment	EL. +4.5 m MSL.
	Slope of embankment	Vertical 1 : Horizontal 2.0.
	Miscellaneous works	2 drainage outlets with flapgates 484 m long ditches along river bank protection. 10 stairs.

3) Kra Mang Floodgate

Hydraulic Gate Works for Kra Mang Floodgate	Gate leaf	Curtain walled type 4 sided watertight stainless steel fixed wheel gate: clear span 6.0m x effective height 5.1 m x 3 gates.
Hydraulic Gate Works	Hoist	Wire rope winched 1 motor 2 drum type hoist (3 phase x 380 V x 50 Hz).
	Stoplog	Clear span 6.0 m x Effective 1.0 m x 3 pieces x 2 sides (downstream and upstream). Telpher rail x 2 sides (downstream and upstream). Manual chain hoist x 2 sides (downstream and upstream). Lifting beam x 2 sides (downstream and upstream).
	Backup power supply system	2 units - Diesel engine generator: 1 phase 220 V/3 phase 380 V x 50 Hz x 20 kVA.
	Incidental equipment	Water level gauges x 2 sets Lighting facility. Lightning rod.
Civil Works	Main structure	Reinforced concrete bottom slab, pier, and deck.
	Hoist room	Shaped steel frame with roof without wall.
	Maintenance bridge	Reinforced concrete slab type; 3 m wide at upstream and 2 m wide at downstream.
	Foundation type	PC pile 600 mm diameter.
	Cut-off wall	Steel sheet pile.
	Wing wall	Reinforced retaining wall.
	Apron	Reinforced concrete: 6 m long at upstream and 6 m long at downstream.
	Channelbed protection	Gabion mattress: 14 m long at upstream side and 14 m long at downstream side.
	Floodwall	U-type Wall and double PC corrugated sheet piling.
Hydraulic Gate Works for Drainage	Gate leaf	Stainless steel fixed wheel gate.
	Hoist	Manual racked gate hoist.
Civil Works for Drainage	Main structure	Reinforced concrete pier, deck, wing wall, box culvert.
	Foundation type	Prestressed concrete pile (600 mm diameter).
	Cut-off wall	Steel sheet piling.

(2) Procurement (Drainage Pump Vehicles)

Drainage Pump	Total capacity of drainage discharge	30 m^3/min (at 10 m of total head).
	Model	Submersible motor driving pump.
	Number	6 units or less (same specifications for all units).
	Bore	200 mm.
	Unit weight of pump	40 kgf/unit or less.
	Power source	3 phase x 440 V x 60 Hz.
	Cable	Cabtire cable: 40 m/unit or more.
	Drainage hose	200 mm diameter x 50 m (discharge side)/unit: 0.2 MPa or more pressure-tight.
	Pump float	1 no./unit
Power generator	Capacity	1 phase 220 V / 3 phase 440 V x 60 Hz, 125 kVA or more.
	Engine	Water-cooled diesel.
Lighting apparatus	Lamps	High intensive discharge (HID) lamp: 1 phase 220 V x 500 W or more x 2 units.
	Cable	Cabtire cable: 20 m or more per lamp.
Control panel	Type	Outdoor weatherproof.
	Function	Containing inverter devices, rotation speed control, and on-off for lighting apparatus.
Chassis with Cab	Country of origin	The Kingdom of Thailand.
	Gross Vehicle Weight (GVW)	Around 10,000 kgf or less.

2-2 OUTLINE DESIGN

2-2-1 Design Policy

(1) Basic Policy

The basic policies of the design for the project are as follows.

1) The proposed Han Tra Floodgate is constructed in the Han Tra Canal at about 360 m upstream from the confluence of the Pasak River. The Kra Mang Floodgate is also constructed in the Kra Mang Canal at about 240 m upstream from the confluence of the Pasak River (just upstream of the existing state railway bridge).
2) The design concept of both floodgates stands on easy maintenance work and its minimum cost. Especially, the gate materials are chosen in view of maintenance-free.
3) The construction materials are procured from the local markets as much as possible.

4) Temporary coffering system is applied for floodgate construction in order to prevent inflow from the Pasak River and drainage water in Han Tra and Kra Mang Canals. Water inside of coffering systems is drained by temporarily installed submergible pumps for construction.

5) Rainwater inside of the target protected area is drained by the proposed Drainage Pump Vehicles.

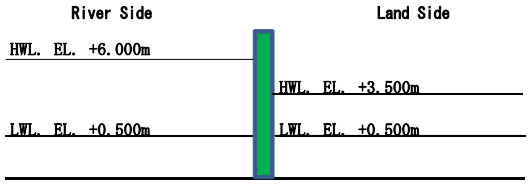
6) During the 2001 flood, the floodwater in the target protected area and the industrial estates including the Rojana Industrial Estate located at south of existing Kha Mao Floodgate was drained by using the drainage pump vehicles which were urgently conveyed from Japan as an international relief assistance. These drainage pump vehicles have showed the excellent result for drainage. Therefore, it is proposed to use widely the Drainage Pump Vehicles in the jurisdiction of RID Regional Irrigation Office 10, as requested by the RID.

(2) Policy for Natural Conditions

1) Design Water Level of Han Tra floodgate and Kra Mang Floodgate

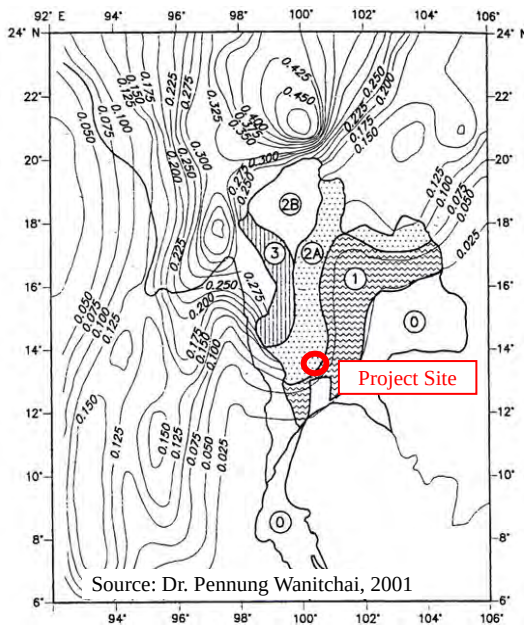
The design flood water level (EL.+6.00 m MSL) at river side (downstream) of both proposed floodgates is determined based on the highest water level of the 2011 flood (EL.+5.91 m MSL) recorded at the Ayutthaya Water Level Gauging Station (S5) along the Pasak River. This recorded water level of EL.+5.91 m MSL is estimated at more than 100-year return period. The design lowest water level of +0.50 m MSL at both river side (downstream) and land side (downstream) is based on the lowest water level of the Pasak River (EL. +0.50 m) after completion of the Pasak dam.

The design high water level of land side (EL. +3.50 m MSL) of both floodgates is determined on the basis of the operation rule of the existing Kha Mao floodgate and ground elevation along the canal.



Source: JICA Survey Team

Figure 2-2-1.1 Design Water Level



Zone 3: High rick of earthquake damage
Zone 2: Moderate risk of earthquake damage
Zone 1: Low rick of earthquake damage
Zone 0: No effect of earthquake damage
is the ratio between acceleration-dependent seismic rick per gravity force

Figure 2-2-1.2 Seismic Coefficient

2) Seismic Coefficient

The horizontal seismic coefficient of 0.10 in Ayutthaya area is applied for the design

of the proposed structures from the design guideline of Thailand prepared by Dr. Pennung, Wanitchai, 2001.

Vertical one is not considered. Therefore, the seismic coefficient is adopted kh=0.10.

3） Condition of Structure Foundation

The geological investigation was carried out at the sites of proposed Han Tra and Kura Mang Floodgates and surrounding area. As a result of the soil borings, the direct foundation can not be applied for the foundation of both floodgates due to very soft (very low N-value) at the surface layer. Therefore, the pile foundation is considered for both proposed floodgates. The top of bearing layer is EL.-17.0 m MSL at the Han Tra floodgate and below and EL.-4.0 m MSL at the Kra Mang floodgate.

(3) Policy for Socio-Economic Condition

Many urgent rehabilitation works have been executed for the 2011 flood, resulting in the increase in costs for materials and labor. In the estimation of project cost, this situation should be considered.

(4) Policy for Condition of Construction Works and Utilization of Local Contractors

The policies for the condition of construction works and utilization of local contractor(s) in the Project are as follows:

1) In the design of civil structures of both floodgates and related facilities, the easily obtained materials in Thailand are adopted, such as concrete, aggregate, reinforcement bar, form, secondary products made of concrete, polyvinyl chloride pipe, etc., are adopted.
2) Necessary embankment material, concrete aggregate, cobble stone in the construction works are purchased from the acceptable suppliers.
3) The construction equipment are available in Thailand on rental-base.
4) More than 8,400 companies related to the construction works are registered in Thailand. Japanese contractor may utilize the local construction companies that have no problems on technology and finances.
5) At the present, the shortage of the workers and operators is occurred due to many urgent rehabilitation works in progress for the 2011 flood. However, it is expected to recover the shortage at September or October, 2012. When construction of both floodgates starts, the workers and operators of the heavy equipments could be supplied and utilized from central area of Thailand including Ayutthaya area.
6) The minimum labor wage has increased by 30% from April, 2012 as government pledges. Therefore, labor cost after April, 2012 is applied for the project cost estimation.
7) Regarding the new installation of hydraulic gate, utilization of stainless materials and application of safety measure system are not common in the Thailand. These are to be procured from Japan or in Thailand under technical supervision of Japanese

contractor/subcontractor.

8) For chassis of drainage pump vehicle, production in Thailand is used. On the other hand, drainage pump unit and control panel fabricated in Japan are used. Installation and mounting works of components onto the chassis are done at workshop in Thailand under the full responsibility of the contractor or its subcontractor.

(5) Policy for Capacity of Executing Agency for Operation and Maintenance

The construction works are executed by Construction Division in the Regional Irrigation Office 10. On the other hand, operation and maintenance works including Drainage Pump Vehicles are carried out by RID Ayutthaya Irrigation Project Office under the Office 10.

At the present, RID has been carrying out the operation and maintenance of the existing Kha Mao Floodgate more than 30 years. It can be said there are not any problem on operation and maintenance from the viewpoint of present budget, staffing, technical and office space condition.

The initial guidance for operation, inspection, and maintenance of completed Floodgates and delivered Drainage Pump Vehicles is planned to be carried out by the Contractor for the RID Ayutthaya Irrigation Project Office. The Management Guidance which ensures the smooth operation and maintenance of Drainage Pump Vehicles and Floodgates is to be conducted under the soft component included in the consulting services. Preparation of draft operation rules, holding seminar, training and discussions are carried out by the Consultant. Based on these activities, draft Operation Rule is finalized.

(6) Policy for Grade of Floodgates and Related Facilities

The policies for the grade of the floodgates and the related facilities in the Project are as follows:

1) It is proposed for the grade of the floodgates and the related facilities to apply the maintenance free materials in view of the maintenance as much as possible.
2) The safety measure system is applied for the proposed floodgates in view of safety operation, even the existing floodgates did not have.
3) The lightning rods are to be installed on both floodgates to avoid the lightning damage, even other existing floodgates near do not have.
4) Chassis fabricated in Thailand is used for Drainage Pump Vehicle considering available spare parts and regulation on vehicle registration in Thailand.

(7) Policy for Construction/Procurement Method and Construction Schedule

The policies for the construction/procurement method and construction schedule of the Project are as follows:

1) The construction schedule is planned based on the possible annual working days considering estimated precipitation in the rainy season and dry season.

2) The periods of the preparatory work and the demobilization are set in consideration of the time of various procedures for construction works, period of the setting and removal of temporary facilities and procurement period of the major materials and equipment.

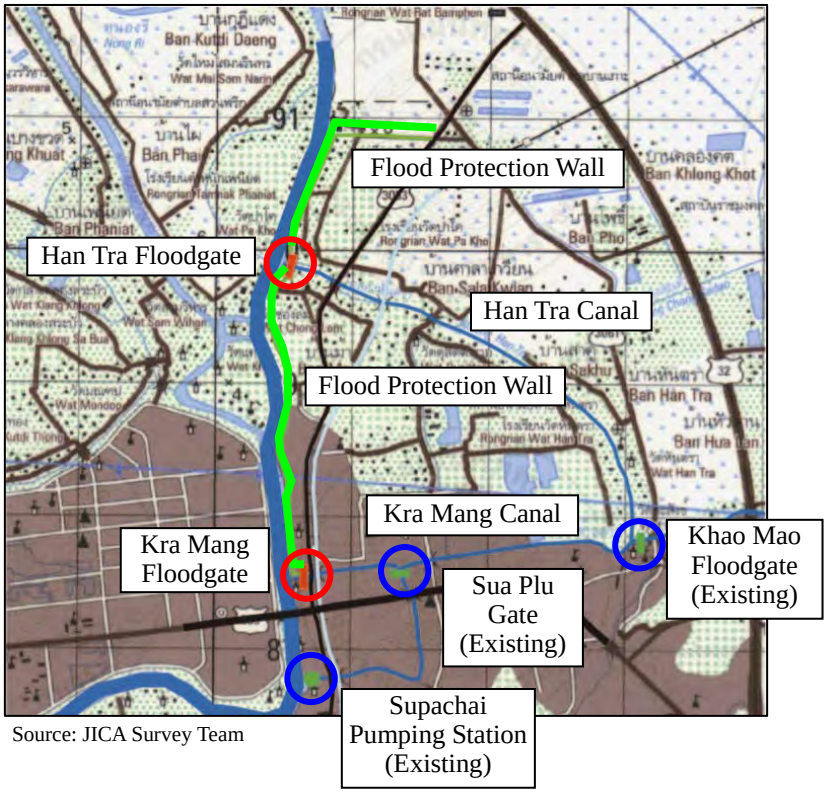
3) The required temporary coffering method is planned considering the safety, impact of surrounding peoples, construction period and economic efficiency.

2-2-2 Basic Plan

(1) Flood Prevention Plan

RID has made a flood prevention plan for left bank, the eastern area, of the Pasak River after the 2011 flood occurred. This plan consists of two floodgates and permanent flood protection wall. The Han Tra Floodgate is planned at the confluence of the Pasak River and the Han Tra Canal, and the Kra Mang Floodgate was planned at the confluence of the Pasak River and the Kra Mang Canal.

Figure 2-2-2.1 shows layout of overall plan.



Source: JICA Survey Team

Figure 2-2-2.1 Flood Prevention Plan to Left Bank of Pasak River prepared by RID

In order to construct the Kra Mang Floodgate and floodwall, the RID had a public consultation meeting in February 2012. In the meeting, some stakeholders disagreed the location of the Kra Mang Floodgate because of necessity of relocation of existing houses. However, to mitigate the flood damage such as the 2011 flood, the construction of both floodgates and floodwall is practically necessary. In view of this situation, the JICA Survey Team have suggested the RID to apply the phased implementation of the Project and the RID has agreed it.

Concept of the phased implementation is as shown in Figure 2-2-2.2.

	
1st Step: Construction of Floodgates (2nos.) (Grant Aid) and Parts of Existing road heightening (GOT Budget) Construction of two floodgates and to connect existing road by the wall. The lower elevation of the existing road will be raise by the GOT. To protect eastern area of the existing road (Route 3053)	**2nd Step: Construction of Flood Protection Wall (GOT Budget)** Flood protection wall and connection wall between flood protection wall and the floodgates. To protect remaining area between the Pasak River and the existing road (Route 3053)

Source: JICA Survey Team

Figure 2-2-2.2 Concept of Phased Implementation

(2) Han Tra Floodgate

1) Location of Floodgate

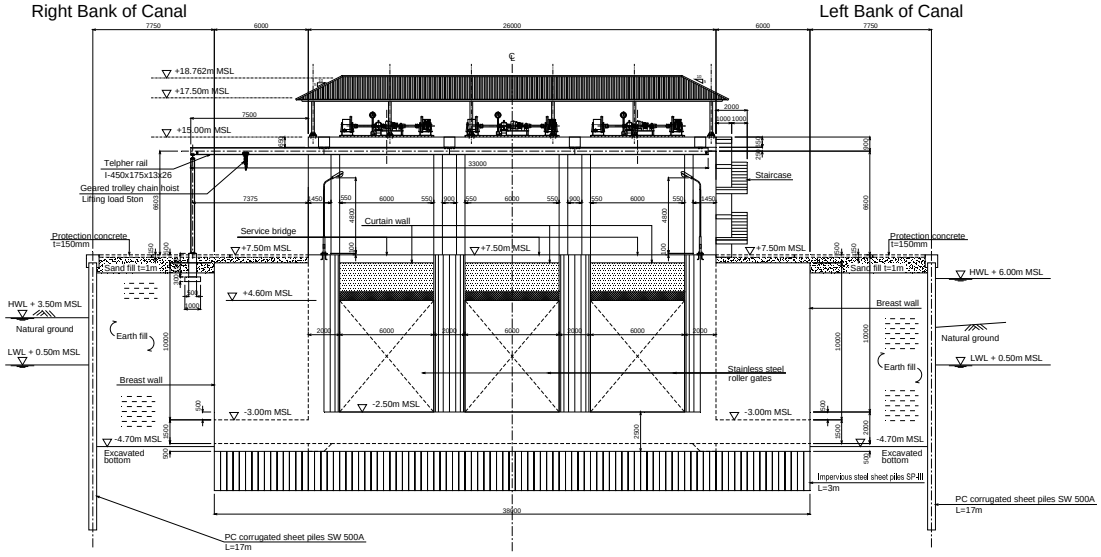
From the viewpoint of topography, geological and geotechnical condition, social environment, easiness of the construction works, etc., location of the Han Tra Floodgate is proposed near the existing bridge of road no. 3053 that is located at about 360 m upstream from the confluence of the Pasak River as shown in Figure 2-2-2.3.

Source: JICA Survey Team

Figure 2-2-2.3 Location of Han Tra Floodgate (North Side)

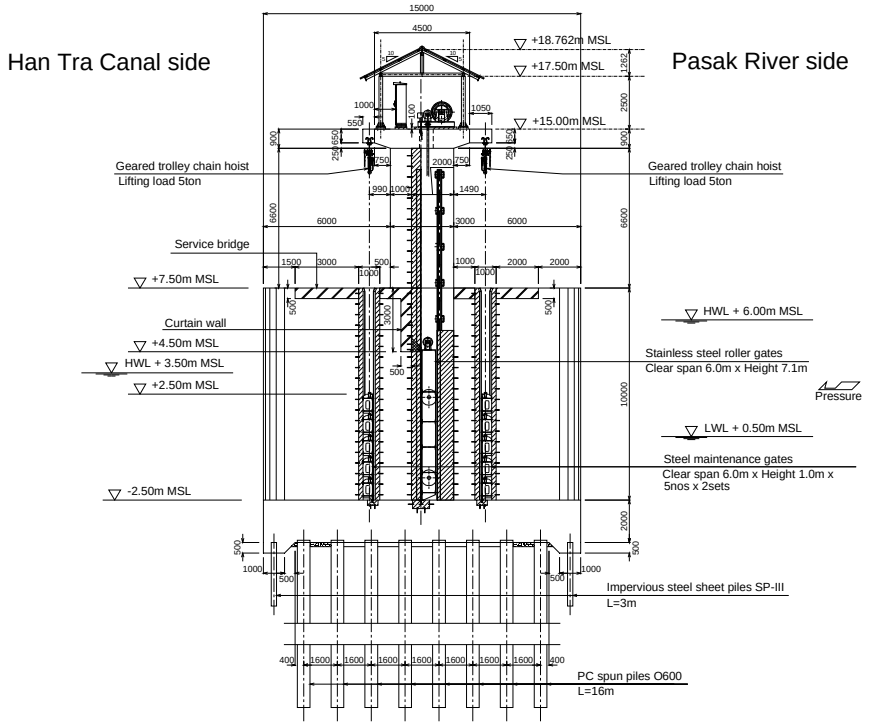
2） Width and Number of Gate

The 6 m wide gate is determined based on the existing floodgates in Bangkok and Kha Mao Floodgate located near the both proposed floodgates. Number of gate is determined to be three considering the topographical and flow capacity and existing Kha Mao Floodgate. Figure 2-2-2.4 and Figure 2-2-2.5 show the front view and profile of Han Tra Floodgate.



Source: JICA Survey Team

Figure 2-2-2.4 Front View of Han Tra Floodgate

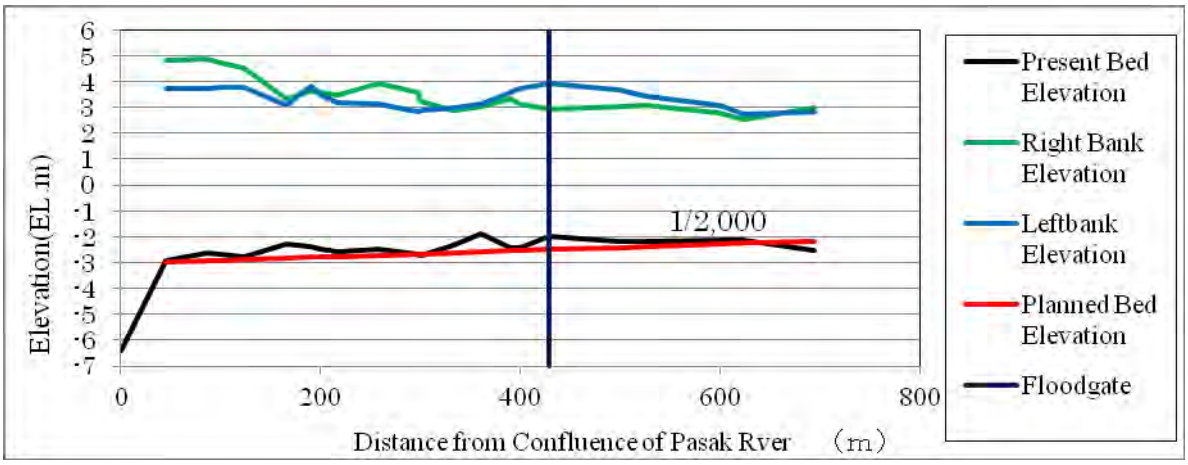


Source: JICA Survey Team

Figure 2-2-2.5 Profile of Han Tra Floodgate

3) Elevation of Apron

The planned canal bed elevation is set from the present one. The bed slope is designed as 1/2,000 from the present condition. Bed elevation of floodgate is set at EL. -2.5 m MSL. The relation between planned canal bed elevation and present one is shown in Figure 2-2-2.6.



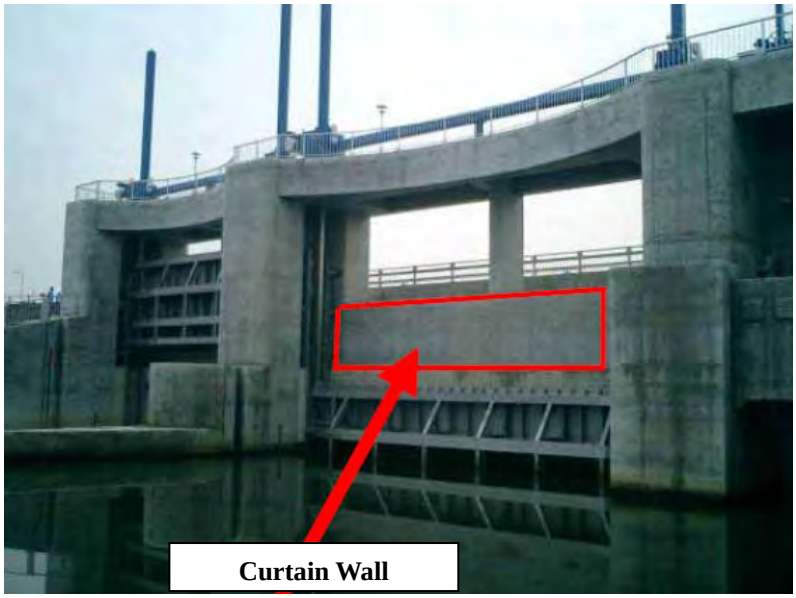
Source: JICA Survey Team

Figure 2-2-2.6 Profile of Han Tra Channel

4) Floodgate Type

Reinforced concrete is used for the main structure of floodgate. Curtain wall is designed at upstream side of the floodgate in order to reduce gate height. This results in reducing the

total height of floodgate, compared with floodgate without curtain wall.



Source: JICA Survey Team

Figure 2-2-2.7 Sample of Floodgate with Curtain Wall

5) Length of Floodgate on Flow Direction

Length of floodgate on flow direction is 15 m in total which is determined from the layout of the gate, stoplog, O&M bridges and stability analysis. In addition, the steel sheet pile (Type III) with 5m length is driven at the end of upstream and downstream of main structures to protect seepage.

6) Foundation Type

Pile foundation is applied due to soft subsoil condition. Since the bearing layer with N-value of more than 30 is laid at around EL. -17.0 m MSL, the pile is designed as bearing pile foundation. The adopted pile is Prestressed Concrete (PC) pile with 600 mm diameter. The interval in pile location is 1.6 m at longitudinal direction (flow direction) and 1.7 m at transverse direction.

7) Gate Equipment

Roller gate is adopted for the gate type because it is very common for the floodgate with this size in not only Japan but also Thailand. Size of gate leaf is 6.0 m clear span and 7.1 m effective height.

Design speed of gate leaf open/close is 0.3 m/min. Wire rope winched 1 motor 2 drum type hoist is proposed for open/close. Minimizing maintenance cost, after consultation with RID Regional Irrigation Office 10, it is proposed to use stainless steels which need no painting for corrosion-resisting of leaf, guide, and wire rope. Seal of gate leaf is designed with

curtain-walled 4 sided watertight pressed from the Pasak River. For rubber seals, there are some shape-types such as P-shape type and flat type commonly used in Thailand. In this Project, P-shape is applied for 2 sides and top of leaf and flat type for bottom.

8） Hoist Deck

The open deck with roof which was adopted for the existing floodgates are applied as commented by the RID Regional Irrigation Office 10. Roof of the hoist deck is designed as truss structure and slate roof. Plan dimension of hoist deck at EL. +15.0 m MSL is 4.5 m wide and 26 m long. Reinforced concrete stair connecting to pier is provided for access.

9） Maintenance Bridge

Two maintenance bridges are provided on the piers of floodgate at downstream and upstream sides. Type of bridges is the reinforced concrete slab. Design load of bridge is TL-14 ton. Middle-class vehicle can pass the upstream bridge having 3 m width and sedan can pass downstream bridge having 2 m width.

10） Stoplog

The stoplog is provided at both downstream and upstream to maintain water level and to protect back flow for the purpose of the inspection, repair or replacement of gate. Stoplog consists of steel leaf and stainless guide.

Guide for stoplog is provided for each gate. However, only one set of stoplog leaf is provided because of maintenance work purpose. Setting and removal of stoplog is carried out using the manual chain block fixed with lifting beam on the floodgate pier.

The design water level of stoplog is set at EL.+2.0 m MSL which is the maximum water level in dry season because the inspection and maintenance is normally carried out during the dry season. Height of one leaf of stoplog is 1m considering easy handling. Five pieces of stoplog from EL.-2.5 m MSL to +2.5 m MSL are needed for up- and downstream, respectively. It means that a total of 10 pieces are necessary. Ten pieces of stoplog are stored at right bank space with ground elevation of EL.+7.5 m MSL of the floodgate compound.

11） Side Wall and Wing Wall

Side wall which is constructed as a part of main structure of floodgate is designed to protect the bank from washed-out. Wing wall constructed together with apron has top elevation of EL.+7.5 m MSL and connects the main structure and floodwall. These walls are supported by the pile foundation (600 mm diameter PC pile).

12） Riverbed Protection

The riverbed protection is provided at both up- and down-stream sides from the floodgate. This protection consists of 6 m long reinforced concrete apron and 14 m long flexible gabion

mattress. Apron and wing wall are the same structure supported with PC piles (600 mm diameter). Since the apron is separated from the main structure of floodgate, cut-off wall is provided. End of mattress is fixed with piles considering washed-out. Both banks in the canal bed protection work area are also protected with the river bank protection consisting of PC corrugated sheet pile with tie rods, stone facing with concrete crib work and concrete pavement.

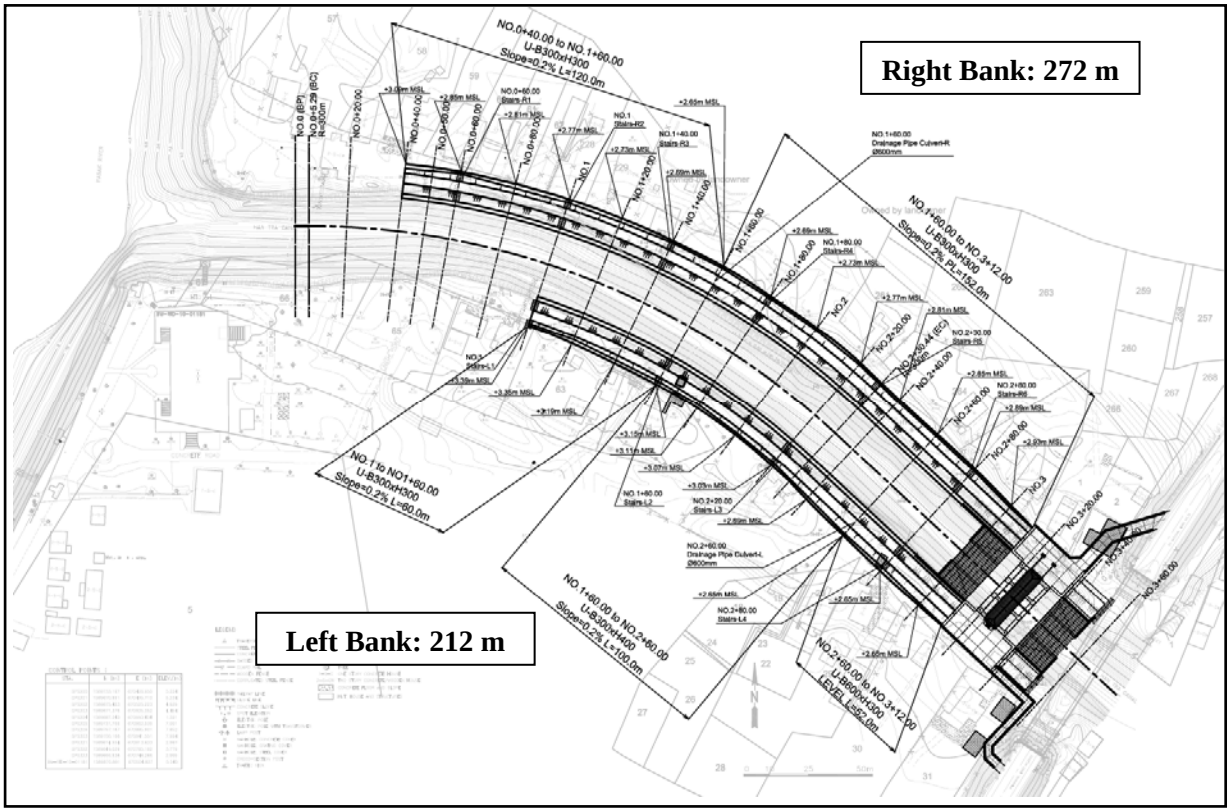
13） Floodwall

Floodgate connects with Route 3035 Road through floodwalls on both banks. Top elevation of floodwall is EL.+7.5 m MSL. Along the floodwall on the right bank, a 4.33 m wide access road to floodgate is provided. However, no access road is planned on left bank. Structure of floodwall consists of double wall with soil filling using PC corrugated sheet piles. Top of floodwall is paved with concrete. Stainless handrails are provided for safety.

14） River Bank Protection

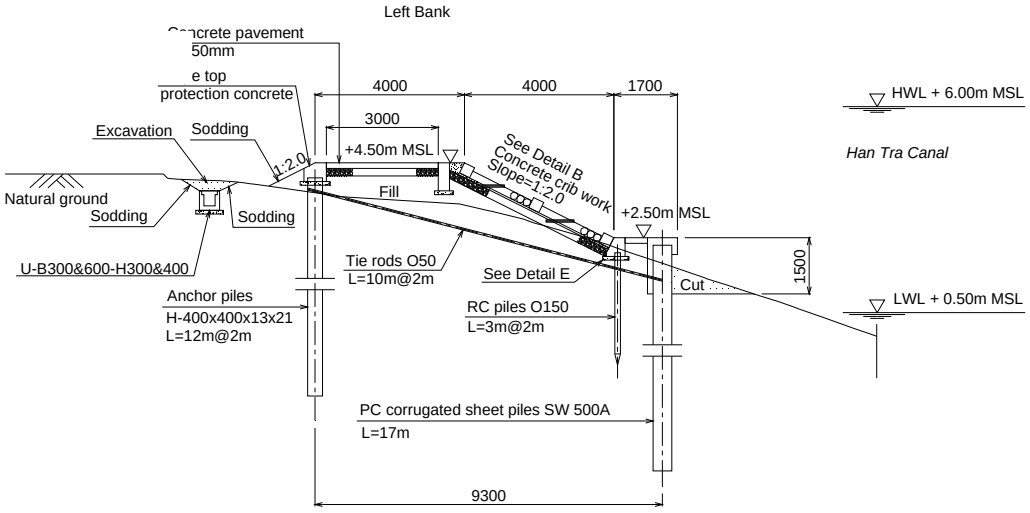
As a first phased implementation of flood protection works along the Han Tran Canal and Pasak River, it is proposed to construct the river bank protection with EL.+4.5 m MSL along the banks of the Han Tra Canal downstream of the floodgate. Length of riverbank protection is 484m long in total; 272 m on the right bank and 212 m on the left bank, respectively, as shown in Figure 2-2-2.8. River protection structurally consists of PC corrugated concrete sheet pile, stone facing with concrete crib work and concrete pavement. PC corrugated sheet piles are supported with tie rods and H-beams. Since design flood level of the Pasak River is EL.+6.0 m MSL, the overflow on the river bank protection is considered in the design. Therefore, weepholes with 50 mm diameter and 15 cm thick concrete pavement, sodding, etc., are provided for protection of erosion due to overflow.

Rainwater is drained through the ditches provided. Two outlets of 600 mm diameter pipe with flapgate are provided for the 5-year return period rain (133 mm during 15 minutes or 70 mm/hr). In addition, stairs for the residents are provided at 10 locations.



Source: JICA Survey Team

Figure 2-2-2.8 Plan of Downstream River Bank Protection in Han Tra Canal



Source: JICA Survey Team

Figure 2-2-2.9 Typical Section of Downstream River Bank Protection in Han Tra Canal

15） Operation Control Panel

The local operation control panel of the floodgate is set on the hoist deck. Locally available relay control system is adopted as reliable system. The local control panel is installed for each gate. On the deck, there are other equipment such as electric motor, etc. to be installed. The local control panel is weather proof construction of outdoor type.

16） Electric Power Supply

The electric power is supplied from the Provincial Electricity Authority in Ayutthaya. It is 3 phase x 4 wire x 380/220 V x 50 Hz. The Authority installs the necessary 22 kV line on electric post near the Project sites with the expense of RID.

The contractor installs the electric power line from the electric post installed by the Authority to the sites. Power is divided into two; 1 phase x 2 W x 220 V x 50 Hz for lighting and 3 phase x 3 W x 380 V x 50 Hz for motors. Receiving/control panels on posts are operating on the ground.

17） Lighting Facility

Lighting facilities are provided at piers and hoist deck.

18） Backup Generator

Backup generator is installed to keep minimum required electricity, when the commercial power shut down is occurred. Type of backup generator is diesel generator and it has a capacity of 1 phase 220 V/3 phase 380 V x 50 Hz x 20 kVA for lighting and operating gates.

19） Lightning Rod

The lightning rod is provided at roof to avoid the lightning damage of the electrical equipment, while the existing floodgates do not have the lightning rod.

20） Water Level Measurement Device

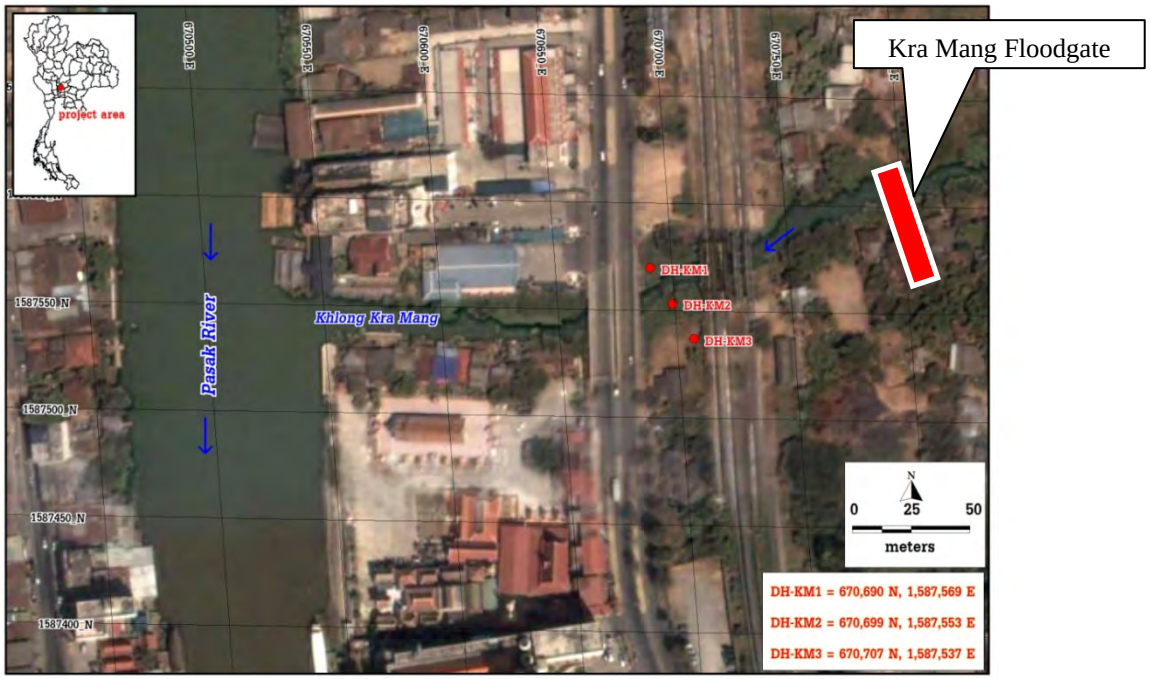
Two types of water level measurement devices are provided to confirm up- and downstream water level of the floodgate. One is a pressure type water level gauge with display and data logger, and the other one is a staff gauge.

(3) Kra Mang Floodgate

1） Location of Floodgate

Location of the Kra Mang floodgate was initially proposed about 20 m upstream from confluence of the Pasak River by RID. However, the stakeholders disagreed the planned location from the environmental viewpoint in the public consultation meeting held in February, 2012. It was alternatively proposed between the road bridge and the state railway bridge.

However, this site has problems on the limited space, existing buried oil pipeline and agreement with the state railway of Thailand. Therefore, the location of the Kra Mang Floodgate was finally decided at about 10 m upstream of the railway bridge from the viewpoint of topographical, geological and geotechnical, social issue and the easiness of the construction works, as recommended by the JICA Survey Team.

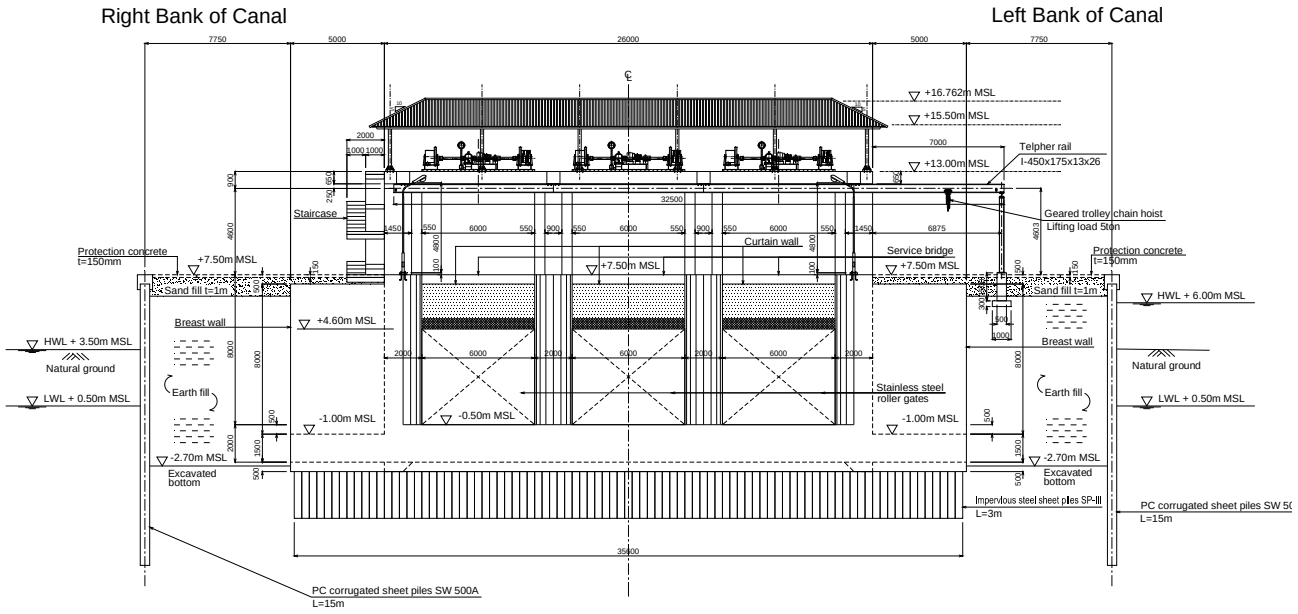


Source: JICA Survey Team

Figure 2-2-2.10 Location of Kra Mang Floodgate (South Side)

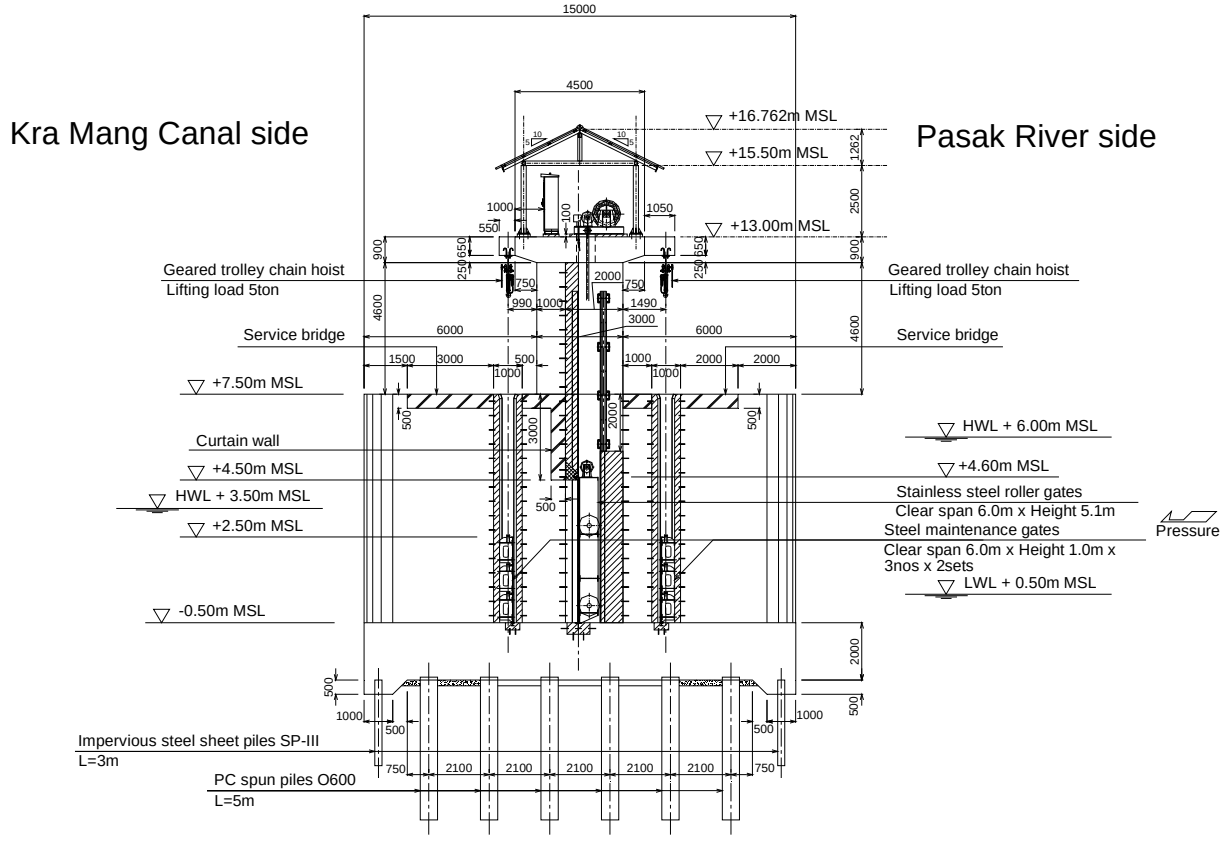
2) Width and Number of Gate

As the same as Han Tra Floodgate, gate width of 6 m is determined based on the existing floodgates in Bangkok and Kha Mao Floodgate located near the both proposed floodgates. Number of gate is determined to be three considering the topographical and flow capacity and existing Kha Mao Floodgate. Figure 2-2-2.4 and Figure 2-2-2.5 show the front view and profile of Han Tra Floodgate.



Source: JICA Survey Team

Figure 2-2-2.11 Front View of Kra Mang Floodgate

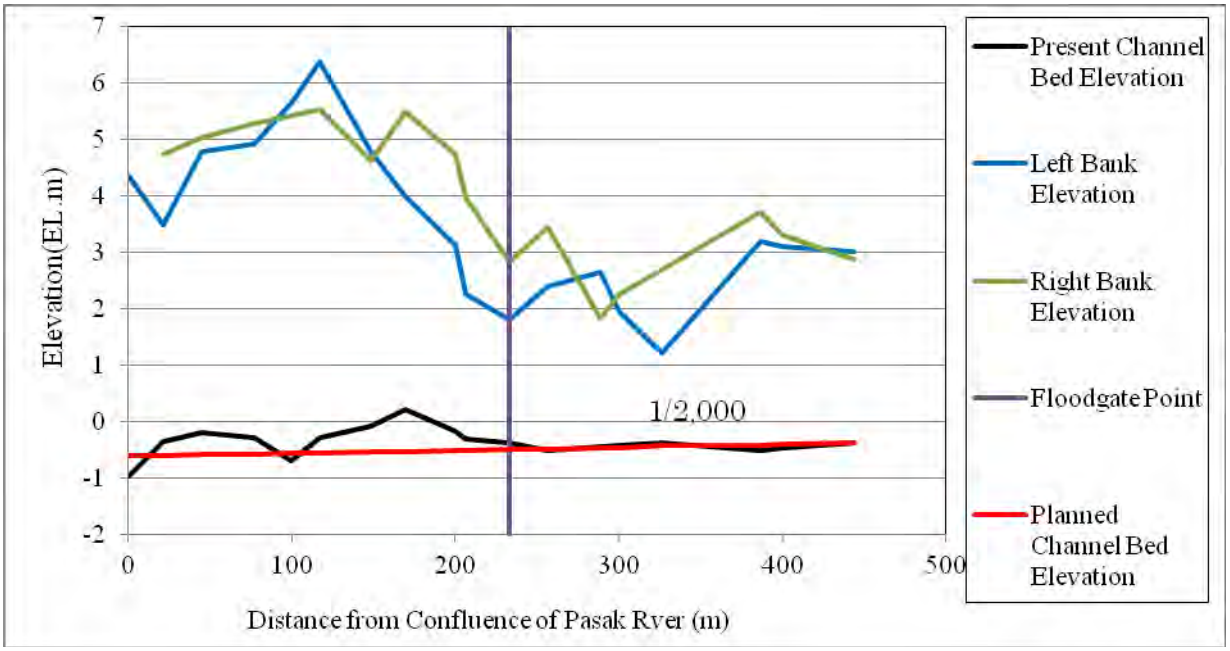


Source: JICA Survey Team

Figure 2-2-2.12 Profile of Kra Mang Floodgate

3） Elevation of Apron

The planned canal bed elevation is set from the present one. The bed slope is designed as 1/2,000 from the present condition. Bed elevation of floodgate is set at EL. -0.5 m MSL. The relation between planned canal bed elevation and present one is shown in Figure 2-2-2.13.



Source: JICA Survey Team

Figure 2-2-2.13 Profile of Kra Mang Channel

4） Floodgate Type

Reinforced concrete is used for the main structure of floodgate as the same as Han Tra Floodgate. Curtain wall is designed at upstream side of the floodgate in order to reduce gate height. This results in reducing the total height of floodgate, compared with floodgate without curtain wall.

5） Length of Floodgate on Flow Direction

Length of floodgate on flow direction is 15 m in total which is determined from the layout of the gate, stoplog, O&M bridges and stability analysis. In addition, the steel sheet pile (Type III) with 3 m length is driven at the end of upstream and downstream of main structures to protect seepage.

6） Foundation Type

Pile foundation is applied due to soft subsoil condition. Since the clay bearing layer with N-value of more than 30 is laid at around EL. -4.0 m MSL, the pile is designed as bearing pile foundation. The adopted pile is Prestressed Concrete (PC) pile with 600 mm diameter. The interval in pile location is 2.1 m at longitudinal direction (flow direction) and 1.8 m at

transverse direction.

7） Gate Equipment

Roller gate is adopted for the gate type because it is very common for the floodgate with this size in not only Japan but also Thailand. Size of gate leaf is 6.0 m clear span and 5.0 m effective height.

Design speed of gate leaf open/close is 0.3 m/min. Wire rope winched 1 motor 2 drum type hoist is proposed for open/close. Minimizing maintenance cost, after consultation with RID Regional Irrigation Office 10, it is proposed to use stainless steels which need no painting for corrosion-resisting of leaf, guide, and wire rope. Seal of gate leaf is designed with curtain-walled 4 sided watertight pressed from the Pasak River. For rubber seals, there are some shape-types such as P-shape type and flat type commonly used in Thailand. In this Project, P-shape is applied for 2 sides and top of leaf and flat type for bottom.

8） Hoist Deck

The open deck with roof which was adopted for the existing floodgates are applied as commented by the RID Regional Irrigation Office 10. Roof of the hoist deck is designed as truss structure and slate roof. Plan dimension of hoist deck at EL. +13.0 m MSL is 4.5 m wide and 26 m long. Reinforced concrete stair connecting to pier is provided for access.

9） Maintenance Bridge

Two maintenance bridges are provided on the piers of floodgate at downstream and upstream sides. Type of bridges is the reinforced concrete slab. Design load of bridge is TL-14 ton. Middle-class vehicle can pass the upstream bridge having 3 m width and sedan can pass downstream bridge having 2 m width.

10） Stoplog

The stoplog is provided at both downstream and upstream to maintain water level and to protect back flow for the purpose of the inspection, repair or replacement of gate. Stoplog consists of steel leaf and stainless guide.

Guide for stoplog is provided for each gate. However, only one set of stoplog leaf is provided because of maintenance work purpose. Setting and removal of stoplog is carried out using the manual chain block fixed with lifting beam on the floodgate pier.

The design water level of stoplog is set at EL. +2.0 m MSL which is the maximum water level in dry season because the inspection and maintenance is normally carried out during the dry season. Height of one leaf of stoplog is 1m considering easy handling. Five pieces of stoplog from EL.-0.5 m MSL to +2.5 m MSL are needed for up- and downstream, respectively. It means that a total of 6 pieces are necessary. Ten pieces of stoplog are stored

at right bank space with ground elevation of EL.+7.5 m MSL of the floodgate compound.

11） Side Wall and Wing Wall

Side wall which is constructed as a part of main structure of floodgate is designed to protect the bank from washed-out. Wing wall constructed together with apron has top elevation of EL.+7.5 m MSL and connects the main structure and floodwall. These walls are supported by the pile foundation (600 mm diameter PC pile).

12） Riverbed Protection

The riverbed protection is provided at both up- and down-stream sides from the floodgate. This protection consists of 6m long reinforced concrete apron and 14 m long flexible gabion mattress. Apron and wing wall are the same structure supported with PC piles (600 mm diameter). Since the apron is separated from the main structure of floodgate, cut-off wall is provided. End of mattress is fixed with piles considering washed-out. Both banks in the canal bed protection work area are also protected with river bank protection having a top elevation of EL.+4.5 m MSL consisting of PC corrugated sheet pile with tie rods, stone facing with concrete crib work and concrete pavement.

13） Floodwall

Floodgate connects with the existing railway bridge through floodwalls on both banks. Top elevation of floodwall is EL.+7.0 m MSL. Along the floodwall on the left bank, a 4.0 m wide access road to floodgate is provided. However, no access road is planned on right bank. Structure of floodwall consists of reinforced concrete U-type retaining wall and double wall with soil filling using PC corrugated sheet piles. Top of floodwall is paved with 0.15 m tick concrete. Stainless handrails are provided for safety. U-typed retaining wall is supported by pile foundation (600 mm diameter PC pile). The left bank area just upstream of the railway bridge is backfilled after the construction of bank protection by double PC corrugated piling and stone masonry revetment in order to access the floodgate compound with ground elevation of EL.+7.5 m.

14） Hydraulic Gate Works for Drainage

Since there exists a drainage channel on the right bank just upstream from the railway bridge, small floodgate with 1 gate is proposed to protect the inflow of flood. Adopted type of the floodgate is curtain walled type 4 sided watertight stainless steel fixed wheel gate. Dimensions of gate leaf are 2.0 m clear span x 1.5 m effective height. Bottom elevation of floodgate is EL.+0.0 m. Manual racked gate hoist is used for open/close of gate. Main structures of floodgate consist of reinforced concrete piers, box culvert, deck and side walls. Floodgate structure is supported by the foundation of pile with 600 mm diameter and cut-off wall is provided for seepage protection.

15） Operation Control Panel

The local operation control panel of the floodgate is set on the hoist deck. Locally available relay control system is adopted as reliable system. The local control panel is installed for each gate. On the deck, there are other equipment such as electric motor, etc. to be installed. The local control panel is weather proof construction of outdoor type.

16） Electric Power Supply

The electric power is supplied from the Provincial Electricity Authority in Ayutthaya. It is 3 phase x 4 wire x 380/220 V x 50 Hz. The Authority installs the necessary 22 kV line on electric post near the Project sites with the expense of RID.

The contractor installs the electric power line from the electric post installed by the Authority to the sites. Power is divided into two; 1 phase x 2 W x 220 V x 50 Hz for lighting and 3 phase x 3 W x 380 V x 50 Hz for motors. Receiving/control panels on posts are operating on the ground.

17） Lighting Facility

Lighting facilities are provided at piers and hoist deck.

18） Backup Generator

Backup generator is installed to keep minimum required electricity, when the commercial power shut down is occurred. Type of backup generator is diesel generator and it has a capacity of 1 phase 220 V/3 phase 380 V x 50 Hz x 20 kVA for lighting and operating gates.

19） Lightning Rod

The lightning rod is provided at roof to avoid the lightning damage of the electrical equipment, while the existing floodgates do not have the lightning rod.

20） Water Level Measurement Device

Two types of water level measurement devices are provided to confirm up- and downstream water level of the floodgate. One is a pressure type water level gauge with display and data logger, and the other one is a staff gauge.

(4) Procurement Plan

1） Overall Plan

It is proposed to provide 10 Drainage Pump Vehicles with a total capacity of 30 m^3/min. at RID Ayutthaya Irrigation Project Office, considering the necessary mobility and drainage capacity.

Purposes of procurement of Drainage Pump Vehicles are as follows:

a) Drainage of the Project area

The proposed Floodgates will protect reverse flow from the Pasak River during the flood by closing gates of proposed Han Tra and Kra Mang Floodgates and existing Kha Mao Floodgate. However, it is required to drain rainwater of the area enclosed by the floodgates. In view of this, drainage pump vehicle is proposed to mechanically drain the rainwater.

b) Drainage in jurisdiction of RID Regional Irrigation Office 10

During the 2001 flood, the floodwater in the Project area and industrial estates including the Rojana Industrial Estate located at south of existing Khao Mao Floodgate was drained by using the drainage pump vehicles which were urgently conveyed from Japan as an international relief assistance. These drainage pump vehicles have showed the excellent result for drainage. In Ayutthaya sub-district area, there is no drainage pump vehicle. In view of this situation, it is proposed to use widely the drainage pump vehicles even in the jurisdiction of RID Regional Irrigation Office 10.

For chassis of drainage pump vehicle, production in Thailand is used considering available spare parts and Thailand regulation. Gross Vehicle Weight (GVW) ranges from 8.5 to 10 ton. On the other hand, drainage pump unit and control panel should be made. They are with light-weight and safety devices. Installation and mounting works of components onto the chassis are done at workshop in Thailand under the full responsibility of the contractor or his subcontractor.

Source: Chubu Regional Development Bureau, MLIT, Japan

Figure 2-2-2.14 Drainage Pump Vehicles utilized for Inundation in 2011

2) Equipment

The following Table 2-2-2.1 shows the major specifications of Drainage Pump Vehicle to be

procured under the Project:

Table 2-2-2.1 Major Specifications of Drainage Pump Vehicle to be Procured

1. Drainage Pump	
(1) Total drainage discharge	30 m^3/min. (at 10 m of total head)
(2) Model	Submergible motor driving pump
(3) Number	6 units or less (same specifications for all units)
(4) Bore	200 mm
(5) Unit weight of pump	40 kgf/unit or less
(6) Type of motor	Dry type submersible synchronous motor
(7) Power source	3 phase x 440 V x 60 Hz
(8) Cable	Cabtire cable 40 m or more per unit with waterproof connector: Cable band 1set/unit
(9) Drainage hose	200 mm diameter x 25 m length x 3 (discharge side)/unit; pressure-tight 0.2 MPa or more
(10) Pump float	1 no./unit. Attaching rope or rod 1 set/unit
(11) Casing	Special lightweight material(s)
(12) Accessories	Tool, mooring rope, mooring anchor, float push-out bar
2. Chassis with Cab	
(1) Country of origin	Kingdom of Thailand
(2) Gross vehicle weight (GVW)	Around 10,000 kgf or less
(3) Drive	Rear-wheel drive
(4) Steering position	Right-hand drive with power steering
(5) Crew	2 or more
(6) Transmission	Manual or automatic
(7) Engine	Water-cooled diesel
(8) Loudspeaker	Output about 30 W
3. Power Generator	
(1) Number	1 unit
(2) Capacity	1 phase 220 V/ 3 phases 440 V x 60 Hz, 125 kVA or more
(3) Engine	Water-cooled diesel
(4) Fuel tank	200 liter or more
4. Lighting Apparatus	
(1) Type	Floodlight
(2) Lamp	High intensive discharge (HID) lamp; more than 220 V x 500 W x 2 units
(3) Cable	Cabtire cable 20 m or more per lamp with waterproof connector
(4) Shrinkable and Rotational Device	Manually shrinkable to up and down and rotation to right and left
5. Control Panel	
(1) Condition	There shall be stored inverter devices for start and rotation speed control of drainage pump, and operating control of each drainage pump and on-off of lighting apparatus shall be possible.
(2) Display language	Thai or English
6. Paint Color	To be specified by RID
7. Spare Parts	
(1) Drainage pump	1 unit
(2) Drainage hose	200 mm diameter x 50 m long

3） Necessary Technical Training for Operation and Maintenance

The Ayutthaya Irrigation Office of RID has no experience of operation of the drainage pump vehicles. Therefore, the Contractor and Consultant will prepare the operation and maintenance manual and conduct the technical training of operation and maintenance for the O&M staff of Ayutthaya Office.

2-2-3 Detail Design Drawing

Detail design drawings of Hantra and Kra Mang Floodgates and River Bank Protection of Han Tra Canal are attached as **APPENDICES-9**.

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Basic Prerequisites for Implementation of the Project

The basic prerequisites for the implementation of the Project are as given below:

(a) The Project shall be implemented in accordance with the Japan's Grant Aid scheme in according to the Exchange of Note (E/N) on the Project between the Government of Japan (GOJ) and the Government of Kingdom of Thailand (GOT).

(b) The executing agency of the Project is the Royal Irrigation Department (RID) of the Ministry of Agriculture and Cooperatives (MOAC).

(c) The consulting services for bidding activities and construction supervision shall be carried out by the Japanese consultant firm based on a contract for consultancy services with the GOT.

(d) The construction and procurement works of the Project shall be implemented based on a construction contract between the GOT and a Japanese construction firm(s) which shall be selected through the prequalification and open competitive bidding.

(2) Implementation Policy

1） Status of Contractors in Thailand

There are more than 8,400 companies, including more than 570 registered companies to the Thai Contractors Association (TCA). Moreover, these companies include 10 Japanese companies and 3 major Thai construction companies that have the projects abroad.

Since they have rendered services for 2011 flood disaster rehabilitation works, the demands of the construction materials, such as the ready mixed concrete, sand, aggregate, steel, etc., are considerably increased. However, the supply of the construction materials is still sufficient. These materials are produced under the quality control based on the TIS (Thai Industrial Standards), ASTM (American Society of Testing and Materials), etc.

2) Site Conditions for Construction of Floodgates

The function of two proposed floodgates is the protection of entering flood discharge into the canal from the Pasak River. Also, a 484 m long riverbank protection from floodgate to downstream along Han Tra Canal is proposed to be construction.

Points to be carefully considered and the implementation policy for construction are described as follows:

(a) The construction method and schedule are planned considering the natural site conditions such as climate, topography, geology and the existing structures/houses. The temporary coffering system inside the canals is required for construction works of the floodgates due to necessity of dry condition. Each plan of the temporary coffering system is required for the Han Tra Floodgate and Kra Mang Floodgate, depending on each site conditions. Since the construction activities are needed even high water season, top elevation of the coffering system should be determined taking the recorded water level of the Pasak River and existing bank elevations around the construction sites into account. The temporary coffering system is planned considering the limited construction period, existing canal network and flow capacity. On the other hand, the displacement measurement control is continuously carried out to avoid collapse of the coffering system during the construction.

(b) The traffic safety plan should be prepared for the heavy construction equipment and the protection of third party accident because the construction sites are located adjacent to the existing main road (Route No. 3053). The plan should be prepared in consultation with the related agencies/offices and to obey the Road Traffic Law and Regulation of Thailand.

(c) The plan for construction methodology and utilization of construction equipment should be prepared considering the social environmental condition such as noise and water quality for the residents living along the canals. For this requirement, appropriate construction management system should be set up in the organizations of the Contractor and the Consultant.

(d) The construction materials/equipment and labor force are locally available and supply of major materials and equipment such as heavy construction equipment, aggregate, concrete, steel, etc., are sufficiently provided. On the other hand, the safety measure system of floodgate such as emergency gate operating system is not commonly used in the existing floodgates. From the safe operation viewpoint and utilization of stainless materials for gate, the gate including the safety measure system is to be procured from Japan or to be procured in Thailand under technical assistance of Japanese contractor.

2-2-4-2 Implementation Conditions

Upon grasping the characteristics of this project and site condition, an appropriate construction plan should be prepared. In the preparation of construction implementation plan, the following points should be considered:

(1) In rainy season during 5.5 months from middle of May to October, there is a peculiar shower rain for 1 to 2 hours every day in the south-east Asia. Due to short rainy duration, the construction works would not be suspended for long period. However, construction time schedule needs to consider this rainy situation.

(2) The water level of the Pasak River observed at the existing RID Ayutthaya Water Level Gauging Station (S5) rose from EL. +3.72 m MSL on 10 September 2011 to EL. +4.14 m MSL on next day 11 September by 0.42 m. On October 17, the recorded maximum water level of EL.5.91 m MSL was observed since 1950. The safety plan should include the emergency evacuation procedure in case that extraordinary water level rising is occurred during the construction period.

(3) The construction plan should consider the following items on the existing soft foundation:

- Ensuring the required trafficability for heavy equipment to construct the floodgate, and
- Ensuring the bearing capacity for leveling concrete placing.

(4) The plan to minimize the negative impact to the residents shall be prepared. Especially, the adequate traffic safety measure must be taken when the community road is used as access road for construction.

(5) Land acquisition is required for construction of proposed permanent structures. In addition, temporary rental of lands is necessary for construction working spaces, materials/equipment yard, office spaces, etc.

(6) Since the structure heights of Han Tra Floodgate and Kra Mang Floodgate is 17.5 m and 13.5 m, respectively, it is required to provide the safety measure for prevention of the accidental fall and collapse of scaffolding.

(7) The 17-month construction period is scheduled. During construction period, there are months of rain and high water of the Pasak River. Therefore, it is required that the construction plan should be carefully prepared to ensure the execution and completion of the construction considering these rain and high water months.

(8) The concrete structure of the floodgates is required the water tightness. To protect the defective results such as harmful crack and the cold joint, appropriate proportional mixing design and pouring of concrete should be planned.

(9) Security fences and guards should be provided for the materials/equipment yard.

(10) To access to the site of proposed Kra Mang Floodgate, it is planned to use temporarily maintenance road of railway located beside the railway. This maintenance road is designed

to be widen for transportation of construction materials/equipment. Therefore, careful safety measures should be taken to protect the accidents about trains and communication lines.

(11) The safety control plan to protect accidents of cranes during the gate installation should be prepared. These work activities should be carried out under the Japanese Engineer's full supervision.

(12) The electrical and mechanical works such as installation of gate control devices and safety system should be conducted under the Japanese Engineer's full supervision considering less experiences of Thailand engineers.

2-2-4-3 Obligation for Construction/Procurement and Installation

The obligations of the GOJ and the GOT are as given in the following table.

Table 2-2-4.1 Obligations of the GOJ and the GOT

Item	Contents	Responsibility		Remarks
		Japan	Thailand	
Procurement of Equipment for Hydraulic Gates	Procurement/carry-in of gate materials and equipment	O		
	Custom clearance of materials and equipment		O	
Procurement of Drainage Pump Vehicles	Procurement/carry-in of gate materials and equipment	O		
	Custom clearance of materials and equipment		O	
Preparatory Work	Land acquisition and resettlement for construction		O	Including base camp, temporary yard
	Relocation of existing utilities for construction		O	Including electricity, water supply and railway communication line
	Installation of utilities for construction		O	Including electricity, water supply and telephone line
	Preparatory work other than above	O		
Main Construction	Temporary coffering work	O		
	Civil works of floodgates	O		
	Design, fabrication, and installation of hydraulic gates for floodgates	O		
	Bank protection works	O		
Compensation	Removal of existing resident houses		O	
Inspection	Civil works, hydraulic gate works and procurement of drainage pump vehicles	O		

Source: JICA Survey Team

2-2-4-4 Construction Supervision/ Procurement Supervision

A Japanese consultant shall execute the bidding activities and construction supervision based on the consultancy contract with the GOT.

(1) Bidding Activities

The main activities to be conducted from preparation of prequalification/bidding documents to construction contract are as listed below:

1) Preparation of biding documents, approval by the Client and concurred by JICA
2) Preparation of Minutes of Understanding for the Project accepted by the residents affected
3) Notice for prequalification for competitive bidding
4) Evaluation of prequalification documents
5) Distribution of bidding documents
6) Question and answer for clarification of bidding documents
7) Notification of Addenda of bidding documents
8) Opening of bidding
9) Evaluation of bid documents
10) Construction contract negotiation
11) Preparation of construction contract agreement

(2) Construction Supervision

The consultant shall supervise the construction/procurement to be executed by the Contractor based on the construction contract and approved implementation plan. The major activities are itemized as follows:

1) Check/approve the implementation plan
2) Check/approve the works related to topographic survey
3) Well acceptance judgment of gate and related equipments
4) Factory inspection of equipment and materials
5) Quality control
6) Progress control
7) As-built control
8) Procurement control
9) Safety control
10) Inspection of work output for interim payments
11) Preparation of reports on environmental monitoring
12) Preparation of monthly progress reports
13) Discussion/coordination with concerned organizations
14) Preparation of management guidance on facilities and equipment
15) Turn-over inspection and acceptance

The Japanese Consultant shall consist of 1-Japanese Construction Management Engineer, 2-Japanese Resident Engineers (full- and short-time), 1-Japanese Engineer for factory inspection in Japan, and 2-Thai Engineers. Moreover, Inspector(s) will be dispatched on the completion inspection of the

Project.

Table 2-2-4.2 Construction / Procurement Management System of the Consultant

Personnel		Job Description
Japanese Engineers	Project Manager	Organize a kick-off meeting with the government organization of Thailand prior to the construction; Hold meetings, discussion and confirmation of construction schedule by holding tripartite meetings (construction owner, consultant, contractor); Execute progress control of procurement of goods, and support contractors for efficient progress of construction; Carry out defects inspection.
	Resident Engineer	Execute quality control, schedule control, management of output; Carry out through training on safety control to parties involved in the construction; Prepare / submit monthly progress reports to construction owner, JICA and the Japanese Embassy; Obtain approval from construction owner, JICA and the embassy in case of design change; Report environmental monitoring results; Prepare operation regulation.
	Civil Engineer	Execute quality control, schedule control, management of output in collaboration with Resident Engineer while busy period of construction, such as pile driving, construction of basement and installation of gate facilities.
	Engineer for Factory Inspection	Execute factory inspections of manufactured parts of the gate; Execute factory inspections and trial run of drainage pumping vehicles; Prepare / submit inspection report to construction owner.
	Commissioning Engineer	Hold defect inspection with construction owner after one year from the completion of construction work; Prepare / submit defect inspection report to construction owner and JICA.
Local Employees	Assistant Engineers (2 persons)	Reside at the project site together with the resident engineer from the start of construction, and provide support in quality control, progress control, and management of output.
	Driver	Drive a car for the Consultant's office throughout the construction period.

2-2-4-5 Quality Control Plan

The following table shows the quality control plan.

Table 2-2-4.3 Quality Control Plan

Item	Items for Inspection	Contents
Construction Materials and Equipment	Gate leaf, gate control equipments, such as drum, gear, etc., Generator, roller, wire, material for water tightness, Safety operational devices and Control Panel.	Factory inspection, inspection sheet of manufacturer, visual inspection at site upon delivery, trial run.
	Quality control of concrete.	Compressive strength, slump, volume of air, water-cement ratio, temperature.
	Quality control of concrete pile.	Inspection certificate of compressive strength, length, cross section.
	Quality control of steel sheet pile, reinforcement bar, etc.	Material certificate (mill sheet), tensile strength test.
	Quality control of sand and aggregate.	Particle size distribution, specific gravity.
Construction Works	PC Corrugated Pile and Steel Sheet Pile.	Installation length and accuracy of installation (eccentricity and vertical).
	PC Pile.	Comparison with the loading test and design condition, checking the soundness of pile by the PDA test.
	Quality and As-built control of hydraulic gate structure.	Check with the design drawings.
	As-built control of riverbank protection.	Check with the design drawings.
	As-built control of backfilling for structures.	Ensure the required compaction.
Drainage Pump Vehicle	Pump, hose, float, cable, power generator, control panel, lighting apparatus, chassis.	Factory inspection, inspection sheet of manufacturer, visual inspection at site upon delivery, trial run.

Source: JICA survey team

2-2-4-6 Procurement Plan

(1) Source of Procurement

The eligible supply source countries for Japanese Grant Aid Projects are Japan or the aid recipient country (Thailand), in principle. The required equipment/materials for this Project are to be procured from local market as much as possible. However, in case that equipment/materials in Thailand are not available or do not conform to the quality specification, they are to be procured from Japan.

The procurement plan of major equipment/materials is described as follows:

1) Construction Materials

The construction materials necessary for the construction of floodgates such as steel sheet piles, reinforcing bars, cement, ready mixed concrete, aggregate, concrete piles, pc corrugated sheet piles and other materials are readily available in Thailand. These materials

are produced in accordance with quality control procedures of international standards such as TIS, ASTM and JIS. The details of the production and supply of these materials are described below:

(i) Steel Sheet Pile, Shape Steel, Reinforcement Bar, Tie Rod and Gabion mattress

Steel products for construction works are produced from steel scrap. The chemical composition and strength are controlled in accordance with international standards. Steel sheet pile is produced exclusively by Siam Yamato Steel Co., Ltd. that is located at Rayong prefecture, at a rate of about 20,000 tons per month. Other steel products, i.e., shaped steel and reinforcing bars, are produced by about 10 companies on the outskirts of the Rayong prefecture and Bangkok metropolitan areas. Tie Rod in conformity with BS, Eurocode, and AISC is locally produced. Gabion Mattress in conformity with ASTM is also locally available.

(ii) Ready mixed concrete

There exist 10 batching plants for ready mixed concrete around the project site. The cement, sand and aggregate are supplied from Sara Buri prefecture, Ang Tong prefecture and Sara Buri prefecture, respectively. The ready mixed concrete is produced and controlled in accordance with TIS. The production capacity at one batching plant is 30 to 80 m3 per hour.

(iii) Sand material

The production mills of the sand material for the concrete and road construction are located in Ang Tong, Ayutthaya, Ratchaburi and Chon Buri prefectures. The sand layer in Ang Tong prefecture is situated 5 to 10 m below paddy field or wetland by dredging collecting method. One of the sand production mills is Concrete Products and Aggregate Co., Ltd., (CPAC) which is the largest company to produce cement, sand and crushed stone. This factory produces sand of 1.5 million ton per year and 36 thousand ton is used for road construction. The CPAC has more than 10 similar sand quarry sites in Ang Tong prefecture.

(iv) Crushed stone and aggregate

The mountain in Sara Buri prefecture is known as major quarry site producing the crushed stone and aggregate of the concrete and the road construction material. Other major production areas are Chon Buri, Ratcha Buri, and Suphan Buri prefectures.

There are about 27 crushed stone and aggregate production mills in Sara Buri prefecture. The production capacity of CPAC that is the largest production company, is 2 million ton per year in Sara Buri prefecture. The stone materials produced in CPAC is 85 to 90 % for the concrete aggregate of ready mixed concrete and remaining one for the road construction. In addition, the total annual production of crushed stone and

aggregate is estimated at more than 30 million tons in Sara Buri prefecture.

(v) Concrete Pile

Suppliers of concrete piles in Thailand are generally dealing with the production, transportation and pile-driving. Rectangular shaped piles are normally used for civil works. I-shape PC piles and RC piles on order-base are also produced in accordance with quality specifications of TIS. Round piles based on Japanese technology are produced by about 10 major concrete pile production companies.

(vi) Prestressed Concrete Corrugated Sheet Pile

PC Corrugated Sheet Pile is produced by Saraburi Construction Technology Co., Ltd., located in Saraburi prefecture, in accordance with JIS. Joint connection and pipe for waterjet method can be attached on pipe. This pile has been utilized for reinforcing dikes of industrial estates affected by 2011 flood.

2) Hydraulic Gate Work - related Equipments and Materials

Under the conditions for long-quality guarantee requirement, minimizing cost for operation and maintenance, and requirement for safety system, the gate equipment and materials are to be procured from Japan and/or Thailand. It is acceptable that Thai companies carry out design, procurement, fabrication, assembling and installation under the instruction of the Engineer of Japanese Contractors.

Gate equipment and materials include of gate leaves, rollers, motors, wire ropes, lifting devices, drums, gears, speed reducing devices, brakes, control panels, etc. Attachments to civil structures include steel side slot for sliding, supporting and rubber water stops.

Many floodgates have been constructed in Thailand. However, safety devices have not been commonly used in the existing gate structures. Moreover, since utilization of stainless materials for gate is not in common, there are less experiences about welding/coating of stainless material which need special technique.

Considering the minimizing cost for operation and maintenance, high-quality requirement, and safety operation, it is proposed to procure the gate in accordance with Japanese Technical Standard. For example, stainless material is utilized for gate leaves, guides, and wire ropes. Adoption of this material results in no painting needed for corrosion protection. In case steel material, painting work should be done every 5 to 7-year interval.

It is also designed to adopt safety devices for gate operation, resulting in protection of damages of facilities and securing safety of operation staff.

3) Construction Equipment

Since most types of construction equipment are available for rental-base or purchase in Thailand, there is generally no problem for procurement of construction equipment. General

contractors own the ordinal construction equipment.

4) Materials for Temporary Works

In general, the local general contractors in Thailand can carry out temporary works with their own equipment and materials such as steel sheet pile, supporting beams, covering plates, H-beams, channel beams, L-beams, etc. A few lease dealers exist for lease-equipment and -materials for temporary works. In view of this situation, it is necessary to make a plan whether to lease or purchase these equipment and materials for temporary works.

5) Spare parts of gate

The following spare parts for hydraulic gates should be supplied by the Contractor. The Contractor shall remedy at his expense any defects during the one year warranty period. After one year warranty period, the RID shall supply the spare parts at his expense.

Table 2-2-4.4 List of Spare Parts

Item	Details
Flood Gates and Hoists	seal rubber for a main gate (undrilled)
	hoisting wire rope with socket for a gate
	electric motor with brake for a gate
	fixing bolts, nuts and washers used in a gate seal rubber
	grease nipples and/or cups of each type and size used in a gate and a hoist
	indicating lights, fuses and fluorescent lamp used in all control cabinets
	position limit switches used in a gate hoist
	torque limit switches used in a gate hoist
	each type and rating of MCB, relay, contactor, printing circuit board and switches
	space heater with thermostatic switch
Stoplog	seal rubber (undrilled)
	fixing bolts, nuts and washers
	grease nipples and/or cups of each type and size

Source: JICA Survey Team

6) Labor

The slight shortage of the labor force presently occurs because many urgent rehabilitation works are executed. However, the construction works of the Project will be started after the most urgent rehabilitation works are completed. Therefore, it is considered that such labor shortage would not occur in the implementation of the Project.

(2) Source Countries for Equipment/Materials to be Procured

The major equipment and materials listed in the table are planned as follows:

Table 2-2-4.5 Source Countries of Equipment and Materials

Equipment and Materials	Thailand	Japan
1) Steel products (steel sheet pile, shaped steel, reinforced bar, tie rod, gabion mattress, etc.)	O	
2) Ready mixed concrete	O	
3) Crushed stone, sand and embankment materials	O	
4) Concrete piles	O	
5) Prestressed Concrete Corrugated Steel Sheet Pile	O	
6) Fuels (gasoline, diesel, kerosene)	O	
7) Steel products for temporary works	O	
8) Plywood for Formwork	O	
9) Falsework	O	
10) Paint	O	
11) Labor	O	
12) Gate Structures		
- Gate leaves	O	O
- Rollers	O	O
- Sheave	O	O
- Motors	O	O
- Wire ropes	O	O
- Drums	O	O
- Gears	O	O
- Speed reducing devices	O	O
- Safety devices	O	O
- Breakes	O	O
- Control panels	O	O
- Manual operating devices	O	O
- Gate guide	O	O
- Stoplog	O	O
- Stoplog guide	O	O
- Chain hoist for Stoplog	O	O
- Telpher rail	O	O
- Water Level	O	O
- Diesel generator	O	O
- Lighting fixtures	O	O
- Power distribution boards and panels	O	O
- Electric cables and wiring	O	O
- Fixed wheel gate for drainage channel	O	O
- Gate guide for drainage channel	O	O
- Hoist for drainage channel	O	O
13) Ordinal construction equipment (backhoe, bulldozer, dump truck, truck crane, truck mounted crane, etc.)	O	
14) Special construction equipment (crawler crane, vibro-hammer, etc.)	O	
15) Drainage pump vehicle		
- Drainage pump		O
- Control panel		O
- Pump float		O
- Chassis	O	
- Power generator	O	
- Drainage hose	O	
- Cable	O	
- Lighting apparatus	O	
- Container	O	
- Installation and mounting work	O	

Source: JICA Survey Team

(3) Transportation route of gate equipments and materials

There are two possible seaports for route of transportation of gate equipments and materials from

Japan to the site: Bangkok Seaport and Laem Chabang Seaport (200 km distance to site). Also, there are two airports available: Suvarnabhumi Airport (80 km distance) and Don Mueang Airport (60 km).

There are frequent ship schedules between Japan and Bangkok which need 2 weeks for navigation. Up to the site from Japan, it is estimated that necessary time including custom clearance and inland transportation is 3 weeks.

2-2-4-7 Operation Guidance Plan

The initial guidance for operation, inspection, and maintenance of Han Tra and Kra Mang Floodgates and Drainage Pump Vehicles is planned to be carried out by the Contractor to RID Ayutthaya Irrigation Project Office. The Management Guidance to ensure the smooth operation and maintenance of drainage pumps and floodgates is to be conducted under the soft component by the Consultant, as explained in the following section.

2-2-4-8 Soft Component Plan

As shown in Figure 2-2-4.1, there exist some water control structures such as floodgates and pumping stations in the Project area. The Project needs the effective, efficient and sustainable operation of existing and planned facilities in total to achieve the maximized performance of the Project.

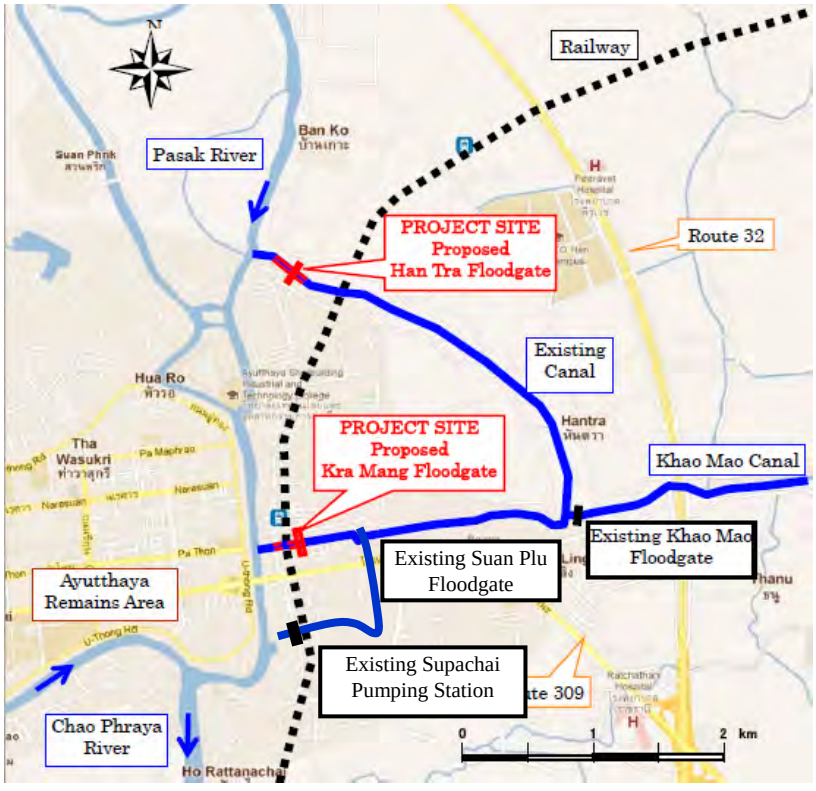


Figure 2-2-4.1 Location of Existing Facilities and New Floodgates

(1) Target of Soft Component

RID has the responsibility for Operation and Maintenance (O&M) of the Project. Through the soft

component on O&M, the O&M staff of concerned RID Ayutthaya Irrigation Project Office, Phra Nakhon Si Ayutthaya Province, Phra Nakhon Si Ayutthaya District, Ayutthaya City, and Ayothaya Town should be requested to familiar with the operation of total facilities up to the following requirements:

1) Operation of Han Tra and Kra Mang Floodgates should smoothly be done.
2) During flood, new floodgates, existing floodgates and pumping station should be totally and smoothly operated, including Drainage Pump Vehicles.
3) Administrative performance should be uplifted regarding the mitigation of flood damage

(2) Accomplishment of Soft Component

After the conduct of completion of proposed soft component, O&M staff can immediately take necessary actions on the following:

1) O&M staff operate the Han Tra and Kra Mang Floodgates based on the instruction of the O&M Manager in any situation.
2) Network composed of Han Tra Floodgate, Kra Mang Floodgate, Khao Mao Floodgate, Suan Plu Floodgate, Supachai Pumping Station and Drainage Pump Vehicles should be established and effectively operated in any situation.

(3) Confirmation of Accomplishment

Accomplishment of O&M staff will be confirmed by the following means:

1) for a) above, under several cases, trial operations are to be made. These operation results will be evaluated using check-sheets.
2) for b) above, trial operations for total facilities are made for several assumed flood cases. Also the result of operation done will be evaluated.

In addition, the Consultant will evaluate their accomplishment based on check-sheets and questionnaires answered by O&M staff. Moreover, O&M Staff who attend the soft component are required to evaluate themselves.

(4) Necessary Actions to be Taken

The following actions should be taken for accomplishment:

1) Preparation of operation rule and manual.
2) Lecture on operation of flood control facilities in total.

(5) Approach for Implementation

The Consultant assist the RID in familiarizing with the operation and maintenance on the following task:

1) A Japanese Consultant who prepares a draft operation rules for totally closely connected facilities. Draft operation rule is presented in the seminar to be held by the Consultant and finalized incorporating the comments of concerned offices.
2) A staff of RID who coordinate with the concerned office for O&M.

(6) Implementation Schedule of Soft Component

The proposed soft component is implemented in Ayutthaya during two (2) months in 2014.

2-2-4-9 Implementation Schedule

The following Figure 2-2-4.2 shows the implementation schedule of the Project:

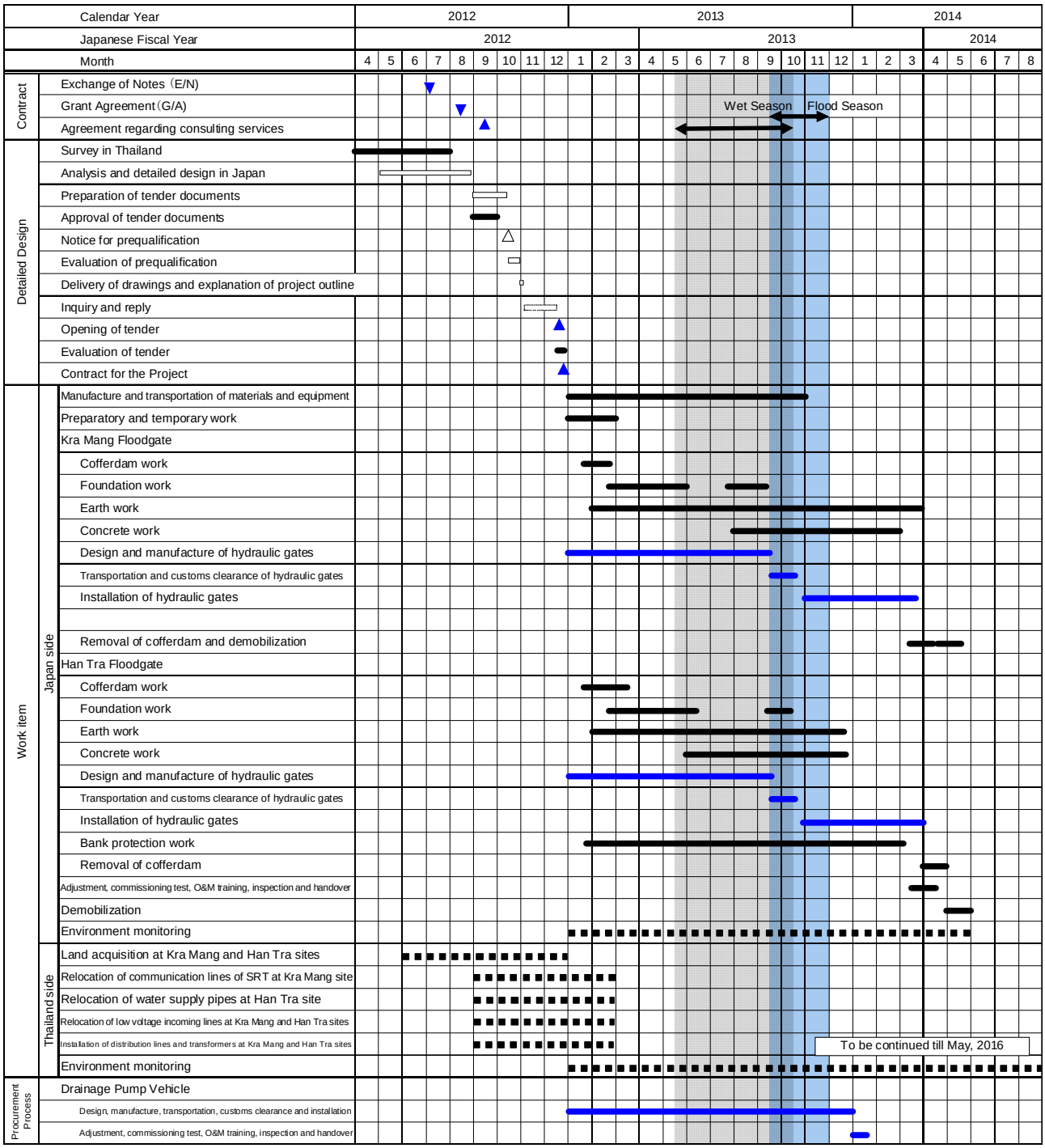


Figure 2-2-4.2 Implementation Schedule of the Project

2-3 OBLIGATIONS OF RECIPIENT COUNTRY

2-3-1 Obligation of the Government of Thailand

To smoothly implement the Project, the GOT is required to undertake the following:

(1) To provide data, information and documents required to carry out the Project,

(2) To provide the lands required for offices, storage houses, material/equipment stock,

temporary disposal of excavation materials, coffering, temporary construction roads, etc.

(3) Presentation of the project summary and construction work methodology, and request for cooperation for construction works to the stakeholders through the stakeholders meeting,

(4) To establish the organization including budget and staff for compensation for land acquisition and resettlement,

(5) To establish the organization in RID including budget and staff (with counterpart) for construction of the Project,

(6) To open an account in a designated bank in Japan for the Banking Arrangement (B/A), and issue the Authorization to Pay (A/P), and bear the advising commission of the A/P and the payment commissions to the bank,

(7) To take necessary measures to ensure prompt unloading and Customs clearance upon entry into Thailand and transportation inside Thailand for the goods procured for the implementation of the Project,

(8) To take necessary measures to exempt the Contractor and the Consultant from Customs duties, internal taxes and other fiscal levies imposed in Thailand for their supply of goods, services, and equipment,

(9) Special treatment related to the entry and the resident in Thailand for the persons who are assigned to the Project based on the authorized contract,

(10) Providing the required permission, authorization, right, etc., to carry out the Project,

(11) To ensure the necessary budget and sufficient number of staffs for the efficient operation and maintenance of the completed facilities under the Japan Grant Aid,

(12) To take quick action for solving potential problems from third parties or non-related people to the Project during the construction activities, and

(13) To secure the safety from the conflict, disturbance, rioting, rebellion, etc. to the Japanese citizen to be engaged in the Project.

2-3-2 Appropriateness and Possibility of Execution for Allotted Items of the Project Implementation by Thailand

(1) Required Various Process for Grant Aid Project

The RID has no projects under the Japanese Grant Aid Project after 1990. However, it is necessary that RID can carry out the required various process for the grant aid project with assistance of the hired Japanese Consultant. In addition, it is necessary to obtain RID's confirmation on the following issues:

- Execution of the stakeholder meetings for the land acquisition, compensation, and resettlement of the residents,
- Explanation of the Project and request for cooperation of the local residents on construction

activities, and

- RID's responsibility and role for operation and maintenance of the Project.

(2) Land Acquisition and Compensation for Resettlement

Land acquisition and compensation for resettlement are required for the construction of civil works. In addition, temporary lands are necessary for the offices of the Contractor and the Consultant, stockyard for materials and equipments, access road, temporary coffering, etc. The temporary lands are to be rented and returned to the owner after the completion of construction works.

Generally, the land acquisition, land compensation, land lease and the compensation for the resettlement shall be carried out based on related laws and regulations of Thailand. This procedure can be done by the RID including the arrangement for temporary lands. The RID has many experiences in Thailand.

2-4 PROJECT OPERATION PLAN

The completed Han Tra Floodgate, Kra Mang Floodgate, and Drainage Pump Vehicles will be operated/maintained by the RID Ayutthaya Irrigation Project Office, the Office has more than 30 year-experience/accomplishment of operation and maintenance of existing Kra Mang Floodgate, necessary budget, and technical level.

The Contractor shall prepare the necessary manual for operation and maintenance of equipment completed and train the RID staff members. Moreover, the Consultant prepares the operation manual and train the RID and Local Government office staffs related to the Project in order to totally, effectively and cooperatively operate the existing and new flood control facilities.

2-5 PROJECT COST ESTIMATION

2-5-1 Initial Cost Estimation

(1) Thailand's Contribution

Cost to be born by GOT is estimated at 19.0 million Baht as shown in Table 2-5-1.1.

Table 2-5-1.1 Cost to be Born by Government of Thailand

Items	Estimated Cost (million Baht)
Land Acquisition and Resettlement	13.5
Installation/Relocation of Electric Lines for Construction of Floodgates	1.5
Relocation of Water Supply Lines	1.0
Relocation of Communication Cables of SRT	2.0
Bank Charge	1.0
Total	19.0

(2) Conditions of Cost Estimate

i) Date of Cost Estimate: April 2012

ii) Currency Exchange Rates

JPY/USD: USD 1 = JPY 79.38

JPY/Local Currency: THB 1 = JPY 2.61

iii) Period of Construction: 17 months

iv) Others: The project is carried out based on the Japanese Government's Grant Aid Scheme.

2-5-2 Operation and Maintenance Cost

For the operation, the required staffs are 1) person in charge of gate operation, 2) gate operator, 3) water level measurement staff, and 4) operator of drainage pump vehicle. For the maintenance, the required staffs are 1) person in charge, 2) mechanician, 3) electrician, 4) workers as required. These necessary staffs will not be hired additionally. It is suggested that the present staffs of maintenance work section in RID Regional Irrigation Office 10 be re-organized for these additional works. Therefore, it is assumed that additional cost of the salary is not required.

On the other hand, the following costs are required for the operation and maintenance of floodgates and drain pump vehicles.

- Electric cost (base cost and additional cost)
- Diesel oil for backup generator
- Gasoline and diesel oil for drain pump vehicles
- Insurance and extension of registration of vehicles
- Consumable items

The following table shows the annual operation and maintenance cost estimated.

Table 2-5-2.1 Annual Operation and Maintenance Cost

Items	Cost (Baht)	Remarks
Electricity charge	20,000	Maximum actual electricity charge in existing Kha Mao Floodgate
Fuel of backup generators	5,000	Tank of generator (max.70 litter)
Fuel of vehicles for drainage pump vehicles (10 nos.)	67,000	Operation: 2 times per year (70 litter/time/no.)
Fuel of generator for drainage pump vehicles	2,000,000	2 times per year (7days per time, 24 hours operation)
Vehicle insurance and extension of vehicle registration	650,000	
Regular maintenance and repair of drain pump vehicles	100,000	
Grease, lamp, etc.	30,000	Consumables of floodgate
Fuel cost of drain pump vehicles	2,067,000	Flood event
Other cost	805,000	Every year
Total	**2,872,000**	

The O&M cost is estimated under the assumption that the Drainage Pump Vehicles are operated for 14 days per year. Fuel cost shares about 70% of the total cost or THB 2,067,000. Since this amount is equivalent to only 1% of total O&M budget of RID in 2011, it is deemed to be possible for RID to prepare budget for this Project.

However, it is preferable that the allocation of the fuel cost between RID and beneficial Local Government Units be discussed and agreed.

CHAPTER 3. PROJECT EVALUATION

3-1 PRECONDITION

The preconditions for the project implementation are as follows;

(1) Completion of land acquisition
The land acquisition shall be completed prior to start of construction works. In addition, agreements with the land owners to borrow lands temporarily utilized for the construction work activities shall be secured.
(2) Relocation of existing utilities such as water supply line, electric power line and communication line of national railway.
(3) Extension of electric lines (380 V x 3 phase x 50 Hz /220 V x single phase x 50 Hz) to the proposed construction sites.
(4) Obtainment of necessary permits for construction activities.
(5) Agreement among the ministries in Thailand with regard to tax exemption.
(6) Budget allocation and arrangement of counterpart personnel for the project implementation.

3-2 NECESSITY INPUTS BY RECIPIENT COUNTRY

This Project covers the first stage of the overall project and 90% of flood plain eastern from the Provincial Road No. 3053 is to be protected from the flood damage. In order to attain the benefits from the overall project, the necessary inputs by the GOT are listed as follows:

1) Establishment of sharing system of information/data and joint-operation system for flood mitigation between RID Office and Local Government Offices who operate the existing facilities/equipment.
2) To ensure the cost for operation and maintenance and to conduct the periodical inspection on the proposed floodgates and drainage pump vehicles.
3) Public information and advocacy for local residents to understand the operation rule of the new floodgates.
4) As a second stage project, the implementation of construction of floodwall along the Pasak River and 2 m-height floodwall on the river bank protection which will be constructed along the Han Tra Canal in the first stage under this JICA grant aid.

3-3 IMPORTANT ASSUMPTIONS

In order to attain the purposes/effectiveness of the Project, it is assumed that the joint-operation system including share of information/data for flood damage mitigation should be established between RID Office who operate/maintain the Han Tra and Kra Mang Floodgates including Drainage Pump Vehicles and Local Government Offices who operate/maintain the existing facilities/equipment.

3-4 PROJECT EVALUATION

3-4-1 Relevance

It is pertinent that the Project be implemented by Japan Grant Aid considering the following:

1) The Project mitigates the flood damage at the east area of Provincial Road Route No. 3035 and industrial estates located at the left bank of the Pasak River/Chao Phraya River.
2) The purpose of the Project is in conformity with objectives and strategies of 10th 5-year Development Plan that are;
   a) Creation of sound service to ensure the safety of life and assets, and
   b) Strengthening of economic and investment infrastructure to attract foreign direct investment.
3) The policy of GOJ on the flood disaster in Thailand is a) to reply the kindness and assistance shown to Japan by Thailand at the time of the Great East Japan Earthquake of March 2011, b) one of Japan's most important responsibilities to share the knowledge and lessons gained from the disasters with the international community, and c) Supporting Japanese firms in Thailand where Southeast Asia's largest Japanese manufacturing firm areas exist. This results in supporting the economy of Thailand and ASEAN.

3-4-2 Effectiveness

(1) Quantitative Effectiveness

Table 3-4-2.1 Quantitative Effectiveness

Indicator	Baseline (Year 2011)	Target Values (after Completion of the Project)
Water Level of the Pasak River at Ayutthaya Gauging Station	EL. +6.0 m MSL (This is based on the maximum water level recorded at the event of 2011 flood since 1950)	EL. +6.0 m MSL (The Project prevents the reverse flow of Pasak River. Water kevel of EL.+6.0 m MSL is equivalent to 2011 flood level flowing into the both Han Tra and Kra Mang Canals)

The Project consisting of construction of the Kra Mang Floodgate and Han Tra Floodgate including river bank protection, and provision of drainage pump vehicles will mitigate the flood damage due to flood reverse flow of Pasak River.

(2) Effectiveness

1) Mentally helpful for local residents and people relative to industrial estates who are anxious about future flood, and

2) Increasing stable business operations and enhancing the reliability of GOT.

Appendices

Appendix-1

Member List of Survey Team

Member List of Survey Team

Positions		Names	Affiliations
(1)	Team Leader /Overall Flood Control Plan	Ryouji MATSUMOTO /Takahiro MISHINA	CTI Engineering International Co.,Ltd.
(2)	Co-team Leader /River Facility Plan	Takahiro MISHINA /Masaki ISHII	CTI Engineering International Co.,Ltd.
(3)	Structural Designer (Grant) (1) Floodgate Design I	Yasuhiro AZUMA	Nippon Koei Co.,Ltd.
(4)	Structural Designer (Grant) (2) Floodgate Design II	Naoki KAJIURA	Nippon Koei Co.,Ltd.
(5)	Structural Designer (Grant) (3) Floodgate Design III	Masaki ISHII /Tatsuji ITO	CTI Engineering International Co.,Ltd.
(6)	Structural Designer (Grant) (4) Floodgate Mechanical Plan I	Arata YAMAGUCHI	Nippon Koei Co.,Ltd.
(7)	Structural Designer (Grant) (5) Floodgate Mechanical Plan II	Masahiro YAMAMOTO	Nippon Koei Co.,Ltd.
(8)	Structural Designer (Grant) (6) Floodgate Electrical Plan	Masayoshi SAITO	Nippon Koei Co.,Ltd.
(9)	Construction Planer/Cost Estimator (Grant) (1) Floodgate	Minoru KIMISHIMA	CTI Engineering International Co.,Ltd.

Appendix-2

Survey Schedule

Survey Schedule

Work Item	2011	2012								
	12	1	2	3	4	5	6	7	8	9
1. Grant Project Formulation										
2. Preparation of Project Outline Paper										
3. Preparation of Inception Report										
4. Basic Design										
5. Preparation of Progress Report										
6. Detailed Design										
7. Preparation of Detailed Design Report										
8. Project Cost Estimation										
Explanation and Discussion on Inception Report				2/23						
Explanation and Discussion on Technical Note							5/15			
Explanation and Discussion on Progress Report							5/28			
Explanation and Discussion on Draft Final Report									9/5	
Signing for M/D on Implementation of Preparatory Survey					3/12					
Signing for M/D on Progress Report							5/30			
Signing for M/D on Draft Final Report									9/7	
Signing for E/N of the Project Implementation								7/5		
Signing for G/A of the Project Implementation										8/15

Appendix-3

List of Parties Concerned in Thailand

List of Parties Concerned in Thailand

Royal Irrigation Department (RID), Ministry of Agriculture and Cooperatives

Name of Person	Organization
Mr. Lertviroj Kowattana	Director General
Mr. Suthep Noipairoj	Deputy Director General for Operation and Maintenance
Mr. Chachawal Punyavateenun	Deputy Director General for Engineering
Mr. Somkiet Prajumwong	Director of Project Management Office
Mr. Kosol Tienthongnukul	Director of Office of Engineering Topographical and Geotechnical Survey
Mr. Chatchai Boonlue	Director of Foreign Financed Project Administration Division
Mr. Panuphan Artsalee	Expert in Civil Engineering (Design)
Mr. Krairerk Inchayanunth	Chief of Design Standard Group
Mr. Thanet Somboon	Hydrologist in Experienced Level
Mr. Thongpeaw Kongjun	Director of Office of Engineering and Architecture Design
Mr. Songsak Soawung	Director of Public Participatory Promotion
Mr. Ugrid Thawonklaikool	Director of Operation and Maintenance Division of Regional Irrigation Office 10
Mr. Jamnong Phungpuk	Director of Office of the National Economic and Social Development Board (NESDB)
Mr. Jirawat Ratisunthorn	Director of Water Crisis Prevention Center
Mr. Prasit Sitho	Chief Engineer (Executive Advisor in Survey and Design)
Mr. Phuwanade Thongrungroj	Chief Engineer (Executive Advisor in Water Allocation and Maintenance)
Mr. Kanchadin Srapratum	Chief of Foreign Financed Project Administration Division
Mr. Noppadol Kosuwant	Chief of Improvement and Maintenance Division
Ms. Sukontha Airkarat	Representative of Director Bureau of Coordination for International Cooperation
Mr. Pinyo Gessa	Plan and Policy Analyst, Senior Professional Level
Ms. Kobkul Rangsiyaroj	Engineer, Professional Level
Mr. Weerawot Sirikul	Chief Engineer of Regional Irrigation Office 10
Mr. Suparat Kosumapinan	Chief of Design Group of Regional Irrigation Office 10
Mr. Chensak Suphakul	Engineer of Regional Irrigation Office 10
Mr. Prasit Sithiyos	Geologist of Regional Irrigation Office 10
Mr. Athaporn Punyachom	Head of Water Management Division of Regional Irrigation Office 10
Mr. Sittiwat Saengsiripaibool	Boundary Survey and Cadastral Survey Coordination of Water Management of Regional Irrigation Office 10
Mr. Prasert Lakrungroungkit	Boundary Survey and Cadastral Survey Coordination of Water Management of Regional Irrigation Office 10
Mr. Maitree Pitinanon	Director of Ayutthaya Irrigation Project Office
Mr. Chatchai Kerdpudpiam	Engineer of Ayutthaya Irrigation Project Office
Mr. Boontham Ponwang	Ayutthaya Irrigation Project Office
Mr. Natthaphong Kosuma	Ayutthaya Irrigation Project Office

State Railway of Thailand

Name of Person	Organization
Mr. Paiboon Sujirangkul	Acting Chief Engineer of Department of Civil Engineering
Mr. Somchart Unsap	Chief of Phra Nakhon Si Ayutthaya Permanent Way Inspector
Mr. Sompot Artca	Assistant Chief of Phra Nakhon Si Ayutthaya Permanent Way Inspector

Committee of Damrongtham Center of Phra Nakhon Si Ayutthaya Province

Name of Person	Organization
Mr. Withaya Pewpong	Governor of Phra Nakhon Si Ayutthaya Province
Dr. Thawee Naritsirikul	Vice Governor of Phra Nakhon Si Ayutthaya Province
Mr. Praphon Aiamsunthorn	Public Works and Town & Country Planning of Phra Nakhon Si Ayutthaya Province
Mr. Surachai Ajonboon	Director of Office of the Natural Resources and Environment of Phra Nakhon Si Ayutthaya Province
Ms. Bubpanat Chindet	Treasury of Phra Nakhon Si Ayutthaya Province
Mr. Sutham Noungam	Land Office of Phra Nakhon Si Ayutthaya Province
Mr. Sahaphum Phumtaritrat	Director of 3rd Regional Office of Fine Arts of Phra Nakhon Si Ayutthaya Province
Mr. Ratchata Pakafung	Director of Marine Department of Phra Nakhon Si Ayutthaya Province
Mr. Chaicharn Pondokmai	Chief of Ayutthaya Railway Station of SRT
Mr. Somsong Sappakosolkul	Mayor of Ayutthaya City Municipality
Mr. Narong Danchaiwiroj	Mayor of Ayothaya Town Municipality
Mr. Adisak Boonrod	Chief Executive of Han Tha Sub District Administrative Organization
Mr. Lamduan Kaisamrit	Chief Executive of Ko Rian Sub District Administrative Organization
Mr. Somboon Imsuwan	Chief Executive of Ban Ko Sub District Administrative Organization
Mr. Chalieow Sukprasert	Chief Executive of Tanoo Sub District Administrative Organization

Appendix-4

Minutes of Discussions

MINUTES OF DISCUSSIONS

ON

THE PREPARATORY SURVEY

FOR

THE FLOOD PREVENTION PROJECT

OF EAST SIDE OF THE PASAK RIVER IN AYUTTHAYA

IN THE KINGDOM OF THAILAND

(EXPLANATION OF DRAFT REPORT)

According to the Minutes of Discussions on the Preparatory Survey (hereinafter referred to as "The Survey") on "the Flood Prevention Project of East Side of the Pasak River in Ayutthaya" (hereinafter referred to as "the Project") on March 12, 2012, JICA Survey Team conducted series of field survey and discussion among related organization, and finally prepared the draft report of the survey.

In order to explain and consult with Royal Irrigation Department (hereinafter referred to as "RID") on the components of the draft report, JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Kazuhiro Yoneda, Chief Representative, JICA Thailand Office, from September 5 to 7, 2012.

As a result of the discussions, both parties confirmed the items described on the attached sheets.

Bangkok, September 7, 2012

Mr. Kazuhiro Yoneda Leader Draft Report Explanation Team Japan International Cooperation Agency	Mr. Lertviroj Kowattana Director General Royal Irrigation Department, Ministry of Agriculture and Cooperatives

Attachment

1. Components of the draft report and related documents

   RID agreed and accepted the contents of the draft report and the related document prepared by the JICA survey team. The Japanese side will finalize the Final Report according to the comments from RID.

2. Tentative Schedule of the Project

   The Team explained and RID agreed the tentative implementation schedule as shown in Annex-2.

3. Japan's Grant Aid Scheme

   RID understood Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Thailand as explained by the Team which was described in the Minutes of Discussions signed on March 12, 2012.

4. Confidentiality on Detailed Specification

   Both sides confirmed all the information related to the Project including technical specifications and drawings and other technical information shall not be released to any other party(ies) before the signing of all the Contract(s) for the Project.

5. Undertakings of Government of Thailand

   5-1 To provide required information and documents to carry out the Project,

   5-2 To provide required land for office, storage, stock yard, temporary spoil bank, coffering, temporary access road, etc.,

   5-3 Explanation of the Project and construction works, and request for cooperation to construction works to the stakeholders through the stakeholders meeting,

   5-4 To establish implementation framework including budget and staff member for compensation of land acquisition, resettlement and its implementation,

   5-5 To establish implementation framework for conducting the Project including budget and staff (with counterpart) and its implementation (including relocation cost of water pipe, electricity line, etc.),

   5-6 To open an account in a designated bank in Japan for the Banking Arrangement (B/A), and issue the Authorization to Pay (A/P), bear the advising commission of the A/P and the payment commissions to the bank,

5-7 To take necessary measures to ensure prompt unloading and Customs clearance upon entry into Thailand and transportation inside Thailand for the goods procured for the implementation of the Project,

5-8 To take necessary measures to exempt the contractor and the consultant from Customs duties, internal taxes and other fiscal levies imposed in Thailand for their supply of goods, services, and equipment,

5-9 Special treatment related to the entry and the resident in Thailand for the persons who are assigned to the Project based on the authorized contract,

5-10 Providing the required permission, authorization, right, etc., to carry out the Project,

5-11 The budget and sufficient number of staffs for the operation and maintenance to the floodgates constructed by the Japan Grant Aid,

5-12 Quick action to settle the problems from third parties and non-related people to the Project during the construction works, and

5-13 To secure the safety from the conflict, disturbance, rioting, rebellion, etc. to the Japanese citizen to be engaged in the Project.

6. Necessary measures and schedule of land acquisition

The team requested RID to take necessary measures in time to meet the following deadlines, and explained that JICA can not verify a process of contract otherwise.

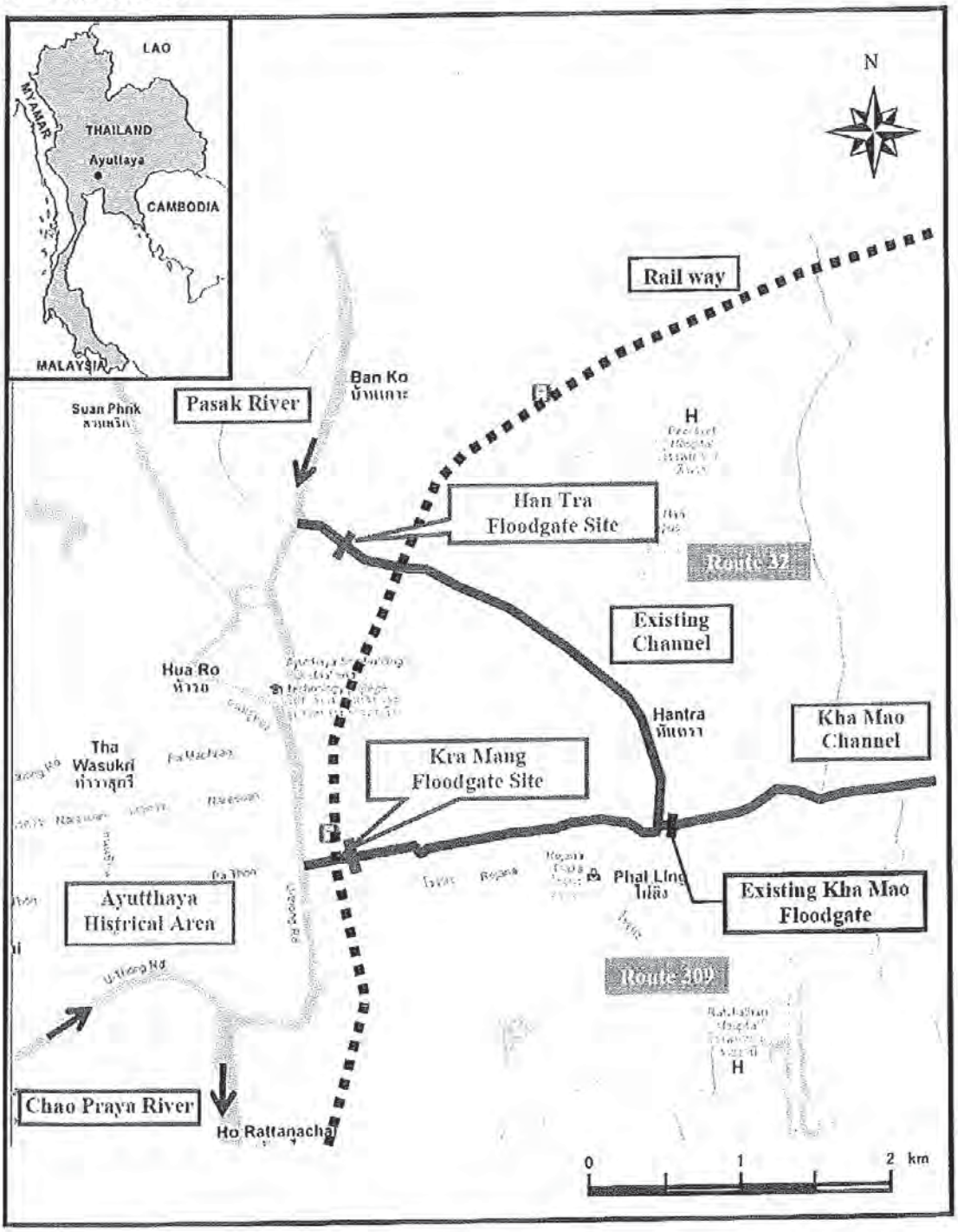
6-1 Agreement on land acquisition and/or resettlement with land owner(s) and/or resident(s) with any types of document shall be secured by the time of Bid Announcement or the middle of October.

6-2 Land acquisition and/or resettlement shall be completed by the Contract Agreement with a contractor.

RID agreed and promised to take necessary measures for those mentioned above (6-1 and 6-2).

The Contents of the Project

1. Site Location



Location Map

2. Contents of the Project

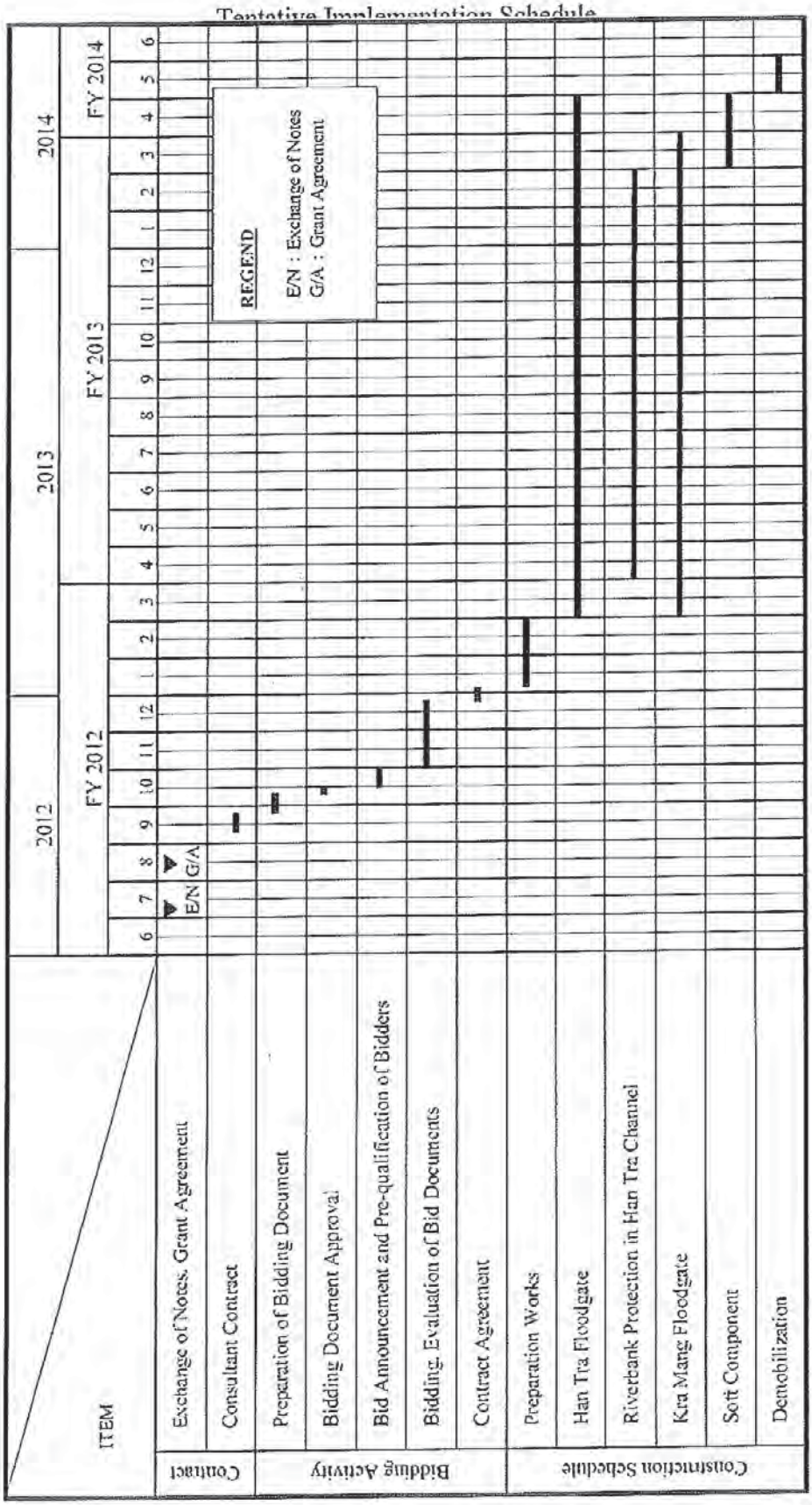
Facilities and Equipment

Items	Dimensions
1. Han Tra Floodgate	
Type	Stainless Steel type Roller Gate
Span	6 m
Number of Gate	3 nos.
Top Elevation of Gate	EL.+4.6 m
Bottom Elevation of Gate	EL.-2.5 m
Top Elevation of Floodgate	EL.+7.5 m
Foundation	Pile foundation
2. Kra Mang Floodgate	
Type	Stainless Steel type Roller Gate
Span	6 m
Number of Gate	3 nos.
Top Elevation of Gate	EL.+4.6 m
Bottom Elevation of Gate	EL.-0.5 m
Top Elevation of Floodgate	EL.+7.5 m
Foundation	Pile Foundation
3. Riverbank Protection in Han Tra Canal	
Type	
Length	212 m (Left)+272 m (Right)=484 m (Total)
Elevation of Pile Coping	EL.+2.5 m
Slope	1:2.0
Top Elevation of Fill	EL.+4.5 m
4. Drainage Pump with Truck	
Drainage Capacity	0.5 m^3/sec/unit (30 m^3/min/unit)
Head	10 m
Type of Pump	Submersible Pump
Generator	Diesel Generator
Truck Size	8 ton Class Truck
Number	10 numbers

Soft Component Plan

	Activities	Content
1	Preparation of coordinated gate operation and pump operation manual	Necessity of coordinated operation method, method of operation, operation record sheet, formation of communication network, communication method of each gate, pump, drain pump truck and office, communication record sheet
2	Guidance of coordinated gate operation and pump operation	Communication training, coordinated gate operation training

Tentative Implementation Schedule



MINUTES OF MEETING

ON

FINAL REPORT MEETING

FOR

The Flood Prevention Project
of
East Side of The Pasak River in
Ayutthaya
in
The Kingdom of Thailand

Final report

(Draft)

September 5, 2012

Between

Japan International Cooperation Agency

And

Royal Irrigation Department

Minutes of Meeting for Final Report

I. Introduction

The Record of discussion on Project for Comprehensive Flood Management Plan for the Chao Phraya River Basin was concluded on 13 January 2012. The Study Team of Japan International Cooperation Agency (hereinafter referred to as "JICA") submitted a Final Report (Draft) to Royal Irrigation Department (hereinafter referred to as "RID") on 5 September 2012 for "Flood Prevention Project of East Side of The Pasak River in Ayutthaya in The Kingdom of Thailand" (hereinafter referred to as the Study).

The major items discussed in the Technical meeting are summarized as follows:

II. Major Items Discussed

Major discussions made in the Technical Meeting among RID and JICA are as follows:

1. ITEM 1: Introduction

RID Mr. Suthep Noipairoj (Deputy Director General for Operation and Maintenance and also the chairman of this meeting updated the progress of Kra Mang Floodgate and Han Tra Floodgate Construction Projects.

- The Consultant Team has adjusted the Floodgate drawings in accordance with requesting of RID last meeting.

2. ITEM 2: Report of Records of Discussion and substantial issues

RID Mr. Suthep Noipairoj (Deputy Director General for Operation and Maintenance and also the chairman of this meeting) updated the progress of Kra Mang Floodgate and Han Tra Floodgate Construction Projects.

RID has 3 items to be discussed with JICA and Consultant Team

1) RID has agreed with the drawings except the pile. RID is worried about the quality of timber pile, which is used for permanent structure of floodgate construction. RID recommended the consultant team to use concrete pile instead of timber pile because the timber is made from Eucalyptus in Thailand. It is soft wood and not good quality. Moreover, it is more expensive than concrete pile. The consultant team informed RID about the timber pile in Japan. It is popular in Japan to use for floodgate construction. The timber pile in Japan is different from the timber in Thailand because the timber pile is made from Pine wood in Japan but the timber in Thailand made from Eucalyptus. The consultant team agreed to change the timber pile to concrete pile.
2) RID will process the land procurement and compensation for affected people for Kra Mang floodgate and Han Tra floodgate construction projects. RID agreed to submit the

agreement between RID and affected people within the mid of October 2012.

RID is so worried about land use of State Railway of Thailand. It is so hard to deal with this agency in Thailand because it is the one of State Enterprise in Thailand. It takes time to get the permission or result of land use of State Railway of Thailand. If RID has any problems with State Railway of Thailand RID will request JICA to assist them.

3) To propose the letter to government agencies for relocation and cost estimation of utilities, RID would like Regional Irrigation Office 10 in Ayutthaya to take responsibility to submit letters to agencies.

RID has already issued the letters for 4 government agencies, State Railway of Thailand, Thetsaban Nakhon Nakhon Si Ayutthaya Waterworks, Provincial Waterworks Authority in Ayutthaya and Provincial Electricity Authority in Ayutthaya. The consultant team and the officer from Regional Irrigation Office 10 in Ayutthaya will go to submit the letter to those agencies on Friday 7, September 2012 at 3.00 p.m.

3. ITEM 3: Report of operation process for construction area preparation

RID Mr. Ugrid Thawonklaikool (Director of Operation and Maintenance Division of Regional Irrigation Office 10 and also a counterpart of this project)

- RID and the consultant team had meeting with Chief, Phra Nakhon Si Ayutthaya Permanent Way Inspector and his staff to request them to survey land use of State Railway of Thailand on Thursday 19 July, 2012 at 10.00 a.m.
- Phra Nakhon Si Ayutthaya Permanent Way Inspector has sent the request documents to Nakhon Sawan Permanent Way Inspector.
- Regional Irrigation Office 10, Mr. Ugrid has contacted to Mr. Nattha (Officer of Nakhon Sawan Permanent Way Inspector) to check about the progressive operation on Tuesday 4 September, 2012. He said that this issue is still on process for consideration at Nakhon Sawan and he will let us know when he has to send the documents to the center of State Railway of Thailand.

4. ITEM 4: Report of the progress of JICA related projects

The Consultant Team Mr. ISHII Masaki (Deputy Team Leader) updated the progress of JICA related projects.

- The grant aid project reached an agreement with JICA and RID and identified projects to assist.
- The Consult Team agreed to change timber pile to concrete pile in accordance with RID suggestion.

5. **ITEM 5: Explanation of Draft Report**

JICA MR. MATSUMOTO Hideaki (Deputy Director Disaster Management Division 1) Global Environment Department

- JICA asked RID about the Panya Consultant team:
  Does RID still need some help from Panya Consultant team?
  The chairman of the meeting doesn't want any help from consultant team because the process of land procurement and compensation should be responsible by RID.
- JICA asked RID about the State Railway of Thailand process.
  RID explained the State Railway of Thailand process as follow:
  1) The local agency of State Railway of Thailand for this project is Phra Nakhon Si Ayutthaya Permanent Way Inspector will inspect area and send the documents to Nakhon Sawan Permanent Way Inspector for consideration.
  2) After consideration, Nakhon Sawan Permanent Way Inspector will send the documents to the center of State Railway of Thailand in Bangkok
  3) The State Railway of Thailand in Bangkok will send the documents to involved agencies to do the cost estimation and relocation of communication line, and then they will send all the documents back to Nakhon Sawan Permanent Way Inspector
  4) The last stage will be ended at Phra Nakhon Si Ayutthaya Permanent Way Inspector
  Remark: Before the operation process of relocation communication line of State Railway of Thailand, RID has to pay for the expenditure first otherwise they won't do anything.
- He has explained the draft report to RID.

6. **ITEM 6: Additional item for Final Report**

The Consultant Team Mr. MISHINA Takahiro (Team Leader)

- Mr. MISHINA mentioned item 5-5 (To establish implementation framework for conducting the Project including budget and staff (with counterpart) and its implementation (including relocation cost of water pipe, electricity line,etc.) is the only one additional item for final report (draft) of Consultant Contract between RID and Consultant Team.

7. **ITEM 7: Requested Information**

RID Mr. Kanchadin Srapratum (Chief of Loan Projects)

- Mr. Kanchadin requested JICA and Consultant Team to submit the contract agreement

(draft) between RID and Consultant Team in Thai version to Procurement and Supply Division before the signed contract date.

Mr. ISHII will send the contract agreement (draft) between RID and Consultant Team in Thai version to Procurement and Supply Division during 10-14 September, 2012.

- Mr. Kanchadin asked JICA and Consultant Team to change the Tentative Implementation Schedule, Item Consultant Contract to third week of September (Thursday 20 September, 2012).

8. ITEM 8: Confirm the Minutes of Discussions (Draft Report)

RID Mr. Suthep Noipairoj (Deputy Director General for Operation and Maintenance and also the chairman of this meeting)

- Mr. Suthep has confirmed the signing between RID and JICA about the Minutes of Discussions on the Preparatory Survey on The Flood Prevention Project of East Side of The Pasak River in Ayutthaya in The Kingdom of Thailand on Friday 7 September, 2012 at 11.30 a.m. at Royal Irrigation Department (Samsen).

8.1 Presentation of Work Plan

Suggestion for the studies to include following:

4) Study based on topographic data for appropriate design of dykes and flood walls.

5) Concept of shelter that is accessible and away from potential flood area

6) RID would like to know the scope of work and the role of RID

9. ITEM 9: Other Business (if any)

The meeting was adjourned at 12.10 p.m.

Apppendix-I

Record of Discussions in Final Report (Draft) Meeting on Wednesday 5 September, 2012

I. Participants

Thai Attendants (Royal Irrigation Department)

NAME-SURNAME	IN CHARGE	ORGANIZATION	CONTACT NUMBER
Mr. Suthep Noipairoj	Deputy Director General for Operation and Maintenance	Royal Irrigation Department (Samsen)	084-700-0522
Mr. Chatchai Boonleu	Director of Foreign Financed Project Administration Division	Royal Irrigation Department (Samsen)	084-700-5327
Mr. Kanchadin Srapratum	Chief of Loan Projects	Royal Irrigation Department (Samsen)	081-721-0034
Mr. Panuphan Artsalee	Expert on Civil Engineering (Design)	Royal Irrigation Department (Samsen)	081-923-7897
Mr. Krairerk Inchayanunth	Chief of Design Standards Group	Royal Irrigation Department (Samsen)	089-121-1146
Mr. Thanet Somboon	Hydrologist (Experienced Level)	Royal Irrigation Department (Samsen)	084-725-4777

Thai Attendants (Regional Irrigation Office)

NAME-SURNAME	IN CHARGE	ORGANIZATION	CONTACT NUMBER
Mr. Maitree Pitinanon	Director of Phra Nakhon Si Ayutthaya Provincial Irrigation Office	Regional Irrigation Office 10 (Ayutthaya)	081-817-9155
Mr. Chatchai Kertputpium	Chief of Engineering Branch	Regional Irrigation Office 10 (Ayutthaya)	087-118-3499
Mr. Ugrid Thawonklaikool	Director of Operation and Maintenance Project	Regional Irrigation Office 10 (Lop Buri)	081-853-3063
Mr. Attaporn Panyachohm	Chief of Water Management Branch	Regional Irrigation Office 10 (Lop Buri)	081-829-5753

Japanese Attendants

NAME-SURNAME	INCHARGE	ORGANIZATION	CONTACT NUMBER
Mr. MATSUMOTO Hideaki	Deputy Director Disaster Management Division 1	JICA	
Mr. MISHINA Takamiro	Team Leader	JICA Study Team	086-075-7961
Mr. ISHII Masaki	Deputy Team Leader	JICA Study Team	084-712-7480
Mr. Kobchai Songsrisanga	Interpreter	JICA	02-261-5250
Mr. Chawalit Chanamai	Engineer	JICA Study Team	087-678-8046
Ms. Kamolnit Ariyakamolpat	Interpreter	JICA Study Team	087-029-2288

MINUTES OF MEETINGS
ON THE PREPARATORY SURVEY
ON THE FLOOD PREVENTION PROJECT
OF EAST SIDE OF THE PASAK RIVER IN AYUTTHAYA
IN THE KINGDOM OF THAILAND

According to the Minutes of Discussions on the Preparatory Survey on "the Flood Prevention Project of East Side of the Pasak River in Ayutthaya" (hereinafter referred to as "the Project") on February 29, 2012, JICA Study Team conducted series of field survey and discussion among related organization, and finally made Progress Report as attached.

On this occasion, the JICA Preparatory Survey Team (hereinafter referred to as "the Team"), which was headed by Mr. Kazuhiro Yoneda, Chief Representative, JICA Thailand Office and Royal Irrigation Department (hereinafter referred to as "RID") had discussions on the contents of the Progress Report, and reached to the agreement.

The contents of the discussions are attached as the Annex.

Bangkok, May 30, 2012

Mr. Kazuhiro Yoneda
Leader
Preparatory Survey Team
Japan International Cooperation Agency

Mr. Lertviroj Kowattana
Director General
Royal Irrigation Department,
Ministry of Agriculture and Cooperatives

1. Technical Issue

The Thai side basically understood and agreed on the Technical Note as the Attachment-2 of the Progress Report as main points of technical issues and preliminary design of the floodgates, related structures and facilities.

2. Obligation of Thai side

The Team explained the obligations of Thai side and Thai side agreed on the contents as follow.

(1) To provide required information and documents to carry out the Project,

(2) To provide required land for office, storage, stock yard, temporary spoil bank, coffering, temporary access road, etc.,

(3) Explanation of the Project and construction works, and request for cooperation to construction works to the stakeholders through the stakeholders meeting,

(4) To establish implementation framework including budget and staff member for compensation of land acquisition, resettlement and its implementation,

(5) To establish implementation framework for conducting the Project including budget and staff (with counterpart) and its implementation,

(6) To open an account in a designated bank in Japan for the Banking Arrangement (B/A), and issue the Authorization to Pay (A/P), bear the advising commission of the A/P and the payment commissions to the bank,

(7) To take necessary measures to ensure prompt unloading and Customs clearance upon entry into Thailand and transportation inside Thailand for the goods procured for the implementation of the Project,

(8) To take necessary measures to exempt the contractor and the consultant from Customs duties, internal taxes and other fiscal levies imposed in Thailand for their supply of goods, services, and equipment,

(9) Special treatment related to the entry and the resident in Thailand for the persons who are assigned to the Project based on the authorized contract,

(10) Providing the required permission, authorization, right, etc., to carry out the Project,

(11) The budget and sufficient number of staffs for the operation and maintenance to the floodgates constructed by the Japan Grant Aid,

(12) Quick action to settle the problems from third parties and non-related people to the Project during the construction works, and

(13) To secure the safety from the conflict, disturbance, rioting, rebellion, etc. to the Japanese citizen to be engaged in the Project.

3. Environmental Consideration

Both sides basically agreed on the draft of Initial Environmental Examination Report for the Project. Although the result of evaluation will not be changed from the draft version, it needs some modification on the wording according to the comments from the section/department in charge of the environmental issue of the both sides. The report will be finalized and RID will submit the report to JICA within three weeks.

4. Social Consideration

4-1 Resettlement Action Plan

The Team requested to RID to finalize Resettlement Action Plan by the beginning of July with the support of the Team. RID answered that RID will finalize the Plan as requested by referring the laws and regulations of the Government of Thailand.

4-2 Building consensus on the resettlement with residents

The Team requested to RID to build consensus on the resettlement of the residents one by one by the middle of October. RID answered that RID will manage to make consensus to be in time.

5. Land Acquisition for temporary stockyard and access road

5-1 Negotiation with the people

RID questioned to the Team regarding the responsibility of the negotiation with the people. The Team answered that RID is responsible for the negotiation with and explanation to the people even it is the land for temporary use.

The Team explained that the location described in the Progress Report was the tentative proposal and it could be changed by RID as long as it had enough space.

5-2 Expenses

RID questioned to the Team whether the expenses for land acquisition for temporary stockyard and access road can be included into the Japanese Grant Aid Project or not. The Team answered that expenses for land acquisition for temporary stockyard and access road can not be covered by the Japanese Grant Aid Project.

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE FLOOD PREVENTION PROJECT
OF EAST SIDE OF THE PASAK RIVER IN AYUTTHAYA
IN THE KINGDOM OF THAILAND

In response to a request from the Government of the Kingdom of Thailand (hereinafter referred to as "GOT"), the Government of Japan decided to conduct a Project for Comprehensive Flood Management Plan for the Chao Phraya River Basin (hereinafter referred to as "the umbrella Project") which consists of (i) Comprehensive flood management plan (Component 1), (ii) Outline design for Japanese Grant Aid (Component 2) and (iii) Pilot projects for emergency rehabilitation (Component 3). The Japan International Cooperation Agency (hereinafter referred to as "JICA") has started the umbrella Project since December 2011, and had series of discussions on the project selection of Component 2 among organization concerned. Finally, a project titled "The Flood Prevention Project of East Side of the Pasak River in Ayutthaya" (hereinafter referred to as "the Project") has been selected by Royal Irrigation Department, Ministry of Agriculture and Cooperatives (hereinafter referred to as "RID") and JICA. Necessary procedures and arrangements are in progress in respective governments.

According to the Record of Discussions of the umbrella Project signed on January 13, 2012, JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team"), which was headed by Mr. Kazuhiro Yoneda, Chief Representative, JICA Thailand Office, and was scheduled to stay in the country from February 23 to the end of August 2012. The Team held discussions with the officials concerned of GOT and conducted a field survey in the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Bangkok, March 12, 2012

Mr. Kazuhiro Yoneda
Leader
Preparatory Survey Team
Japan International Cooperation Agency

Mr. Lertviroj Kowattana
Deputy Permanent Secretary
Acting for Director General
Royal Irrigation Department
Ministry of Agriculture and Cooperatives

ATTACHMENT

1. Background

October 2012	The flood of the Chao Phraya River began to affect the people and economy of the Kingdom of Thailand.
October 19 – 28, 2011	JICA Needs Survey Team investigated the flood damages.
November 7, 2011	Government of Thailand (Ministry of Foreign Affairs) officially requested the umbrella Project proposed by the RID and DWR.
December 22, 2011	Minutes of Meetings which described basic understanding both sides about framework, contents and important issues to be concerned of the umbrella Project was signed and exchanged by RID, DWR and JICA witnessed by the National Economic and Social Development Board (hereinafter referred to as "NESDB").
December 22, 2011	Consultant Team of the umbrella Project was assigned by JICA.
January 13, 2012	Record of Discussion (hereinafter referred to as "R/D") which stipulated contents of the umbrella Project was signed and exchanged by NESDB, RID, DWR and JICA.

2. Outline of the umbrella Project

Component 1: Comprehensive flood management plan considering the effect of the climate change and land development. This component consists of two (2) sub-components as follows;

- Sub-component 1-1: Preparation of a detailed map necessary for reviewing the M/P of 1999 (Sub-component 1-2)
- Sub-component 1-2: Review of the "Study on integrated plan for flood mitigation in Chao Phraya River Basin" (hereinafter referred to as "M/P")

Component 2: Outline design for Japanese Grant Aid for Disaster Prevention and Reconstruction

Component 3: Pilot projects of emergency rehabilitations and/or urgent countermeasures to protect the priority area such as the industrial complex and/or Bangkok are implemented

- This Preparatory Survey will be conducted under the Component 2.

3. Project Title

Both sides agreed that the project title for this survey was "the Flood Prevention Project of East Side of the Pasak River in Ayutthaya".

4. Objective of the Project

The objective of the Project is to mitigate the risk of damages from flood in the downstream area of the Khao Mao canal including Bangkok and industrial complexes by constructing regulators in Ayutthaya.

5. Project site

The site of the Project is located on east side of the Pasak River in Ayutthaya as shown in ANNEX 1.

6. Responsible and Implementing Agency

The responsible and implementing entity for the Project is the Royal Irrigation Department, Ministry of Agriculture and Cooperatives.

7. Items requested by the Government of Thailand

Through discussions between RID and the Team, the requested components were confirmed as below.

- New construction of two main bodies of regulators
- Production of gates and installation to the main bodies
- New construction of their related structures such as revetment

In addition to the above items, RID requested to consider pump(s) for drainage water inside of the regulators when the gates of regulators were closed.

Appropriateness and necessity of each item of the request including pumps will be assessed and specifications of each item of the request will be decided based on the result of the Preparatory Survey and additional survey done by the JICA's consultant in consideration with budget availability of Japan's Grant Aid and operation and maintenance capacity of RID.

8. Japan's Grant Aid Scheme

8-1 Thai side understands the Japan's Grant Aid Scheme explained by the Team, as described in ANNEX 2. Thai side also understands that the procedure for the Project is specially arranged due to emergency treatment.

8-2 Thai side will take the necessary measures, as described in ANNEX 3, for smooth implementation of the Project.

9. Schedule of the Survey

9-1 The Team will proceed for further studies in Thailand until the end of August, 2012.

9-2 The Team will prepare the progress report of the Preparatory Survey in English. JICA will dispatch a mission to explain its contents in May.

Contents of the progress report will consist of technical notes, preliminary design, undertakings and inputs from each Government and necessary measures for environmental

and social consideration.

9-3 JICA will prepare the final report of the Preparatory Survey and dispatch a mission to explain its contents in August.

Contents of the final report will be detailed design, implementation plan, cost estimation, and maintenance and monitoring plan.

In addition to the final report, a set of reference documents for making bid documents will be prepared.

9-4 JICA will finalize the final report and send it to the GOT by the end of August, 2012.

10. Other relevant issues

10-1 Responsibility for the detailed design and bid document

Through the Preparatory Survey and additional survey, JICA will prepare detailed design and related documents just as reference documents for conducting bidding procedure. GOT has to take necessary procedure to authorize the detailed design and the bid document after receiving reference documents.

10-2 Land Clearance and Provision of Disposal Area of Construction Debris

Both sides confirmed that land clearance of construction area would be undertaken by the Thai side and completed before the commencement of the construction work.

Thai side agreed to provide the disposal area of construction debris at own cost and take necessary measures according to the related law before the commencement of the construction work.

10-3 Removal of residences in the site

Thai side agreed to undertake a responsibility of removal of residences in the project site before the commencement of the construction work, if any.

10-4 Environmental and Social Considerations

Both sides agreed that it is not necessary to take procedures for the approval of Environmental Impact Assessment (hereinafter referred to as "EIA") for the Project according to the laws and regulations of Thailand.

The Team explained that the Project is temporally categorized as "B" based on JICA's Guidelines for Environmental and Social Considerations (April, 2010) because the Project does not have significant adverse impact but needs careful consideration for environmental and social impact as it is new construction project. Thus Initial Environmental Examination (hereinafter referred to as "IEE") shall be conducted for the Project. In addition, it is necessary to make a Resettlement Action Plan (hereinafter referred to as "RAP") if any resettlement will be take place by the Project.

Both sides agreed that IEE procedure and RAP will be completed by the RID with support

from the Team by the time of discussion on the progress report of the Preparatory Survey.
GOT shall have a full responsibility for explanation to stakeholders about environmental impacts of the Project.
Also GOT is requested to take actions such as preparing environmental check list as shown in ANNEX 4 as a brank form and taking the monitoring procedure in accordance with the monitoring form as shown in ANNEX 5.
The environmental check list and the monitoring form have to be prepared by the time of discussion on the progress report of the Preparatory Survey.

10-5 Design Policy and Condition

Both sides agreed on the design policy and condition as shown in the Inception Report. If any changes and/or detailed technical issue to be confirmed between both sides arise, technical note will be made, signed and exchanged by both sides. Representative of JICA side for this technical matter is a leader of consultant team, and representative of Thai side is Director of Region 10 of RID.

10-6 Arrangement for the Survey

As response to the request by the Team, Thai side agreed to arrange following items:

(1) To provide the Team with available data, information and materials necessary for the execution of the Survey which was agreed in R/D.
(2) To prepare the answers for the Questionnaires presented by the Team,
(3) To assign full-time counterparts to the Team during their stay in Thailand and to play the following roles as the coordinator to the Team:
    1) To make the appointments and to set up the meetings with the authorities, departments and all other factories and firms whatever the Team intends to visit,
    2) To attend site survey and any other visiting place with the Team and to make any convenience on accommodation, working room, adequate transportation, getting the permissions if required, etc., and
    3) To assist and to advise the Team for their collection of data and information,
(4) To secure the permission to photograph and enter into private properties and restricted areas for the Team for proper execution of the Survey, if necessary,
(5) To take any necessary measures deemed necessary to secure the safety of the members of the Team, and
(6) To make arrangements to allow the Team to bring back to Japan any necessary data, maps and materials related to the Survey, subject to approval by the GOT, in order to prepare the report.

10-7 Operation and Maintenance cost

Necessary cost for operation and maintenance of the project after the completion of the

Project will be surveyed through the Preparatory Survey.

10-8 Confidentiality of the Project

All the information related to the Project such as detailed drawings, specifications, and the result of cost estimation shall not be released to a third party before conclusion of all the contract(s) for the Project, because they are confidential documents that contain information related to the tender.

10-9 Tax Exemption

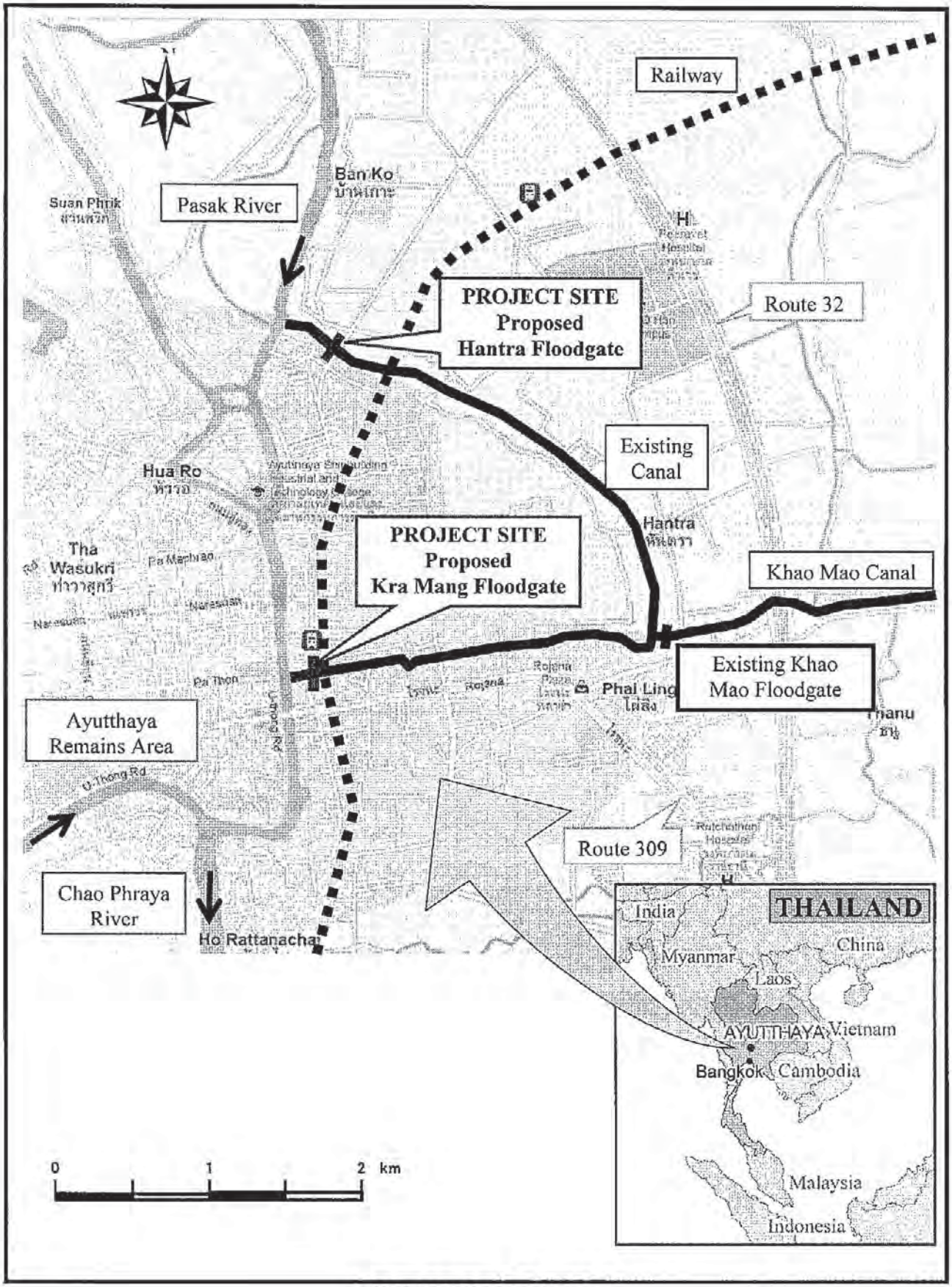
The tax exemption including Value Added Tax (VAT), custom duty, and any other taxes and fiscal levies in Thailand which is to be arisen from the Project activities will be ensured by RID. RID and the Thailand International Development Cooperation Agency will take any procedures necessary for tax exemption with the Ministry of Finance of Thailand at their responsibility.

Annex 1: Project Site
Annex 2: Grant Aid Scheme JAPAN'S GRANT AID
Annex 3: Major Undertakings to be taken by Each Government
Annex 4: Environmental Checklist
Annex 5: Monitoring Form

Related Document to this Minutes of Discussions: Inception Report

Annex 1

Project Site



LOCATION MAP

Annex 2

Grant Aid Scheme JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of this Preparatory Survey is to provide reference documents for making bid document for the contract of the Project. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design and detailed design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Detailed Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and transfers it to the Government of recipient country.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex 3.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

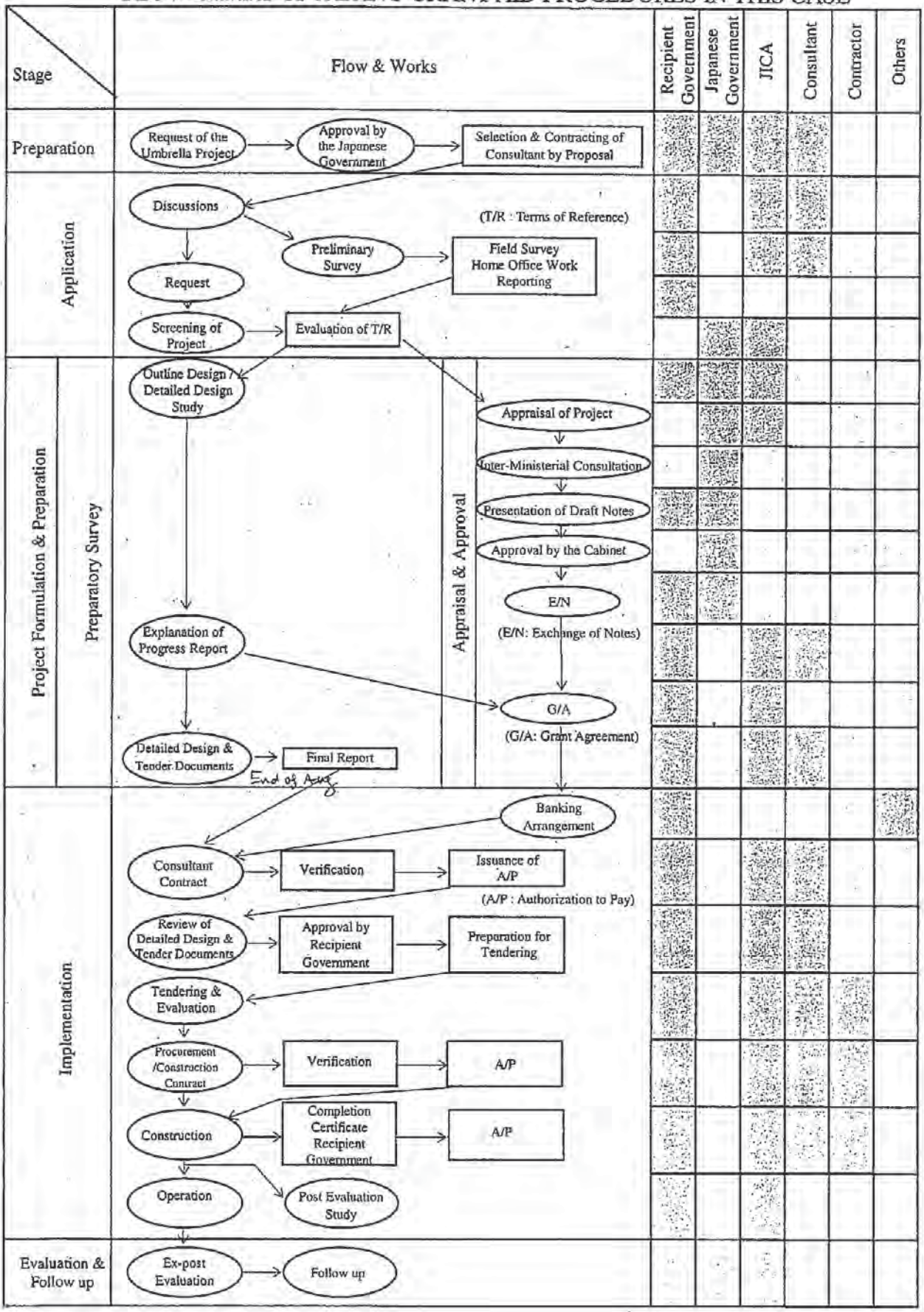
(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA's Guidelines for Environmental and Social Considerations (April, 2010).

FLOW CHART OF JAPAN'S GRANT AID PROCEDURES IN THIS CASE



Annex 3

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure [a lot] /[lots] of land necessary for the implementation of the Project and to clear the [site]/[sites];		●
2	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services [be exempted] / [be borne by the Authority without using the Grant]		●
4	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
5	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		●
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
8	To give due environmental and social consideration in the implementation of the Project.		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

Environmental Checklist: 11. River and Sand Erosion Control

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) (b) (c) (d)	(a) (b) (c) (d)
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) (b)	(a) (b)
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a)	(a)
2 Pollution Control	(1) Water Quality	(a) Is there a possibility that changes in river flow downstream (mainly water level drawdown) due to the project will cause areas that do not comply with the country's ambient water quality standards?	(a)	(a)
	(2) Wastes	(a) In the case of that large volumes of excavated/dredged materials are generated, are the excavated/dredged materials properly treated and disposed of in accordance with the country's standards?	(a)	(a)
	(3) Subsidence	(a) Is there a possibility that the excavation of waterways will cause groundwater level drawdown or subsidence? Are adequate measures taken, if necessary?	(a)	(a)
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a)	(a)

	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that hydrologic changes, such as reduction of the river flow, and seawater intrusion up the river will adversely affect downstream aquatic organisms, animals, vegetation, and ecosystems? (e) Is there a possibility that the changes in water flows due to the project will adversely affect aquatic environments in the river? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a) (b) (c) (d) (e)	(a) (b) (c) (d) (e)
3 Natural Environment	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	(a)	(a)
	(4) Topography and Geology	(a) Is there a possibility that excavation of rivers and channels will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas?	(a)	(a)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) (b) (c) (d) (e) (f) (g) (h) (i) (j)	(a) (b) (c) (d) (e) (f) (g) (h) (i) (j)

	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect the downstream fisheries and other water uses? (c) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced?	(a) (b) (c)	(a) (b) (c)
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)	(a)
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a)	(a)
4 Social Environment	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	(a)(b)	(a)(b)
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) (b) (c) (d)	(a) (b) (c) (d)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) (b) (c)	(a) (b) (c)

	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) (b) (c) (d)	(a) (b) (c) (d)
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry checklist should also be checked.	(a)	(a)
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a)	(a)

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate
environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the
country and locality in which the project is located.

Annex 5

MONITORING FORM

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
ex.) Responses/Actions to Comments and Guidance from Government Authorities	

2. Mitigation Measures

- Air Quality (Emission Gas / Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
SO_2						
NO_2						
CO						
O_3						
Soot and dust						
SPM						
Dust						

- Water Quality (Effluent/Wastewater/Ambient Water Quality)

I. II. III. Item	1. 2. 3. Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
pH						
SS (Suspended Solid)						
BOD/COD						
DO						
Total Nitrogen						

Total Phosphorus						
Heavy Metals						
Hydrocarbons / Mineral Oils						
Phenols						
Cyanide						
Temperature						

- Waste

Monitoring Item	Monitoring Results during Report Period

- Noise / Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level						
Vibration level						

- Odor

Monitoring Item	Monitoring Results during Report Period

3. Natural Environment

- Ecosystem

Monitoring Item	Monitoring Results during Report Period
ex.) Negative effects/Actions to Valuable species	

4. Social Environment

- Resettlement

Monitoring Item	Monitoring Results during Report Period

- Living / Livelihood

Monitoring Item	Monitoring Results during Report Period

Appendix-5

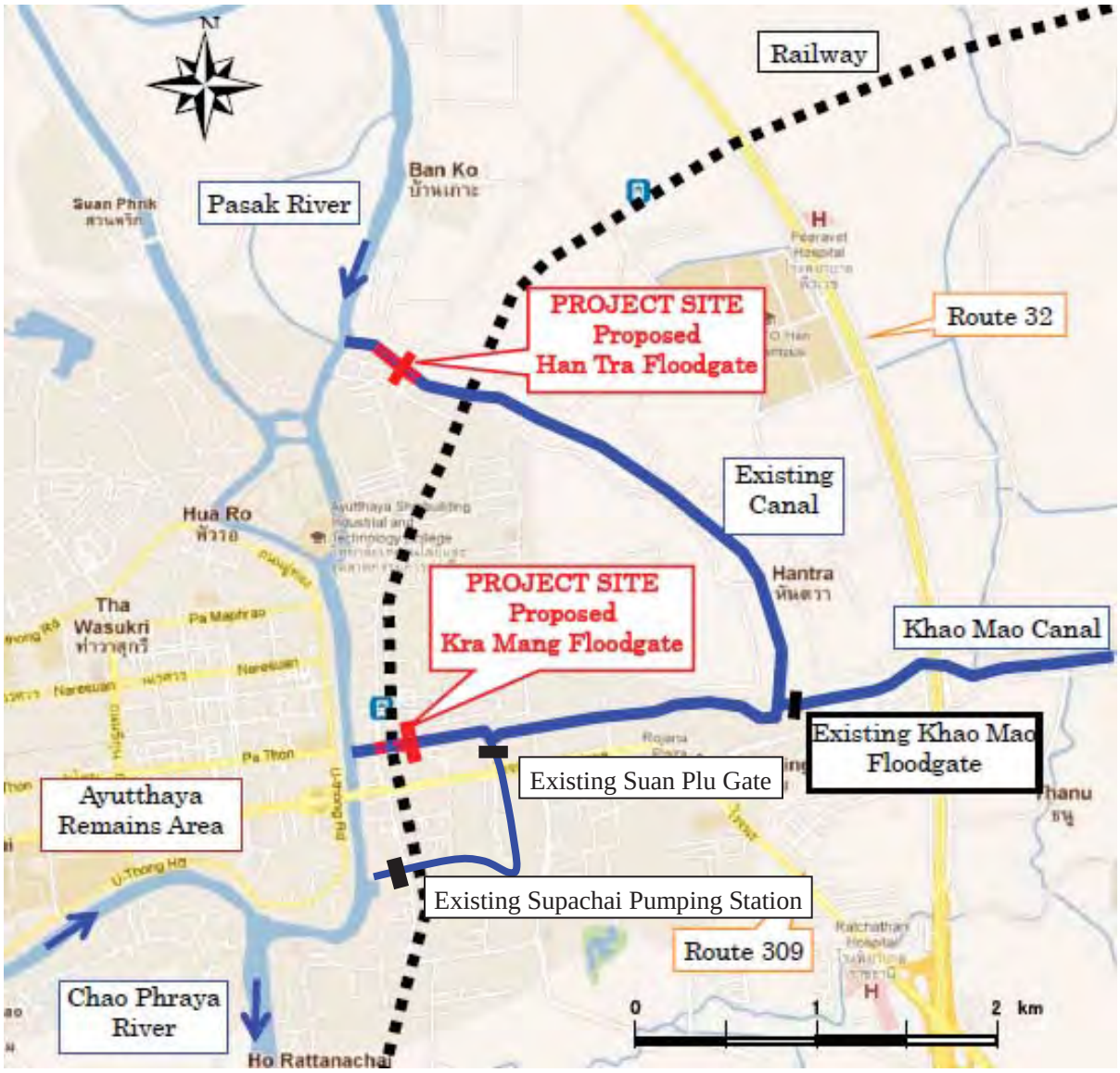
Soft Component Plan

1 Background of Soft Component

(1) Background

The purposes for construction of Han Tra and Kr Mang floodgates are 1) to secure the safety of life and assets at the east area from the route 3053 and 2) to mitigate the flood damage of the industrial estates against the entering water from the Pasak River during the flood event.

However, the canal system in this area consists of the Khao Mao canal, Han Tra canal, Kra Mang canal, connection canal to pumping station and two (2) new floodgates, one existing floodgate and one pumping station as shown in Figure-1.



Source: JICA Survey Team

Figure-1 Location of Canals, Floodgates and Pumping Station

(2) Present Operation Rule

The present operation rule is as follows;

1) When the water level at the Pasak gauging station reaches EL. +2.6 m MSL, the existing small gate is closed. And the drainage works in the southern area from root 309 are started by the drain pumps in pumping station.
2) The gates of Khao Mao floodgate are closed to protect entering water from the Pasak River and to keep upstream water level less than EL. +3.5 m MSL.

Therefore, the residents in low land area along the Kra Mang and Han Tra canal is frequently suffered inundation during the flood event.

(3) Necessity of Assistance of Close Operation of Flood Gates, Pumping Station and Drainage Pump Vehicles

The purpose of the Project is to mitigate flood damage in the east area of route 3053 against the entering water from the Pasak River. However, there are several structures in the canal system as shown in Figure-1. The optimal operation of these structures and drainage pump vehicles that are procurement equipments in this project shall be studied to demonstrate maximum effectiveness of the grant aid.

2 Goal of the Soft Component (or Management Guidance) Plan

RID and other related agencies will conduct O&M of the floodgates, pump station and drainage pump vehicles after completion of Japan Grant Aid Project. Therefore, the operation level of the staffs in the executing agencies, such as RID Regional Irrigation Office 10, Ayutthaya Irrigation Project Office, O&M division in Phra Nakhon Si Ayuttaya province, Phra Nakhon Si Ayutthaya district, Ayutthaya city, and Ayothaya town, shall be reached to the following status through the soft component plan.

1) The gate operation of Han Tra and Kra Mang floodgates will be carried out adequately and efficiently.
2) The gate operation of existing and new floodgates, operation of pumping station and the drainage pump vehicles will be conducted cooperated operation and a communication network for coordinated operation will be formulated among these structures and the drainage pump vehicles during the flood event.
3) Improvement of an administrative service to flood damage mitigation.

3 Results of the Soft Component Plan (Direct Effects)

As results of the soft component (or management guidance) plan, the O&M staffs in the executing agencies are able to take quick action. The results of the soft component are as follows:

Result 1) The gate operation of Han Tra and Kra Mang floodgates will be conducted adequately an efficiently.

Result 2) Flood damage in the project area will be mitigated by a coordinated gate operation and a communication network among Han Tra floodgate, Kra Mang floodgate, Khao Mao

flood gate, Suan Plu gate, Supachai pumping station and the drainage pump vehicles

4 Validation of the Results

The results of soft component plan will be validated as follows:

Result 1) Test operations of Han Tra and Kra Mang floodgates to several cases are carried out by the operators. The foreign expert checks their performance by using checklist for the floodgate operation.

Result 2) Test cooperation operations considering several flood cases are carried out by the operators. Firstly, the foreign expert confirms communication networks of the operators and responsible person in RID Ayutthaya Irrigation Project Office. After then, the cooperation operation training will be started. The foreign expert checks their performance by using checklist for cooperation operation of the floodgates, the pump station and the drainage pump vehicles.

The skill up and comprehension of operation will be confirmed to use a checklist and a questionnaire or interview survey after the training.

5 Activities in the Soft Component Plan (Input Plan)

RID will conduct O&M of the newly construction floodgates and drainage pump vehicles after completion of the construction and the procurement. The soft component plan is designed to attain the following goals which will contribute to maintain the Project effects.

(1) Preparation of coordinated gate operation and pump operation manual

(2) Guidance of coordinated gate operation and pump operation

The content of the activities is shown in the following table.

Table-1 Contents of Activities in the Soft Component Plan

Activities		Content
1	Preparation of coordinated gate operation and pump operation manual	Necessity of coordinated operation method, method of operation, operation record sheet, formation of communication network, communication method of each gate, pump, drainage pump vehicle and office, communication record sheet
2	Guidance of coordinated gate operation and pump operation	Communication training, coordinated gate operation training

6 Procurement of Local Resources

A Japanese consultant of operation and maintenance expert will provide the services stated in the above input plan, together with one counterpart from RID Regional Irrigation Office 10. The activities of the counterpart are a coordination between RID and the consultant.

7 Implementation Schedule

The implementation schedule of the soft component plan is set at 3 March, 2014 to 1 May, 2014. The draft operation manual will be prepared at beginning of April. The finalization of the operation manual will be executed to collect idea and suggestion from the stakeholders of the gate operation through the seminar and training in middle of April. Finally, the skill and comprehension of operation will be confirmed through the training by using the final version of the operation manual in last of April.

8 Outputs of the Soft Component Plan

The outputs of the soft component plan are as follows:

(1) Coordinated gates and pump operation manual in English

(2) Training text for coordination gates and pump operation in English

9 Cost Estimation

About JPY 4.3 million

10 Obligation of RID

The obligations of RID for the soft component plan are as follows:

(1) RID should assign one (1) counterpart personnel to the consultant

(2) RID should assign fifteen (15) trainees for seminar and coordinated gate operation guidance to be conducted under the soft component plan from the following offices and agencies:

(a) RID Regional Irrigation Office 10

(b) RID Ayutthaya Irrigation Project Office

(c) O&M division of Phra Nakhon Si Ayutthaya province

(d) O&M division of Phra Nakhon Si Ayutthaya district

(e) O&M division of Ayutthaya city

(f) O&M division of Ayothaya town

(3) RID should permit operation of Han Tra, Kra Mang, Khao Mao flood gates, Supachai pumping station and drainage pump vehicles for coordinated operation guidance to be conducted under the soft component

Appendix-6

Abbreviated Resettlement Action Plan

ABBREVIATED
RESETTLEMENT ACTION PLAN
FOR
THE FLOOD PREVENTION PROJECT OF
EAST SIDE OF THE PASAK RIVER IN AYUTTHAYA
IN THE KINGDOM OF THAILAND
(TENTATIVE EDITION)

SEPTEMBER 2012

ROYAL IRRIGATION DEPARTMENT

MINISTRY OF AGRICULTURE AND COOPERATIIVES

KINGDOM OF THAILAND

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1.0 INTRODUCTION

The Government of Thailand (GOT) with support by the Japan International Cooperation Agency (JICA) intends an emergent anti-disaster project to construct floodgates and relating structures in Ayutthaya. The Project area in Ayutthaya was severely damaged by the historical flood in 2011, and the impacts in this area spread the industrial complex downstream. In the Project, two floodgates will be installed in Kra Mang canal, where can play an important role as the regulator of flood flow from the Pasak River.

The JICA Guidelines for Environmental and Social Considerations (2010) classifies the Project as Category B, where their potential adverse impacts on the environment and society are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily. In addition, this scale of project does not need the Environmental Impact Assessment (EIA) according to the law in Thailand. However, an Initial Environmental Examination (IEE) has been conducted for the Project because impacts on the environment and local society should be considered by construction works in the Project. In view of possible land expropriation and resettlement of inhabitants around the project areas, an Abbreviated Resettlement Action Plan (RAP) has been prepared in accordance with the JICA Guidelines in 2010 and relating regulations and laws in Thailand.

The RAP is to ensure that people whose properties are affected as a result of the Project receive sufficient support and compensation.

1.1 Project Name

Flood Prevention Project of East Side of the Pasak River in Ayutthaya in the Kingdom of Thailand (hereinafter referred to as 'the Project')

1.2 Description of the Project

Two floodgates will be installed in Han Tra and Kra Mang area along the Kra Mang canal, Ayutthaya. To ensure flood prevention based on the flood in 2011, both floodgates are designed to bear +6.0 m MSL (Pasak River side) and +3.5 m MSL (canal side) of flood level. Approximately 400 m-long riverbank protections are constructed along both side of the canal from the floodgate toward the Pasak River in Han Tra area. Location of the Project is shown in Figure 1.1 and 1.2.

Figure 1.1 Location of the Project (Han Tra)

Figure 1.2 Location of the Project (Kra Mang)

2.0 NECESSITY OF LAND EXPROPRIATION AND RESETTLEMENT

2.1 Project Component and Impact Area

The project activity that will lead to land being expropriated or to people being resettled is the construction of floodgate, together with the construction of ancillary facilities and bank protection. As described in section 1.2, the center of affected areas locates in Han Tra and Kra Mang, respectively. The number of possible households that would be affected by the Project is respectively 3 in Han Tra and 8 in Kra Mang, even though being entitled legally or not.

2.2 Review of Alternative Plans

In the process to determine the project sites, the priority was a mitigation of flood damages by installation of floodgate. In addition, considerations to minimize land expropriation and resettlement of inhabitants were included. Evaluation results of comparison of alternatives for project sites including zero option are shown in Table 2.1.

The result revealed that Option 2 could not provide any land expropriation and resettlement of inhabitants. However, some inhabitants opposed the option due to issues on landscape and access to the canals. Thus a concern arose it could take much time to make a positive agreement with those people. There is constraint on available time for the project because of urgent disaster-prevention measures. Finally, the proposed projects were selected both in Han Tra and Kra Mang areas securing flood prevention, even though small scale of land expropriation and resettlement of inhabitants would takes place

Table 1.1 Review of Alternative Plans

Effect		Zero Option	Option 1	Option 2	Proposed Plan
Ha Tra Floodgate	Positive	*No human-induced environmental & social adverse effect expected.	*Maximum positive effect can be achieved with the completion of RID proposed embankment plan.	*No resettlement is required by the project. *Residents live east of N3050 can be secured without completion of RID proposed embankment plan. *Maximum positive effect can be achieved with the completion of RID proposed embankment plan.	*Residents live east of N3050 can be secured without completion of RID proposed plan. *As RID proposed plan completed, maximum positive effect can be achieved. *Maximum effect can be achieved with the completion of RID proposed embankment plan.
	Negative	*Due to no protective measure will be given, major economical and property damages are expected as the 2011-year scale flood occurs.	*Resettlement will be required for several buildings by placed flood gate. *No protection will be supplied until completion of whole RID's river bank construction. *Residents strongly oppose the RID proposed plan.	*Disturbance of access to the channel will occur by river bank protection. *No protection will be supplied until completion of whole RID's river bank construction. *Without the completion of RID proposed plan, residents between the Pasak river and N3050 can not be secured. *Residents strongly oppose the RID proposed plan.	*Resettlement will be required for several buildings by the construction of flood gate and protection bank.
Kra Mang Floodgate	Positive	*No human-induced environmental & social adverse effect is expected.	*Maximum positive effect can be achieved with the completion of RID proposed embankment plan.	*No resettlement is expected by the plan.	*Relatively smaller size of adverse effect, resettlement is required.
	Negative	*Due to no protective measure exits, major economical and property damages are expected as the 2011-year scale flood occurs.	*Several buildings are expected to be resettled by the plan. *Little reduction of flood damages is expected without the completion of RID plan. *Residents strongly oppose the RID proposed plan.	*Little reduction of flood damages is expected without the completion of RID plan. *Residents strongly oppose the RID proposed embankment plan. *Ministry of Railway strongly opposes the plan.	*Several buildings are expected to be resettled by the plan.

3.0 LEGAL FRAMEWORK OF LAND EXPROPRIATION AND RESETTLEMENT

3.1 Basic Concept of Laws and Regulations

As for land expropriation and resettlement of inhabitants relating to a project planned by a national or local authority in Thailand, four (4) legislations mainly relate to the processes.

Constitution of the Kingdom of Thailand, B.E. 2540 (1997)

Land Expropriation Act, B.E. 2530 (1987)

Regulations of the Office of the Prime Minister on Procurement

Ministerial Minutes of Meeting on July 11, 1989

The Constitution states that the expropriation of immovable property shall not be made except by virtue of the law specifically enacted for the purpose of public interest.

Land Expropriation Act in 1987 is the general law to acquire private lands and buildings to carry on public purpose. The public purposes such as defense, natural resources, town planning, agriculture development, industrial, land consolidation and other projects.

In the Regulation of the Office of the Prime Minister Regulation on Procurement, Director General of the project organization should sign an order of land acquisition to proceed with land expropriation. The chairman of committee may appoint a working group or assign a professional grader to prepare the evaluation report.

The Ministerial Minutes of Meeting on July 11, 1989 showed that the government policy has overcome the problems of illegal occupants in public land for the projects of the Royal Irrigation Department (RID).

3.2 Definition of Estimation of Compensation

Land Expropriation Act

The person who has interest in land can claim for money compensation as follows:

(1) owners or occupants of land by law, (2) owners of permanent buildings or improvement on land, (3) lessees of land, buildings or other improvements with rent contracts, (4) owners of trees and (5) owners of moveable buildings.

In these five cases, compensation should be assessed for demolition costs, moving costs and reconstruction costs. The amount of compensation should be assessed by comparison of (1) sales price of similar property, (2) the medium land price list for land tax, (3) the assessed value of real estate for registration act, (4) the adjustment between comparable sales and subject property and (5) the reason and purpose of expropriation. Compensation on such act should be paid to a person who holds legal right and interest on land, buildings and trees.

Regulations of the Office of the Prime Minister on Procurement

The evaluation report should include comparable sales not less than three sales, and an evaluation report on a basic market comparison approach is also needed. The committee use market value to negotiate with the land owner. If the final price is obtained, the two parties will go to the Land Office to register for transfer and pay compensation to the dispossessed owner. The ways for negotiation and compensation according to the regulations are on a friendly-process basis.

In practice, the sale from the contract price is usually lower than the market value or some sale is not comparable, the working group can refer to the assessed value for transfer fee but the price to purchase is not more than 50 percent (Agriculture Land Reform Purchase Manual).

Ministerial Minutes of Meeting on July 11, 1989

The compensation will not be paid for land taken but will be paid for relocation costs. The relocation costs should be assessed by compensation with lowest assessed land value for transfer fee under the land code. The compensation committee can adjust by reason of public

land so relocation cost should be 2/3 or 3/5 of the assessed land value. If the project area covers more than one Tambon (sub-district), the lowest land price unit should be an average.

3.3 Proceeding on Land Expropriation and Resettlement

Proceeding on land expropriation and resettlement of inhabitants has three alternatives that acquire by (1) friendly negotiation, (2) Royal Decree or compulsory acquisition and (3) expropriation.

Friendly negotiation procedure is the most efficient for timeline. It is an appropriate alternative for a small project opposite to second and third alternatives, which take time and have to initiate special law and regulation for the Project. Under compulsory acquisition and expropriation, the land owner has right to appeal the amount of compensation to the minister. In case of no settlement, the landowner can present the dispute to the political court. The total timeline for appeal does not exceed one year, but the political court is about 5-10 years.

Projects of RID should follow its proper rule reflecting the laws above mentioned. The rule acts different manners by scale of projects for water storage development, irrigation and water resource development. Though the Project, construction of floodgate and bank protection is not categorized in the scales, the rule for small-scale project should be applied from a viewpoint of social considerations.

3.4 Method of Calculation of the Property and Compensation

In the Laws of Thailand, the head of compensations are land taken, severance damage, disturbance and betterment. Land taken consists of compensations for land, building/house and trees. The calculation methods include market comparison, cost and income methods. The valuation is fixed at the date of acquisition for friendly negotiation, at the date of the Royal Decree for compulsory acquisition and the date of enforcement for expropriation. Severance damage is loss of land part, calculated by difference of value before and after acquisition. The result is to be the difference calculated. Disturbance is any losses occurring when the owner has to move from the residential or commercial area such as transportation cost, location goodwill, law service or valuation service, cost of cure, advertising cost. Disturbance loss is calculated by comparing with the criteria of other departments.

3.5 Timing for Payment of Compensation

In case negotiation was settled, the offer should pay compensation within 120 days from the date of signing the contract, in accordance with the Land Expropriation Act.

3.6 Comparison of Laws of Thailand with JICA Guidelines

In general, the Thai legislation is compatible with major provisions of the JICA Resettlement Policy, but some differences are to be noted. The most significant of these differences is that under Thai legislation or regulation, emphasis is put on the definition of formal property rights and on how the acquisition of properties for public purposes is to be implemented and compensated, while in case of the JICA policy emphasis is put both on the compensation of rightfully owned affected properties and on the general rehabilitation of the livelihood of the PAPs and affected households. The differences between the legislation of Thailand and JICA Guidelines are outlined in Table 3.1.

Table 3.1 Comparison of Laws of Thailand with JICA Guidelines

No.	JICA Guidelines	Laws of Thailand	Gaps between two systems	Policy of resettlement in the project
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives (JICA GL).	Right of way for land expropriation should be minimized when only needed for construction project (Expropriation of Immovable Property Act (EIPA) Section 6 (3)).	None	To minimize right of way, affected persons and land taken

No.	JICA Guidelines	Laws of Thailand	Gaps between two systems	Policy of resettlement in the project
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken (JICA GL).	EIPA Section 21 Para.5 rules compensation for displacement or consequential losses, exempting transfer fee and stamp duty (EIPA Section 11 Para.2) and income tax under Revenue Code (Ministerial Regulation No.126, Item 2 (29) (1966)).	RID has no criteria to compensate consequential losses. Affected person have to pay Income Tax	To pay only compensation for displacement or consequential losses in accordance with EIPA Section 21 Para.5. No compensation to recover Income Tax.
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels (JICA GL).	Ministry of Transportation and Communications (MOTC) pays for sentimental loss at 30,000-100,000 Baht/family to restore their standard of living. RID pays transportation cost for illegal occupiers in public land 2/3-4/5 of the lowest land value for transfer fee.	None	Illegal occupiers within right of way in Kra Mang Floodgate will be moved out and sufficient compensation for restoring their standard of living will be considered or find new leased land in vicinity.
4.	Compensation must be based on the full replacement cost as much as possible (JICA GL).	Compensation must be considered from (1) market price (2) assessed land value for transfer fee (3) medium price for local development tax (4) condition and location of land taken and (5) reasons and objective of expropriation (EIPA Section 21 Para.1).	None	Market value is assessed at acquisition date by expert valuers. Market value is expected higher than assessed value for transfer fee to reflex full compensation.
5.	Compensation and other kinds of assistance must be provided prior to displacement (JICA GL).	Compensation should be paid within 120 days after two parties signed contract (EIPA Section 11). By negotiation, much should be paid before starting construction (Manual of Construction and Land Acquisition for Irrigation, 2011).	None	Compensation should be paid within 30-35 days after Budget Programming Division of RID transfers budget to Finance Division of Ayutthaya Province.
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public (JICA GL).	Resettlement action plan is a normal work plan done by the project manager in case that resettlement of inhabitant occurs.	None	Resettlement action plan is prepared for this project even though it is a small-scale project.
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their	Office of Public Consultation of RID has responsibilities to hold consultations with the affected people and their communities based on	None	Three committees including: (1) Complaint handling mechanism by Land Acquisition and

No.	JICA Guidelines	Laws of Thailand	Gaps between two systems	Policy of resettlement in the project
	communities based on sufficient information made available to them in advance (JICA GL).	information Item7 of Office of Prime Minister Regulation for Public Consultation 2005 (OPMR-PC).		Compensation Assessment Committee, (2) Monitoring the complaint solving by Center of Transparency for Land Acquisition Working Group of RID, and (3) Coordination among relating departments by Coordination and Monitoring Committee chaired by Vice Governor of Ayutthaya Province.
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people (JICA GL).	OPMR-PC Item8 concentrates on people's understanding of the project, collection of the people's opinion, injurious affection and any losses to affected persons.	None	Private Consultant helps to prepare information for public consultation, property survey and criteria to assess compensation and communicate to affected persons.
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans (JICA GL).	Participation of affected persons by delegate of District Chief Officer, Assistant District chief Officer and village head can be member of Land Acquisition and Compensation Committee, Property survey Sub-committee and compensation Payment Sub-committee.	Appointed village head or chief of communities can substitute affected persons.	The Governor appointed Board of Directors for progressive monitoring and problems solving chaired by Vice Governor under Provincial Decree No.1833, July11, 2012.
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities (JICA GL).	EIPA Section 25 establishes grievance mechanism for affected persons who don't satisfy compensation and can appeal to Minister. For friendly negotiation, land acquisition and compensation assessment committee works as an affected person's counselor.	None	Organizations for grievance mechanism for affected persons are: (1) Land Acquisition and Compensation Assessment Committee and (2) Property Survey Sub-committee.
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey),	Royal Decree enforces RID's delegate to identify affected persons, land and building and to record for assessing compensation (EIPA Section 9 Para 1). Land acquisition process by negotiation, affected persons and land taken for irrigation project finally prepare by surveyor from Department of	None	Property survey and compensation list conducted by private consultant, first approved by Property Survey Sub-committee, second approved by Land Acquisition and Compensation Assessment Committee.

No.	JICA Guidelines	Laws of Thailand	Gaps between two systems	Policy of resettlement in the project
	preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits (WB OP4.12 Para.6).	Lands (survey 43K).		
12.	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying (WB OP4.12 Para.15).	Eligibility of benefits includes 1.Legal Land's owner 2.Legal permanent building or improvement's owner 3.Lessee of land or land and building 4.Trees and Crop's owner 5.Legal moveable building or improvement's owner 6.Persons who loss easement right for access to public road (EIPA Section18).	None	Property field survey sheets by private consultant are to be double-checked by Survey 43K from Department of Lands in accordance with the correspond law.
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based (WB OP4.12 Para.11).	Compensation lists are prepared by land-based as types of property and benefits of affected person as well as preference.	None	Compensation list is to be prepared by Property Survey Sub-committee.
14.	Provide support for the transition period (between displacement and livelihood restoration) (WB OP4.12 Para.6).	Compensation is prepared for consequential losses such as rental cost for transition period (EIPA Section 21 Para.5).	None	Only houses outside right of way are eligible for the compensation.
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc (WB OP4.12 Para.8).	RID defines vulnerable group only as illegal occupier of public land because of their landless.	Below poverty line group, elderly, women, children or ethnic minorities are out of scope for particular attention by RID regulation.	The project will take care of one illegal occupier group within right of way in Kra Mang area.
16.	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared (WB OP4.12 Para.25).	OPMR-PC Item7 requires that resettlement plan is one of information to present to affected persons and community.	OPMR does not define the border number of affected people for abbreviated resettlement plan.	Abbreviated resettlement action plan is to be created for the project.

3.7 Policy for Land Expropriation and Resettlement in the Project

In order to fill in gaps between two systems, the RAP defines the policy for land expropriation and resettlement in the Project as follows:

1 .The Government of Thailand will use the Project Resettlement Policy (the Project Policy) for the Flood Prevention Project of East Side of the Pasak River in Ayutthaya in the Kingdom of Thailand specifically because existing national laws and regulations have not been designed to address involuntary resettlement according to international practice, including JICA's policy. The Project Policy is aimed at filling-in any gaps in what local laws and regulations cannot provide in order to help ensure that PAPs are able to rehabilitate themselves to at least their pre-project condition. This section discusses the principles of the Project Policy and the entitlements of the PAPs based on the type and degree of their losses. Where there are gaps between the Thailand legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Government practices and JICA's Policy.

2. Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

3. Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.

4. Compensation and rehabilitation support will be provided to any PAPs, that is, any person or household or business which on account of project implementation would have his, her or their:
Standard of living adversely affected;
Right, title or interest in any house, interest in, or right to use, any land (including premises, agricultural and grazing land, commercial properties, tenancy, or right in annual or perennial crops and trees or any other fixed or moveable assets, acquired or possessed, temporarily or permanently;
Income earning opportunities, business, occupation, work or place of residence or habitat adversely affected temporarily or permanently; or
Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.

5. All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost or adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAPs residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets(IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.

6. PAPs that lose only part of their physical assets will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land and structures will be agreed during the resettlement planning process.

7. People temporarily affected are to be considered PAPs and resettlement plans address the issue of temporary acquisition.

8. Where a host community is affected by the development of a resettlement site in that community, the host community shall be involved in any resettlement planning and decision-making. All attempts shall be made to minimize the adverse impacts of resettlement upon host communities.

9. The resettlement plans will be designed in accordance with Thailand's Land Expropriation Act (1987) and JICA's Policy on Involuntary Resettlement.

10. The Resettlement Plan will be translated into local languages and disclosed for the reference of PAPs as well as other interested groups.

11. Payment for land and/or non-land assets will be based on the principle of replacement cost.

12. Compensation for PAPs dependent on agricultural activities will be land-based wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal land titles. If replacement land is not available, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensation will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the project.

13. Replacement lands, if the preferred option of PAPs, should be within the immediate vicinity of the affected lands wherever possible and be of comparable productive capacity and potential1. As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.
14. Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihood and standards of living of PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.
15. The resettlement plan must consider the needs of those most vulnerable to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, women, children, elderly and disabled) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.
16. PAPs will be involved in the process of developing and implementing resettlement plans.
17. PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.
18. Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition (including compensation and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the Government of Thailand.
19. Displacement does not occur before provision of compensation and of other assistance required for relocation. Sufficient civic infrastructure must be provided in resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be ongoing activities.)
20. Organization and administrative arrangements for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.
21. Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the resettlement management system. An external monitoring group will be hired by the project and will evaluate the resettlement process and final outcome. Such groups may include qualified NGOs, research institutions or universities. Monitoring reports shall be forwarded directly to the JICA.

Cut-off-date of Eligibility

The cut-off-date of eligibility refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAPs and be eligible to Project entitlements. In the Project, cut-off dates for titleholders will be the date of notification under the Land Expropriation Act and for non-titled holders will be the date of the officially first public consultation for the PAPs; July 05, 2012. This date has been disclosed to each affected village by the relevant local governments and the villages have disclosed to their populations. The establishment of the eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of Project entitlements

Principle of Replacement Cost

All compensation for land and non-land assets owned by households/shop owners who meet the cut-off-date will be based on the principle of replacement cost. Replacement cost is the amount calculated before displacement which is needed to replace an affected asset without depreciation and without deduction for taxes and/or costs of transaction as follows:

[1] Agricultural land for land of equal productive capacity means that the land provided as compensation should be able to produce the same or better yield the AP was producing on his/her land prior to the project. The production should be in the planting season immediately following the land acquisition. It can be for a future period if transitional allowance equal to the household's previous yield is provided to the AP household while waiting for the land to get back to the same productivity as the previous land.

a. Productive Land (agricultural, aquaculture, garden and forest) based on actual current market prices that reflect recent land sales in the area, and in the absence of such recent sales, based on recent sales in comparable locations with comparable attributes, fees and taxes or in the absence of such sales, based on productive value.
*Productive value is one of valuation methods in accordance with the standard property assessment in Thailand.
b. Residential land based on actual current market prices that reflect recent land sales, and in the absence of such recent land sales, based on prices of recent sales in comparable locations with comparable attributes; fees and taxes. (Expropriation of Immovable Property Act in 1987)
c. Houses and other related structures based on actual current market prices of affected materials.
*Cost approach is in accordance with the standard property assessment in Thailand.
d. Annual crops equivalent to current market value of crops at the time of compensation.
*Net operating income in accordance with the standard property assessment in Thailand.
e. For trees (including perennial crops), cash compensation at replacement cost that should be in line with local government regulations, if available, is equivalent to current market value given the type and age at the time of compensation.
*RID categorizes 218 types of trees in accordance with the standard property assessment in Thailand.

4.0 CENSUS SURVEY AND VALUATION OF PROPERTIES

Based on the Project information and results of community profile analysis with support of local people and authority, full census should be undertaken. The first survey began on July 23, 2012 and finished on July 31, 2012. Note that the compensation eligible cut-off date for the Project was set on July 5, 2012, when the first public consultation meeting was held and contents of the Project were announced.

The census should be conducted to survey the following items for determining the eligible land, persons/households and shops, and for valuating their properties to compensate and follow up. An emphasis is to take special care for the vulnerable group (e.g. households below poverty line, headed by woman, family member with a disability etc.) not to be treated unequally compared with other groups.

1) Population Census

Results of population census are listed in a table. To avoid an intrusion of new inhabitants into the Project area after the cut-off date, information on land use restriction for the Project is to be announced broadly to the public by the local land authority with support of community leaders. See Annex 1 for sample table.

2) Survey on Land and Properties

To list all properties and the amounts eligible for resettlement:

Land, houses, shops, public facilities, trees etc. See Annex 2 for sample table.

3) Survey on Household and Livelihood

To list basic information on standard characteristics and livelihoods of the eligible households:

e.g. Production system, occupation, family member, income by formal/informal economic activity, living standard, social/cultural background etc.

4) Vulnerable Group

To list Information on vulnerable people who need special supports including:

e.g. Poverty group, people without land, the aged, disability persons, women, children, ethnic group, non-protected people based on national laws etc.

4.1 Results of Survey

Results of survey regarding items above described are to be summarized with comments and tables. Valuation of compensation is based on the results and used for negotiation with the PAPs to acquire land and resettle PAPs. Table 4.1 indicates the summary of the survey for the possible affected households regarding population, buildings and family finances. Details will be proposed after determining compensation values to individual PAPs.

Table 4.1 Results of Survey in the Project-affected Areas

Population – Han Tra

Type of Loss	Affected Unit			Affected Head		
	Legal	Illegal	Sum	Legal	Illegal	Sum
With Resettlement	**3**	**0**	**3**	**8**	**0**	**8**
1 HH (in government land)	0	0	0	0	0	0
2 HH (in private land)	3	0	3	8	0	8
3 HH (tenants)	0	0	0	0	0	0
4 CBEs (in government land)	0	0	0	0	0	0
5 CBEs (in private land)	0	0	0	0	0	0
6 CBEs (tenants)	0	0	0	0	0	0
Without Resettlement	**4**	**2**	**6**	**10**	**10**	**20**
7 Land owners	4	0	4	10	0	10
8 Wage earners	0	2	2	0	10	10
Grand Total (1-8)	**7**	**2**	**9**	**18**	**10**	**28**

HH: House Hold, CBEs: Commercial and Business Enterprises

Population – Kra Mang

Type of Loss	Affected Unit			Affected Head		
	Legal	Illegal	Sum	Legal	Illegal	Sum
With Resettlement	**2**	**6**	**8**	**10**	**25**	**35**
1 HH (in government land)	1	6	7	8	25	33
2 HH (in private land)	1	0	1	2	0	2
3 HH (tenants)	0	0	0	0	0	0
4 CBEs (in government land)	0	0	0	0	0	0
5 CBEs (in private land)	0	0	0	0	0	0
6 CBEs (tenants)	0	0	0	0	0	0
Without Resettlement	**0**	**0**	**0**	**0**	**0**	**0**
7 Land owners	0	0	0	0	0	0
8 Wage earners	0	0	0	0	0	0
Grand Total (1-8)	**2**	**6**	**8**	**10**	**25**	**35**

Buildings

No.	Area	Type of Building	Sub-total	Total
Residential				
1	Han Tra	Single storey, wood	6 (3)	**9 (3)**
2		Double storey, wood	1	
3		Wood & brick	2	
4	Kra Mang	Single storey, wood	3 (3)	**8 (8)**
5		Double storey, wood	2 (2)	
6		Tin shed	3 (3)	

Figures in parenthesis indicate the number of HH to be resettled.

Family Finances

Income			Savings/Debt %	
Working condition	No. of HH	Average income baht/month/HH (min. – max.)	with savings	with debt
Han Tra				
Full time	6	10,900 (500 – 30,000)	44% (4/9)	22% (2/9)
Part time	2			
Unemployed	1			
Kra Mang				
Full time	5	35,000 (7,000 – 100,000)	38% (3/8)	63% (5/8)
Part time	2			
Unemployed	0			
Others	1			

5.0 COMPENSATION AND ASSISTANCE

PAPs entitled for compensation or at least rehabilitation provisions, and lives back supports under the Project are determined after the surveys on properties. Entitled PAPs are to be categorized in a few groups reflecting the result of survey as well as the Thai legislation system.

5.1 Compensation for Loss

Losses and their compensations are summarized by the result of survey. Possible losses are estimated as (1) Land for resident and agriculture, (2) Houses and other related structures, (3) Crops, (4) Trees (including perennial crops) and (5) Income. Compensations should be calculated based on the results of survey in accordance with the laws and regulations, and conditions in the Project areas.

Compensation eligibility was limited by a cut-off date, July 5, 2012 for the Project. Persons who have settled in the Project areas after being publicized cut-off date are not to be considered project-affected, and persons initiating improvements to land or structures after a cut-off date publication are not to be eligible for additional compensation. However, sufficient advance notice prior to project implementation is to be surely provided to those persons.

5.2 Lives Back Plan

Lives back for PAPs generally includes improvement or restitution of revenue opportunity and/or livelihood in accordance with Guidelines of WB or JICA. Relating laws and regulations in Thailand provide compensation for costs of land and building acquisition, and transferring cost for resettled people. The Project would affect 3 households in Han Tra and 8 in Kra Mang to move both fully and partially. However, as the removal could be within the same communities, any impacts on their business including work trip are not expected. For the reason, lives back after relocation is not to be conducted in the Project. However, if the Project apparently is proved to contribute to a worsening livelihood of relocated people, assistance would be considered depending on the situation.

5.3 Entitlement Matrix

Works under the Project will be implemented in accordance with a compensation eligibility and entitlement framework in line with both laws and regulations in Thailand and the JICA Guidelines. A summary of entitlement matrix is shown in Table 5.1 (attached at the end of the report).

5.4 Land Acquisition and Compensation Assessment Committee

Assessment for land acquired and following compensation is a task of the Land Acquisition and Compensation Assessment Committee. Plans of calculated compensation by land valuers are investigated in Working Group for Transparency Land Acquisition Center (WTLC) of RID

first. After the surveillance, the Assessment Committee makes final assessment to determine values of compensation with works by two (2) sub-committees as (1) Property survey sub-committee and (2) Compensation payment sub-committee.

The Assessment Committee consists of four (4) members directed by Mr. Padej NEAPNEAN, Chief Officer of Ayutthaya District and others including chief of land registration section, officer of local administration council and chief of land procurement of Regional Office 10, RID.

6.0 COMPLAINT HANDLING MECHANISM

A complaint handling mechanism is established to allow PAPs appealing any disagreeable decision, practice or activity arising from land or other properties compensation. PAPs will be fully informed of their rights and of the procedures for addressing complaints whether verbally or in writing during consultation, survey and period of compensation. Cares will always be taken to prevent complaints rather than going through a handling process. They can be conducted through careful land expropriation and resettlement design and implementation, by ensuring full participation and consultation with the PAPs, and by establishing extensive communications and coordination among all relating entities like affected communities, the project operator and local governments in general.

In the Project, the provincial complaint handling mechanism "Damrongtham Center of Phra Nakhon Si Ayutthaya Province" is to be used because of advantages as: (1) the Center is well-known in Ayutthaya, (2) its guidelines and methodology are clear in terms of responsibility, complaint handling process, procedure, work standard, evaluation and monitoring, and mitigation emergency plans and (3) its personnel, equipment and budget are ready.

6.1 Operation of the Center

The Center's roles comprise (1) receiving a complaint, (2) examining and analyzing the complaint and submitting it for further action in case "it has ground", (3) submitting it to the agency concerned for verifying, (4) evaluating the complaint handling, (5) preparing emergency plans to prevent impacts from complaint handling and (6) reporting the examination result and completing the case.

Complaints under the scope of the Center can be divided into nine (9) categories as (1) request for assistance, (2) suffering, (3) request for justice, (4) providing clues and influential people, (5) public utilities/services, (6) natural resources/environment, (7) corruption/misconduct/malfeasance, (8) land problem and (9) others.

6.2 Process of Complaint Handling

There are eight (8) steps for handling complaints.

(1) Receiving complaints at the specific channel.
(2) Receiving, registering and analyzing complaints within one (1) day
(3) Submitting the screened and analyzed complaints to the governor for consideration within three (3) days.
(4) Solving problems by agencies concerned such as state agencies, state enterprise, districts, local administrative organizations, etc within 15 days.
(5) The Governor considers the result of complaint handling by agencies concerned (according to item (4)) within three (3) days.
(6) The consideration is divided into two cases: settled case and unsettled case. For the latter, the governor will instruct the agency concerned to improve/change/resolve the complaint within one (1) day.
(7) Reporting the solution to the complainer or and via the channel in item (1) within three (3) days.
(8) Analyzing the complaint for seeking sustainable solution.

The whole complaint handling process takes around 26 days.

6.3 Formation of Complaint Handling Structure

The management structure of Phra Nakhon Si Ayutthaya Province that is in the form of committee called "Committee of Damrongtham Center of Phra Nakhon Si Ayutthaya Province" is as in Table 6.1. Vice Governor of Phra Nakhon Si Ayutthaya Province is assigned by the Governor of the Province as the chairperson of the Committee.

Table 6.1 Composition of the Committee

No	Name-Surname	Belong to	Position
1	Dr. Thawee Naritsirikul	Vice Governor of Phra Nakhon Si Ayutthaya	Chairperson
2	Mr. Praphon Aiamsunthorn	Public Works and Town & Country Planning of Phra Nakhon Si Ayutthaya	Committee
3	Mr. Surachai Ajonboon	Director of Office of the Natural Resources and Environment in Phra Nakhon Si Ayutthaya	Committee
4	Ms. Bubpanat Chindet	The treasury of Phra Nakhon Si Ayutthaya	Committee
5	Mr. Sutham Noungam	Land Office of Phra Nakhon Si Ayutthaya	Committee
6	Mr. Sahaphum Phumtaritrat	Director of the 3rd Regional Office of Fine Arts, Phra Nakhon Si Ayutthaya	Committee
7	Mr. Ratchata Pakafung	Director of Marine Department Ayutthaya	Committee
8	Mr. Chaicharn Pondokmai	Chief of Phra Nakhon Si Ayutthaya Railway Station	Committee
9	Mr. Somsong Sappakosolkul	Mayor of Phra Nakhon Si Ayutthaya City Municipality	Committee
10	Mr. Narong Danchaiwiroj	Mayor of Ayothaya Town Municipacity	Committee
11	Mr. Adisak Boonrod	Chief Executive of the Han Tha Sub District Administrative Organization	Committee
12	Mr. Lamduan Kaisamrit	Chief Executive of the Ko Rian Sub District Administrative Organization	Committee
13	Mr. Somboon Imsuwan	Chief Executive of the Ban Ko Sub District Administrative Organization	Committee
14	Mr. Chalieow Sukprasert	Chief Executive of the Tanoo Sub District Administrative Organization	Committee
15	Mr. Maitree Pitinanon	Director of Regional Irrigation Office in Phra Nakhon Si Ayutthaya	Committee and Secretary
16	Mr. Chatchai Gertputpiam	Chief of Engineering Branch of Regional Irrigation Office in Phra Nakhon Si Ayutthaya	Assistant of Secretary

The composition of the contact section "Damrongtham Center of Phra Nakhon Si Ayutthaya Province" regarding complaint handling is shown in Table 6.2.

Table 6.2 Composition of Complaint Handling Section

Section	Location	Contact	
Damrongtham Center	Ayutthaya City Hall, 2nd Floor	Hotline	1567
		Website	www.ayutthaya.go.th/justice.php
		Others	Letters, direct visit

7.0 IMPLEMENTATION SYSTEM

RID has all responsibilities for resettlement and compensation processes including financing. In particular, Regional Office 10 and Regional Irrigation Office in Phra Nakhon Si Ayutthaya of RID mainly work for implementing land expropriation and resettlement of affected persons, as well as following-up them. Key persons for implementation are Mr. Ugrid Thawankluikool,

Manager of Regional Office 10 and Mr. Mitree Pitinanon, Director of Regional Irrigation Office in Phra Nakhon Si Ayutthaya, with support of Mr. Songsak Soawung of Office of Public Participatory of Promotion in RID.

Inside RID, Working Group for Transparency Land Acquisition Center (WTLC) plays a role of:

1) Screening land acquisition for medium and large project before submitting to Director General,
2) Considering and making comments for land acquisition procedure to be transparency and fairy (only compensation more assessed value).

WTLC consists of nine (9) members led by Deputy Director General for Engineering. Table 7.1 indicates organization of WTLC.

Table 7.1 Organization of Working Group for Transparency Land Acquisition Center (WTLC)

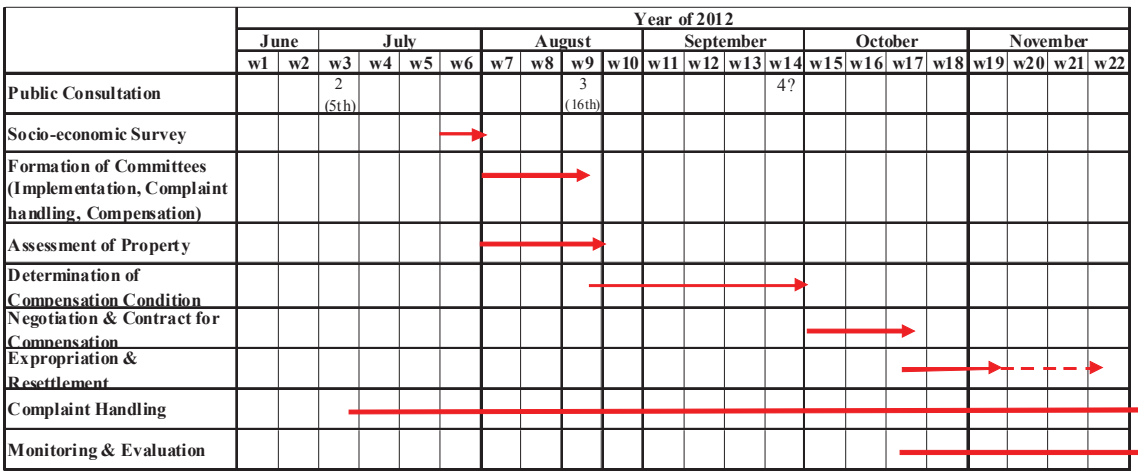
No	Title in RID	Position
1	Deputy Director General for Engineering	Chairperson
2	Director of Large Irrigation Project Bureau	Committee
3	Director of Medium Water Resource Development Bureau	Committee
4	Director of Engineering Topographical and Geotechnical Survey	Committee
5	Expert in compensation assessment	Committee
6	Expert in compensation assessment	Committee
7	Expert in compensation assessment	Committee
8	Director of Laws and Lands Bureau	Committee
9	Lawyer from Laws and Lands Bureau	Committee & Secretary

8.0 IMPLEMENTATION SCHEDULE

In order to ensure an effective and sufficient implementation of the land expropriation/resettlement/compensation program, an effective system of planning and condition should be required.

The implementation schedule for major activities relating to both long-term and temporary structures is provided in Table 8.1.

Table 8.1 Schedule for Implementation of the Major Activities



9.0 COST AND FINANCING

The overall cost for compensation under this RAP will be estimated after census survey and valuation of properties by the working group regarding land procurement of RID in line with JICA Guideline as well as Thai legislations. The working group consults the Land Acquisition and Compensation Assessment Committee (LAC) led by Mr. Padej Naepnean, Chief Officer of Ayutthaya District about compensation plan. LAC submits the list of compensation to RID after evaluating the plan. Consultation with the PAPs with the compensation listed will be done, and permanent secretary of RID will ask the Ministry of Finance for the budget when being agreed with. The implementation cost of the RAP will be covered by the Royal Irrigation Department (RID). Most budgets will be allocated next fiscal year of Thailand because the year starts on October 1.

Note that the list of compensation has not been created for consultation yet because the working group is elaborating a compensation plan. The plan will be completed within October and negotiations with the PAPs will start later.

10.0 MONITORING AND REPORTING

Implementation of the RAP will be monitored regularly by Regional Irrigation Office in Phra Nakhon Si Ayutthaya to ensure that those activities have processed in accordance with the provisions of the RAP. It involves the monitoring of land expropriation, payment of compensation for lost properties and resettlement of PAPs.

Monitoring activities will be conducted in three stages as 1) before, 2) during and 3) after the Project.

1) Before: This is the first and important activity to determine whether or not the RAP is carried out as planned.
2) During: Interaction with PAPs is the main issue to find out what problems the PAPs have and are encountering.
3) After: This activity has to be undertaken basically two years after the completion of the Project. It includes determining whether the economic conditions of the PAPs prior to the Project implementation would be maintained or improved.

10.1 Monitoring Indicators

Main monitoring indicators of RAP implementation is provided in Table 10.1.

Table 10.1 Monitoring Indicators of RAP implementation

Period	Activity	Indicator	Means of Verification
Before (Monthly)	Decision-making about the Project and RAP procedures	Conduction of public consultations on schedule.	Monitoring report
	Land expropriation	Number of land acquired.	
	Resettlement of inhabitants	Number of inhabitants / households resettled.	
	Compensation payment	Number of PAPs compensated.	Monitoring report and signatures of PAPs compensated.
During (Monthly)	Conditions of PAPs	Number of complaints recorded and solved.	Monitoring report Record of complaints and the findings
After (Quarterly)	Conditions of PAPs	Number of complaints recorded and solved.	Monitoring report Record of complaints and the findings

10.2 Promotion of PAPs into Monitoring Activity

In order to carry out the RAP efficiently, the project management unit will work to enhance participations of the PAPs into monitoring activities in partnership with local leaders and authorities, or a specific entity like a NGO if necessary.

11.0 CONSULTATION AND PARTICIPATION

Consultation and participation is a process through which stakeholders give an influence and share control over development initiatives, decisions and resources that may affect them. Also, consultation and participation has been a major principle in the planning and preparation of the detailed design of the Project. Strong emphases are put on the activity to ensure that PAPs participate in the process and ideas from the PAPs reflect into the Project in the Thai laws as well as the JICA Guideline and WB OP 4.12. Two types of consultations will be conducted in the RAP as below:

1) Consultation for Local Leaders

   Promotion of awareness of the Project prior to conducting consultations for possible PAPs can be helpful to make agreements with the Project by the PAPs effectively.

2) Consultation for All Stakeholders

   All stakeholders will be involved in this type of consultation. In the RAP, three steps of consultations are to be planned.

Table 11.1 Schedule of Public Consultations with PAPs

Step	Title	Objective	Expected Results	Schedule
1	Announce-ment	To explain the project description to stakeholders and all relevant people	People concerned will be provided clear information to prevent incorrect information about the project. A public participation process will be created.	On July 5, 2012 At Krungsri River Hotel, Phra Nakhon Si Ayutthaya
2	Methodology Participation	To consult with local people	All issues presented shall be preliminarily accepted by stakeholders.	On August 16, 2012
3	Methodology Confirmation	To report and explain the results and methodology suggested by the stakeholders and relevant people during the 2nd meeting.	Stakeholders and all parties concerned should accept the operation guidelines and support the operation without any resistance.	To be held in late August or later in Ayutthaya.

11.1 Consultation Meetings with the PAPs

The public consultation meetings with the affected households and businesses were conducted twice on July 5 and August 16, 2012, respectively. Summary of the meetings is as follows:

Date & Time: July 5, 2012 8:30 - 12:00
Venue: Fuengfah Meeting Room, Krungsri River Hotel, Phra Nakhon Si Ayutthaya

Program:

Time	Contents
8:30-9:00	Registration and documents distribution / project exhibition
9:00-9:30	Reporting speech by Mr. Ugrid THAWANKHAIKUL , Director of Operation and Maintenance Division of Regional Irrigation Office 10 of RID
	Opening speech by Mr. Nattee BORSUWAN, Permanent Secretary in Phra Nakhon Si Ayutthaya
9:30-10:50	History of the project, objectives, the scope of area, operational period by Mr. Ugrid THAWANKHAIKUL, Director of operation and maintenance division of Regional Irrigation Office 10 of RID
	Description of project according to construction drawings by Mr. Masaki ISHII, Engineer and assistant manager of JICA Survey Team
	Assistance procedures for affected people by Mr. Takayuki HATANO, Environmental officer of JICA Survey Team and Mr. Klayo THONGSOM, Expert assessment of the property and vice-chairman of Thai Appraisal Foundation
10:50-11:00	Coffee break
11:00-12:00	Discussion and exchange ideas by area groups

Participants: 73 people attended the meeting including 55 of potential affected people.

Agencies	Participants
1. Provincial, district government agencies	3
2. Local government organization	2
3. Community leader/affected people	49
4. Private sector	1
5. JICA Committee	7
6. Royal Irrigation Department (RID)	5
7. Local Consultants (Panya Consultants)	6
Total	**73**

Q & A

No.	Question/Comment	Area	Response
1	Construction of regulator should include the component of water pump in case of closing regulators or being logged water.	Han Tra Kra Mang	By Mr. Ugrid THAWANKHAIKUL as: In the project, introduction of permanent water pumps is out of scope. However, reasonable number of movable water pumps will be provided for drainage.
2	During flood, pumping water from flooded area to the river/canal is essential. We want to introduce permanent pumps at the regulator.		
3	The project will construct high bank protection along the canal. How will the logged water be delivered into drainage pipes?	Han Tra	
4	How will people living in the railway area be supported? Most of them don't have legal ownership.	Kra Mang	By Mr. Chakkrish THAMMASIRI, social specialist coordinated by JICA Survey Team as: After the meeting, we will start social survey for compensation. We will valuate how we can assist for affected people.
5	How will people for land expropriation be supported?	Han Tra	

No.	Question/Comment	Area	Response
6	Project operator should have meetings with local governments /agencies to promote the project and find solutions.	Han Tra Kra Mang	By Mr. Ugrid THAWANKHAIKUL as: We have explained the project to the Governor in Province of Phra Nakhon Si Ayutthaya. He agreed and has appointed the board of directors to drive the project.

Date & Time: August 16, 2012 8:30 - 17:00
Venue: Phetphloi Room, Ayothaya Riverside Hotel, Phra Nakhon Si Ayutthaya
Program:

Time	Contents
For land / asset owners	
8:30 - 9:00	Registration and documents distribution
9:00 - 9:30	Opening speech by Mr. Songsak SAOWANG, Director of Irrigation Department Participation Promotion Group of RID
	Opening speech Mr. Nattee BORSUWAN, Permanent Secretary in Phra Nakhon Si Ayutthaya
	Guest speech Dr. Tawee NARISIRIKUL, Vice Governor of Phra Nakhon Si Ayutthaya Province
9:30 – 10:50	Presentation on the land and asset compensation measures Mr. Klayo THONGSOM, Vice chairman of Thai Appraisal Foundation ・Criteria for determining land prices ・Criteria for determining structure prices ・Criteria for determining tree prices ・Land rent during construction (based on international standard)
10:50 – 11:00	Coffee Break
11:00 – 12:00	Discussion and exchange ideas
12:00 – 13:00	Lunch
For land / asset renters	
13:00 – 13:30	Registration and documents distribution
13:30 – 14:50	Presentation on the land and asset compensation measures Mr. Klayo THONGSOM, Vice chairman of Thai Appraisal Foundation ・Criteria for determining compensation for renters ・Criteria for determining structure prices ・Criteria for determining tree prices
14:50 – 15:00	Coffee Break
15:00 – 17:00	Discussion and exchange ideas

Participants: 73 people attended the meeting including 60 of potential affected people.

Agencies	Participants
1. Provincial, district government agencies	8
2. Local government organization	4
3. Community leader/affected people	48
4. JICA Committee	3
5. Royal Irrigation Department (RID)	5
6. Local Consultants (Panya Consultants)	5
Total	**73**

Q & A

No.	Question/Comment	Response
1	Are there any public hearings on the construction of Kra Mang and Han Tra regulators?	The project was prepared in accordance with the regulations and procedures of the Prime Minister's Office. The project briefing and public hearing were arranged on July 5, 2012 to explain to local people that there will be a project in Kra Mang and Han Tra canals.
2	Are there any questionnaires to ask people if they agree or disagree with the project?	Participants can express their ideas concerning the project in the questionnaire. The consultant will summarize and present it to the agency who will make the decision.
3	Has an impact study been conducted in the project sites because it is a world heritage?	An Initial Environmental Examination (IEE) has been conducted for the project. The IEE proves few impacts on the environment by the project
4	The project seems focusing on flood protection in the factories, esp. for Rojana, while local people don't benefit much from it.	We understand the project construction will really help industries on the industrial estate. But we also consider that it will help local people because most families also work in the industries there.
5	In Kra Mang, two old houses of teak woods seem being within the construction area. I wonder if the project may affect these houses.	RID has a policy to implement the project in a way that affects the fewest people. The large one is expected out of affection. Temporary demarcation has been made only with red-wooden posts. The permanent boundary, which will be marked with concrete posts 1m above the ground, has not been demarcated. After demarcation, the land will be measured in order to determine how much land should be intruded in the title deed.
6	In the residential area belonging to the State Railway of Thailand, there are some houses without any rental contract. Some houses have lived there for over 70 years. How will RID help them in case of removal?	Basically, these renters will not be entitled to any compensation from the land owner as they have no contract. The working group in RID is examining the compensation for affected houses taking into consideration individual condition.
7	Residents inside the land of the State Railway worry about their occupation, as most residents work at the market near their land and at the railway station. In addition, most children are studying at schools around here. They concern their livelihoods would be affected if RID provides land far away.	The National Housing Authority will provide housing for only large construction projects. This project is not large, however. If RID agrees to do this, it must consult with the Authority on where to find space for constructing houses. The affected people can submit ideas to the consultant, who will gather the information and submit it to those who make the decisions.

Figure 11.1 Views of Public Consultation, July 5, 2012

Figure 11.2 Views of Public Consultation, August 16, 2012

Table 5.1 Entitlement Matrix

Item No.	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation)	Implementation issues /Guidelines	Responsible Organization	Legal Ground
1	Land Taken (fee simple)	Private land owner	Land taken compensation considering five (5) ways under section 21 of Expropriation of Immovable Act (EIA): (1) Market price on the date of Royal Decree enforcement /date of purchase. (2)The tax base for Local Development Act. (3)The assessed value for Transfer Fee under Land Code. (4)Reason and objective of acquisition. (5)Assess compensation by Sale Comparison Method	1.Fix the project area on Cadastral Map 2.Mark temporary poles on land to be acquired 3.Declare date to start the project 4. Have a meeting with affected persons to acquire land by friendly negotiation 5.Request a surveyor from Land Office to subdivision survey 6.Land Office presents the survey map (sur.34 k) to RID for determining area of land taken 7.Property Survey: Land Building and Trees 8.Meeting Land Acquisition and Compensation Assessment Committee (LAC) 9.Assess compensation of land taken 10.LAC prepares compensation list to RID to approve 11.Request a budget from Permanent Secretary of RID 12.Register land at the Land Office 13.Pay compensation to land owner(s) by Land Acquisition Sub-committee (by transferring to affected person's book bank)	1.Project Operator (RID) 2.Land Ownership Branch 10 (RID) 3.Ayutthaya Governor 4.Public Participation Bureau (RID) 5.Project Director Ayutthaya (PDA) 6.Ayutthaya Land Office 7.Property Survey Sub-Committee (PSSC) 8.PDA 9.LAC 10.LAC 11.LAC 12.PDA, Land Office, Land Owners 13.Payment by Sub-Committee	Manual of RID operation on law enforcement, 2009 RID.246/2012 (Presented by consultant) RID 407/2003
2	Trees/Crops on Public /Private /Common Land	1) Person with legal ownership of the land 2) Socially recognized owner 3) Unauthorized occupants of the trees /plants 4) Local Authority 5) Jurisdiction person of housing project	218 kinds of trees and crops are listed for compensation in accordance with RID standard compensation of tree and crop (Nov 17 2006) e.g. 3,150 THB/rai (rice) 819-1,071 THB/tree (coconut)	1.Prepare aerial photo maps 2. Fix the project area on the map 3.Submit to use the project land from the government agency who manages that land 4. Mark temporary poles on land to be acquired 5. Declare date to start the project 6.Have a meeting with affected persons to acquire land by friendly negotiation 7.Present Project to Land Acquisition and Compensation Assessment Committee (LAC) 8.Criteria to assess compensation of trees by LAC 9.Land Acquisition sub-committee conducts the survey 10. Land Acquisition Committee (LAC) approves compensation 11. Request a budget from Permanent Secretary of RID 12. Pay compensation to land owner by Land Acquisition Sub-committee (by transferring to affected person's book bank)	Same as No.1	Manual of RID operation on law enforcement, 2009 RID.246/2012 (Presented by consultant) RID tree & crop price list RID 407/2003
3	Building or Rehabilitation (fee simple)	Legal owner(s) of structure	Reconstruction of building or rehabilitation for parts of a structure like transmission pylon, fence, walkway etc.	1.Assessment building compensation by replacing cost approach with Unit- in Place Method 2.Principle of reinstatement	Same as No.1	RID standard building cost 2010
4	Land and Building under Leasehold	1) Lessor 2) Lessee	Lessor: Market value of the property - lessee interest Lessee: NPV of profit rent for the residual years of contract *Profit rent = Market rent – Contract rent	1.Survey contract rent of land or property 2.Survey market rent of comparable property 3.Calculation of profit rent 4.Calculation of profit rent (lessee interest) 5.Calculation of lessor interest	PSSC	EIA Section 18 (3)
5	Consequential Loss	Affected households/persons when moving out	Disturbance cost: compensation equivalent to removal, legal/other associated expenses for relocation, transportation etc. Opportunity cost: 30-100 thousand THB for sentimental loss depending on acquired cost of building.	Assessment from opportunity cost method	PSSC	EIA Section 21 (5)
6	Move-out Cost (Same as No.1 but Land Owned by Public)	Unauthorized occupants /persons	Cost is assessed from 2/3 or 3/5 of lowest land price for transfer fee	1. Survey occupation area 2. Assess move-out cost base on lowest land price (Bath/sq.w.)	Property Survey Sub-committee	Cabinet's resolution 11-7-2532

Note: 1 rai = 1,600 m^2, 1 sq.w = 4 m^2

APPENDIX

MONITORING FORM

Monitoring Form (Land Expropriation and Resettlement)

Preparation of Resettlement Site (where necessary)

No.	Expropriation of the site (e.g. Area no. of resettlement HH, etc.)	Status (Completed (date)/not done)	Details (e.g. Site selection, identification of candidate site, discussion with PAPs, Development of the site, etc.)	Expected date of completion
1				
2				

Public Consultation

No.	Date	Place	Contents of the consultation/main comments and answers
1			
2			
3			

Resettlement activities	Planned total	Unit	Progress in quantity			Progress in %		Expected date of completion	Responsible organization
			During the quarter	Till the last quarter	Up to the quarter	Till the last quarter	Up to the quarter		
Preparation of RAP									
Employment of consultants		MM							
Implementation of census survey (incl. socio-economic survey)									
Approval of RAP									
Finalization of PAPs list		No. of PAPs							
Progress of compensation payment									
Lot 1									
Lot 2		No. of HHs							
Lot 3									
Lot 4									
Progress of land expropriation									
Lot 1									
Lot 2		m^2/ha/							
Lot 3									
Lot 4									
Progress of asset replacement									
Lot 1									
Lot 2		No. of HHs							
Lot 3									
Lot 4									
Progress of relocation of people									
Lot 1									
Lot 2		No. of HHs							
Lot 3									
Lot 4									

Monitoring Form (Construction Phase)

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Responses/Actions to Comments and Guidance from Government Authorities	
Explanation regarding the Project asking from residents etc.	

2. Mitigation Measures

- Air Quality（Emission Gas / Ambient Air Quality）

Item	Unit	Measured Value（Mean）	Measured Value（Max.）	Country's Standards	Referred International Standards (Japan)	Remarks (Measurement Point, Frequency, Method)
SO_2	ppm			0.12 ppm	0.04 ppm	1 site including sensitive receptors near the project site or others Frequency: See *1 Method: Authorized methods in Thailand, WHO or JIS
NO_2	ppm			0.17 ppm	0.06 ppm	
CO	ppm			30 ppm	10 ppm	
TSP	mg/m^3			0.33 mg/m^3	-	

*1: Quarterly, or adjusted based on air pollutant-generating activities. Semi-annually in 2 years (in-use).

- Water Quality（Effluent/Wastewater/Ambient Water Quality）

Item	Unit	Measured Value（Mean）	Measured Value（Max.）	Country's Standards*1	Referred International Standards (Japan)	Remarks (Measurement Point, Frequency, Method)
pH	-			5-9	6.5-8.5	Each up & downstream of the center of construction (2 points in total) Frequency: See*2 Method: Authorized methods in Thailand, WHO or JIS (For surface water observation, describe observation record)
SS (Suspended Solid)	mg/l			-	<50 mg/l	
BOD	mg/l			<4 mg/l	<5 mg/l	
DO	mg/l			>2 mg/l	>5 mg/l	
TCB	MPN /100ml			<20,000 MPN/100ml	<5,000 MPN/100ml	
Oil	mg/l			-	No detected	
Surface water	-			-	-	

*1: Criteria in Class 4 are applied. In case of no criterion in country's standards, the referred standard is applied (TCB applies criterion in Class 3).

*2: Quartery, or in case that a problem occurs (at-work), Semiannually in 2 years (in-use)

- Waste

Monitoring Item	Monitoring Results during Report Period
Content of complains from residents and its handling	

- Noise / Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards (Japan)	Remarks (Measurement Point, Frequency, Method)
Noise level	dB(A)			70dB(A) (115dB(A))	45-65dB(A) (85dB(A))	1 sites including sensitive receptors near the project site or others Frequency: See *1 Method: Authorized methods in Thailand, WHO or JIS (Vibration applies Japanese Criterion)
Vibration level	dB			-	75dB	

*1: Quarterly, or adjusted based on noise-generating activities (at-work). Once during test operation (in-use).

- Odor

Monitoring Item	Monitoring Results during Report Period
Content of complains from residents and its handling	

3. Social Environment

- Living / Livelihood

Monitoring Item	Monitoring Results during Report Period
Content of complains from residents and its handling	

- Resettlement

Monitoring Item	Monitoring Results during Report Period
Confirmation of monitoring items on resettlement and measures in case of problems (Process of resettlement, Arrangement of relocated place, Condition of household/property)	
Condition of livelihood and handling of complains	

Monitoring Form (Operation Phase)

1. Response/Action to Comments and Guidance from Persons Resettled and Authorities

Monitoring Item	Monitoring Results during Report Period	Frequency
No. and contents of formal comments made by persons resettled		Upon receipt of comments/ complaints
No. and contents of responses from authorities		

2. Natural Environment

- Water Quality

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken	Frequency
pH, DO, SS, BOD, Oil, E.coli(TCB), Observation of surface water			Semiannually (2 years after the service)

Reference standards: 5-9(pH), >2mg/l(DO), <4mg/l(BOD), <20,000MPN/100ml(TCB) employing Thai standards.

- Noise & Vibration

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken	Frequency
Leq, Lmax Vibration level			Once (During test operation)