Appendix-4 Minutes of Discussions

4-1 Minutes of Discussions (First Field Survey)

MINUTES OF DISCUSSIONS

ON THE PREPARATORY SURVEY

ON PROJECT ON REPLACEMENT AND EXPANSION

OF WATER DISTRIBUTION SYSTEM

FOR PURSAT, KAMPONG THOM, SVAY RIENG, SIHANOUKVILLE AND BATTAMBANG

IN THE KINGDOM OF CAMBODIA

In response to the request from the Government of the Kingdom of Cambodia (hereinafter referred to as "Cambodia", the Government of Japan decided to conduct a Preparatory Survey on Project on Replacement and Expansion of Water Distribution System for Pursat, Kampong Thom, Svay Rieng, Sihanoukville and Battambang (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA") .

JICA sent to Cambodia the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Fumihiko Okiura, Director, Water Resources Management Division 1, Water Resources and Disaster Management Group, Global Environment Department, JICA, and is scheduled to stay in the country from July 25 to 31, 2010.

The Team held discussions with the officials concerned of the Government of Cambodia and conducted a field survey at the study areas.

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Phnom Penh, July 29, 2010

Fumihiko Okiura
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Heng Sokkung
Under-Secretary of State
Ministry of Industry, Mines and Energy
The Kingdom of Cambodia

ATTACHMENT

1. Objective of the Project (Request)

The objective of the Project is to improve the water supply services in the cities of Pursat, Kampong Thom, Svay Rieng, Sihanoukville and Battambang through the replacement and expansion of water distribution system.

2. Project site (Request)

The sites of the Project are the cities of Pursat, Kampong Thom, Svay Rieng, Sihanoukville and Battambang as shown in **Annex-1**.

3. Responsible and Implementing Agency

3-1.The Responsible Agency is Ministry of Industry, Mines and Energy (hereinafter referred to as "MIME").

3-2.The Implementing Agencies are Department of Potable Water Supply (DPWS) of MIME, Provincial Departments of Industry, Mines and Energy (hereinafter referred to as "DIME"), and the Waterworks in respective Provinces of Pursat, Kampong Thom, Svay Rieng, Sihanoukville and Battambang.

4. Items originally requested by the Government of Cambodia

The items originally requested by the Cambodian side are described in **Annex-2**.

The both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis, and the final components of the Project would be decided by the Japanese side.

5. Japan's Grant Aid Scheme

5-1 The Cambodian side understands the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-3**.

5-2 The Cambodian side will take the necessary measures, as described in **Annex-4**, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Survey

6-1 The consultant members of the Team will proceed to further studies in Cambodia until September, 2010.

6-2 JICA will prepare the draft basic design report in English and dispatch a mission in order to explain its contents to the Cambodian side around February 2011.

6-3 In case that the contents of the report are accepted in principle by the Cambodian side, JICA will finalize the report and send it to the Cambodian side around April 2011.

6-4 The Cambodian side understands that execution of the Preparatory Survey (hereinafter referred to as "the Survey") does not necessarily imply the Japanese Government's commitment of the

project implementation.

7. Other relevant issues

The following issues were discussed and confirmed by both sides.

7-1. Priority Project on Pipe Network among 5 Cities

1) Both sides agreed that the priority project on pipe networks among 5 cities would be selected in August 2010 based on the Survey results and following consideration. Both sides also found that there are two ways to select the priority project, namely by the cities and by the type of pipes.
2) The criteria to select the priority project may include the following;
   a. Criteria to screen the priority project
      - Overlapping with other donors
      - Operation and maintenance of water treatment plants inclusive of financial status
      - Residents' willingness to connect/pay for water service
   b. Criteria to select more effective project
      - Population served/ service coverage
      - Rate of loading of water treatment plant
      - Project scale (preliminary estimation of project cost)
      - Socio-economic impact of the project (commerce and/or industry)
      - Priority of Cambodian side

7-2. Phasing of Field Survey

The Team explained that the field survey in Cambodia will be divided into following two phases in order to select the priority project on pipe network.

1) Field Survey I (from end of July to middle of August, 2010)
   - Confirmation of the necessity and appropriateness of the project requested by the Cambodian side
   - Collection and analysis of the necessary information and data
   - Examination of the requested project on pipe network in 5 cities and appropriate scale of the priority project as a grant aid project
2) Homework in Japan (at middle of August, 2010)
   - Selection of the priority project on pipe networks among 5 cities by Government of Japan
3) Field Survey II (from end of August to end of September, 2010
   - Explanation of the priority project to Cambodian side
   - Implementation of the survey necessary for the design of priority project

7-3. Planning of Pipe Network

1) The Team explained that the target year should be set at a few years after the expected timing of completion the Project, because the Japanese Grant Aid is deemed to be provided to meet urgent

and short-term needs of the recipient country.

2) Both sides confirmed that the planning framework, such as water demand projection and unit consumption rate, and design of pipe network would be investigated with making use of the Water Master Plan for respective cities formulated by "The Project on Capacity Building for Water Supply System (Phase 2)" under the cooperation of JICA.
3) As for individual house connections, both side agreed that necessity of provision of the materials such as water meters and pipes will be considered in the Survey in order to assist the expansion of water supply to poor communities. Both sides also confirmed that Cambodian side will bear the cost for installation works.

7-4. Social and Environmental Considerations

1) Cambodian side explained that the Initial Environmental Impact Assessment (IEIA) and/or the Environmental Impact Assessment (EIA) are not needed for the project under the laws and regulations of Cambodia.
2) The Team explained that the environmental and social considerations studies would be conducted according to JICA's Guidelines for Environmental and Social Considerations in order to examine the mitigation measures of impacts and monitoring plan during/after the implementation.

7-5. Tax exemption

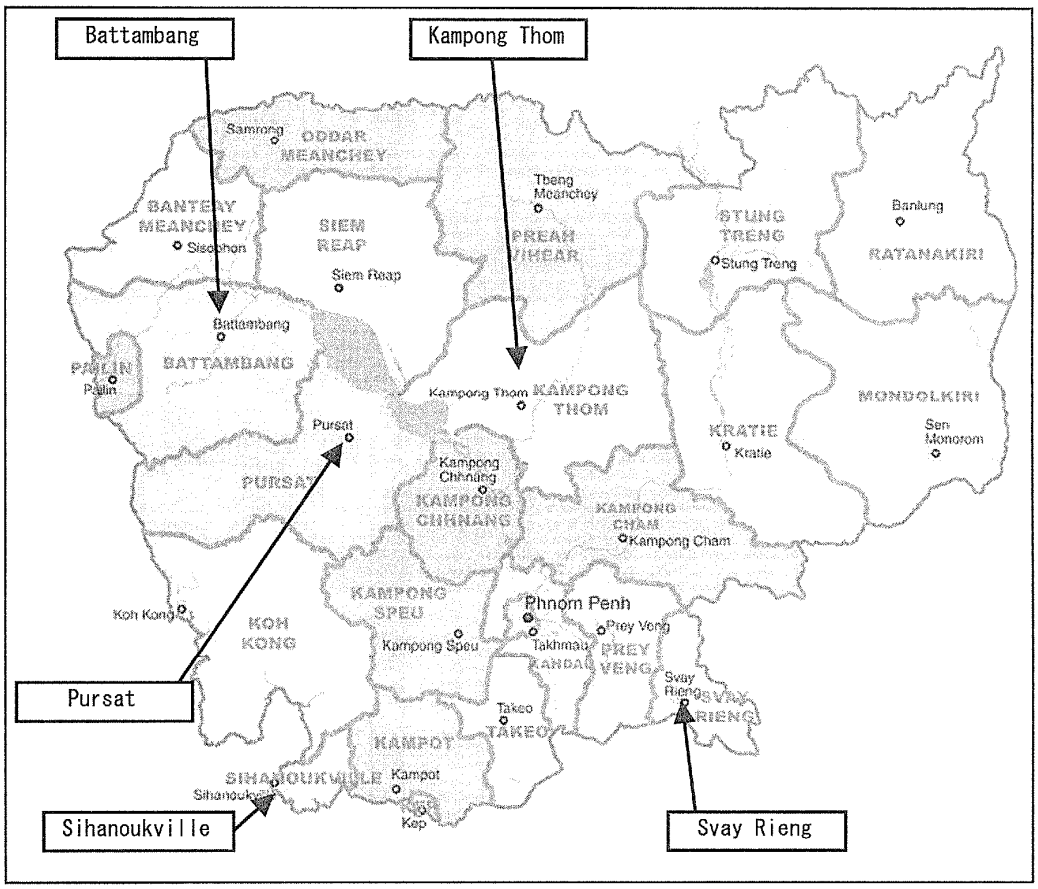
The taxes including Value Added Tax (VAT), custom duty, and any other taxes and levies in Cambodia which is to be arisen from the Project activities will be exempted by Cambodian side. MIME will take any procedures necessary for the tax exemption with the Ministry of Economy and Finance of Cambodia at its responsibility.

7-6. Overlapping with other projects

Both side confirmed that the on-going / proposed projects in 5 cities supported by other donor agencies, NGO, and Cambodian official organization(s) should be carefully investigated to avoid overlapping with the Project. Cambodian side agreed to provide necessary information on related projects.

Annex-1 Project Sites Map
Annex-2 Items Requested by the Cambodian Side
Annex-3 Japan's Grant Aid Scheme
Annex-4 Major Undertakings to be taken by Each Government

Annex-1: Project Sites Map



Annex-2: Items Requested by the Cambodian Side

1. Distribution Facilities

(1) Pipe network in Battambang	L=38km
(2) Pipe network in Pursat	L=22km
(3) Pipe network in Kampong Thom	L=50km
(4) Pipe network in Svay Rieng	L=30km
(5) Pipe network in Sihanoukville	L=28km

2. Equipments

(1) Excavator	5 nos
(2) Rear Dump Truck	5 nos
(3) Tamping Rammer	5 nos
(4) Cargo Truck with Cab Back Crane	5 nos

3. Distribution Management System 5 nos

Annex-3: JAPAN'S GRANT AID SCHEME

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

Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles 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 (Attachment 1)

Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal & Approval
  -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation by Exchange of Notes (hereinafter referred to as "the E/N")
  -The Notes exchanged between the GOJ and a Government of 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 the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned 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 on by both parties concerning the basic concept of the Project.
- Preparation of a basic 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 Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure 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 in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

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

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

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 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

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(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". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

The Government of 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 secure 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 Attachment 1.

(6) Proper Use

The Government of recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as 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 in 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.

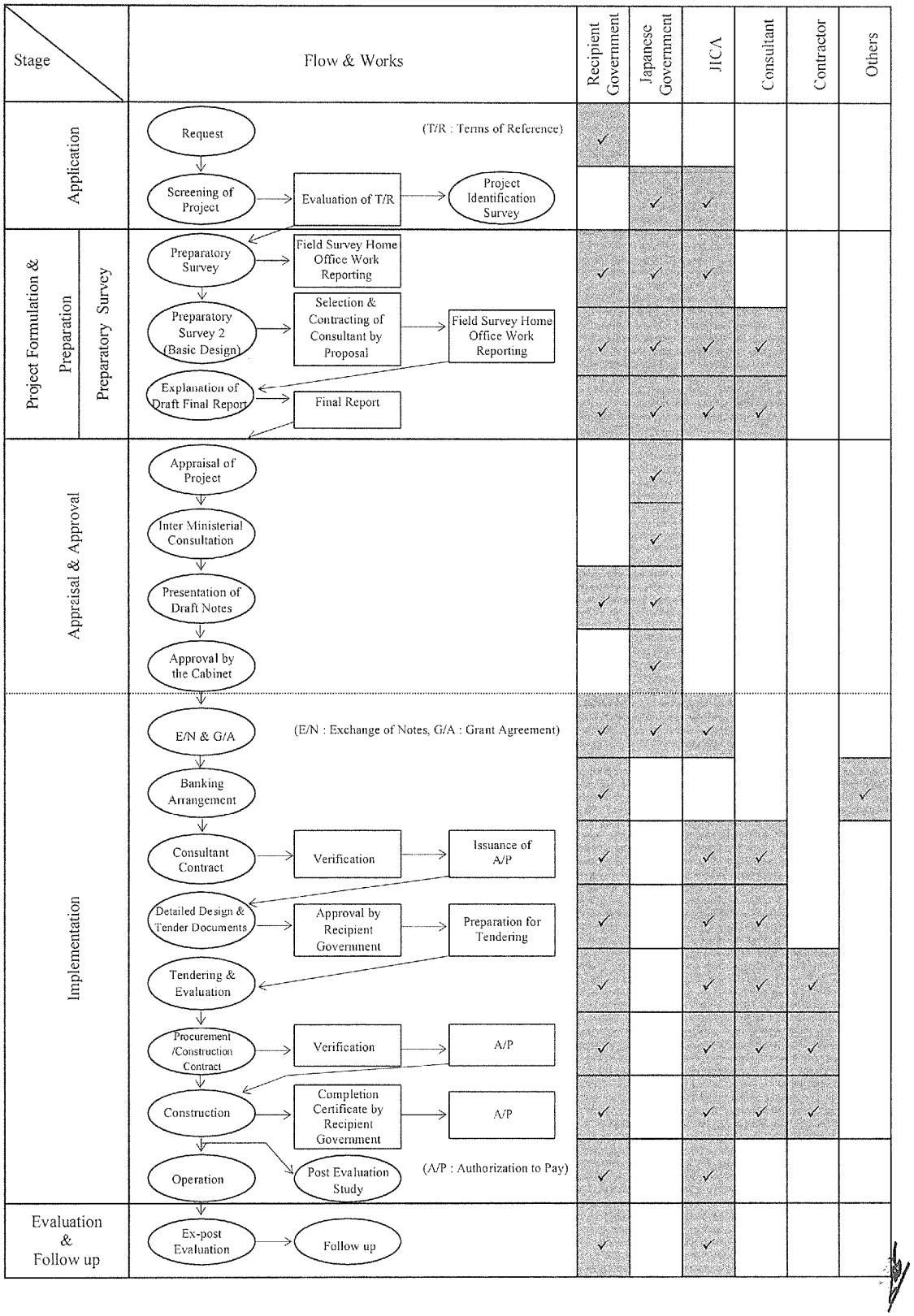
(9) Authorization to Pay (A/P)

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

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA environmental and social considerations guideline.

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Annex-4: 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 land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
5	To ensure prompt unloading and customs clearance at the port of disembarkation in 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	(●)	(●)
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
8	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
9	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●

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

4-2 Technical Notes (Second Field Survey)

TECHNICAL NOTE
ON THE PREPARATORY SURVEY (FIELD SURVEY II)
ON PROJECT ON REPLACEMENT AND EXPANSION
OF WATER DISTRIBUTION SYSTEM
FOR PURSAT, SIHANOUKVILLE AND BATTAMBANG
IN THE KINGDOM OF CAMBODIA
AGREED UPON BETWEEN
MINISTRY OF INDUSTRY, MINES AND ENERGY
AND
JICA PREPARATORY SURVEY TEAM

Phnom Penh, September 1st, 2010

Nobuki Abe
Chief Consultant
Preparatory Survey Team
Japan International Cooperation Agency (JICA)
Japan

Heng Sokkung
Under-Secretary of State
Ministry of Industry, Mines and Energy
The Kingdom of Cambodia

(As a witness)

Masahiro Ueki
Assistant Director
Water Resources Management Division I
Global Environment Department, JICA
Japan

JICA Preparatory Survey Team (hereinafter referred to as "the Team") for the Project on Replacement and Expansion of Water Distribution System for Pursat, Kampong Thom, Svay Rieng, Sihanoukville and Battambang (hereinafter referred to as "the Project") was dispatched to Cambodia from 29th August to 30th September, 2010. The Team held a series of discussions with the concerned officials of Ministry of Industry, Mines and Energy (hereinafter referred to as "MIME"). Based on above discussions, the following items were confirmed between both parties. The Team will proceed to further works and prepare the Outline Design Study Report.

1. Priority Project on Pipe Network

1-1. MIME understood that the priority project on pipe network would be selected by the cities.

1-2. The Team reported that Japanese Government finally selected the cities of Pursat, Sihanoukville and Battambang where further surveys would be carried out during their visit in Cambodia. MIME agreed the decision made by the Japanese Government. Both sides also confirmed that final components of priority project would be decided by Japanese side based on the result of field survey II in Cambodia and analysis in Japan.

1-3. The Team explained that IEIA and/or EIA for the Project are not needed under the laws and regulations of Cambodia according to the interviews with the officials of Department of Environment in respective Provinces.

2. Project Title

Following above, both sides agreed to change the Project title to "Project on Replacement and Expansion of Water Distribution System for Pursat, Sihanoukville and Battambang."

3. Objective of the Project

Both sides also agreed that the objective of the Project is to improve the water supply services in the cities of Pursat, Sihanoukville and Battambang through the replacement and expansion of water distribution system.

4. Field Survey II in Cambodia

The Team explained that the followings would be conducted in each selected city during the field survey II. MIME agreed to extend assistance requested by the Team for smooth implementation of field survey II.

(1) Topographic survey

- Topographic survey (route survey) on the proposed replacement and expansion pipeline routes for each prioritized city will be carried out.
- This survey will be contracted out.

(Request to the Cambodian side)

- Each WWs are requested to extend assistance to obtain permission from the road

authority for smooth execution of surveying.

(2) Social survey

- Social survey will be carried out aiming at collecting baseline data such as public awareness, water service status, current sanitary condition, confirmation of service coverage status, issues of water supply/sewerage and willingness to connect/pay and affordability to pay.
- This survey will be contracted out under the instruction of the JICA survey team.
- The contents of questionnaire/Interview will be planned by the survey team. Number of samples will be 100/city.

(Request to the Cambodian side)

- Each WWs are requested to extend assistance to identify the specific survey area and allocation of sample number by classification (income level, water use, etc.).

(3) Site survey on the distribution pipes to be replaced/expanded

- Based on the result of the 1st field survey, further survey will be carried out to prepare preliminary design of prioritized project. Proposed sites of flow meters and/ pressure reducing valves to be installed will be also preliminarily examined.

(Request to the Cambodian side)

- Each WWs are requested to extend assistance to attend site survey as required.
- Each WWs are requested to provide data of the existing service connections (number, type/material and diameter) of each pipeline to be replaced.

(4) Survey on operation and maintenance

- Based on the result of the 1st field survey, further survey will be carried out to prepare countermeasures for operation and maintenance accompanied by implementation of the proposed project.

(Request to the Cambodian side)

- Each WWs are requested to extend assistance to collect additional data/information as required.

(5) Survey on preliminary project cost estimates

- Based on the result of the 1st field survey, further survey will be carried out to prepare preliminary project cost estimates.

4-3 Minute of Discussions (Explanation on Draft Report)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY (BASIC DESIGN)
ON PROJECT ON REPLACEMENT AND EXPANSION
OF WATER DISTRIBUTION SYSTEM
FOR PURSAT, SIHANOUKVILLE AND BATTAMBANG
IN THE KINGDOM OF CAMBODIA
(EXPLANATION ON DRAFT OUTLINE DESIGN REPORT)

In July 2010, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey for the Basic Design on Project on Replacement and Expansion of Water Distribution System for Pursat, Sihanoukville and Battambang (hereinafter referred to as "the Project") to Cambodia and through discussion, field survey and technical examination of the results in Japan, JICA prepared a draft outline design report (hereinafter referred to as "the Draft Report").

In order to explain and to consult with Cambodia on the components of the Draft Report, JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Fumihiko Okiura, Director, Water Resources Management Division 1, Water Resources and Disaster Management Group, Global Environment Department, JICA, from January 5 to 13, 2011.

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

Phnom Penh, January 12, 2011

Mr. Fumihiko Okiura
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan

H.E. Heng Sokkung
Under-Secretary of State
Ministry of Industry, Mines and Energy
The Kingdom of Cambodia

ATTACHMENT

1. Components of the Draft Report

The Cambodian side agreed and accepted in principle the components of the Draft Report explained by the Team. The components of the Project are shown in **Annex-1.**

2. Japan's Grant Aid Scheme

The Cambodian side understood the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Cambodia as explained by the Team and described in Annex-3, Annex-4 of the Minutes of Discussions signed by both sides on July 29, 2010.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Cambodian side by April 2011.

4. Other Relevant Issues

The following issues were discussed and confirmed by both sides.

4-1) Project Cost Estimation

The team explained to the Cambodian side the tentative Project Cost Estimation as described in **ANNEX-2**. It is provisional estimate and would be further examined by the Government of Japan for the approval of the Grant. The Cambodian side understood that the Project Cost Estimation is not final and subject to be modified. Both sides agreed that the Project Cost Estimation should never be duplicated or released to any outside parties until signing of all the contract(s) for the Project.

4-2) Undertakings and Obligations of the Cambodian Side

In case that the Project would be approved by the Government of Japan, the Cambodian side would execute the obligations in pace with the progress of the construction and procurement in addition to the major undertakings described in Annex-4 of the Minutes of discussions signed by both sides on July 29, 2010. The list of the obligations is described in **ANNEX-3**.

4-3) Number of Service Pipe Connection in Battambang

The Cambodian side understood that number of new service pipe connection along the newly expanded pipelines in Battambang should be limited to 2,000 households until the capacity of water supply is strengthened.

4-4) Material of Service Connection for Poor Communities

The Team explained that material of service connection for poor communities would be provided as Japanese grant aid. The Cambodian side agreed that MIME and/or respective waterworks set the implementation policy of connection fee for poor communities by July 2011.

4-5) Soft Components of the Project's facilities

The Project would implement the technology transfer and capacity building in the areas of service pipe connection and flow management as Soft Components, so that the Cambodian side would be able to accomplish the reconnection of service pipes properly and improve operation and maintenance of distribution facilities. The Cambodian side agreed and committed to assign the staff in respective waterworks as follows:

- Service pipe connection: Staffs and casual plumbers as shown in the Draft Report by March 2012
- Flow management: Staffs as shown in the Draft Report by October 2012

4-6) Overlapping with Other Projects

Both sides confirmed that the Project would not be overlapped with any other projects supported by other donor agencies, NGOs, and Cambodian official organizations.

ANNEX-1 Components of the Project

ANNEX-2 Project Cost Estimation (CONFIDENTIAL)

ANNEX-3 Obligations of the Cambodian side

ANNEX-1 Components of the Project

Component	Category	Major Specifications, Quantity and Contents
Facility Construction	Replacement	Pipe Length: Total 31.8 km Pipe Type: DCIP and HDPE Pipe Diameter: 50A to 350A Note: Re-connection of service pipeline is under Cambodian works.
	Expansion	Pipe Length: Total 91.8 km Pipe Type: DCIP and HDPE Pipe Diameter: 50A～350A
	Particular Route and Major Accessory	Crossings of Road/ Railway/ River and Detour Route: 3 units Flow Meter*[1], Valves (GV*[1], PRV*[1], FCV*[1/2], ARV, BOV): 3 units Note*[1]: Accessories will be connected to the existing pipeline partially. Note*[2]: Cambodian side shall install the primary distribution line of electric power.
	Flow Monitoring	Distribution Flow Monitoring System (Telemetric Data Processing): 3 units
Procurement	Materials for Service Pipe Connection	Re-connection: Clamp Saddle, HDPE , Valves, Fittings, etc. 4,400 sets New Connection (for expansion pipes): Clamp Saddle and Water Meter: 2,400 sets New Connection (for existing pipes): Water Meter 700 peaces
	Equipment for HDPE Connection	SF Connector: for HDPE suitable with pipe diameter of 50A or below 5 sets Portable Engine Generator: 5 kVA 5 units
Capacity Development	Service Pipe Connection	Skill of qualified service connection and proper turn-over inspection
	Flow Management	Theory and application of the flow monitoring system, preparation of the action plan

CONFIDENTIAL

This page is closed due to the confidentiality.

ANNEX-3 Obligations of the Cambodian side

Items
1. Construction of facilities
(1) To notify all authorities concerned of the Project, and obtain necessary permissions and approvals for construction/ installation works and traffic control
(2) To obtain all the acceptances for public land use if necessary
(3) To announce the traffic control and water cutoff to the residents in construction areas in advance
(4) To contract the broadband service with telephone provider and bear communication cost for flow monitoring system
(5) To install primary power supply to flow control valves in Sihanoukville
(6) To assign casual plumbers for reconnection of service pipe and water meter
2. Policy of connection fee for poor communities
(1) To set the implementation policy of connection fee for poor communities
3. Soft Component
(1) To assign the responsible personnel for service pipe connection and flow management, and to assign casual plumbers for service pipe connection.
4. Common items
(1) To organize Project Implementation Unit (PIU), which consists of officials from MIME, DIME and respective waterworks
(2) To promote new service connection especially for poor communities
5. Other items
(1) To carry out necessary procedures for issue of the Authorization to Pay (A/P) required for payments to Japanese Consultants and Contractor, and to bear the advising commission of the A/P and payment commissions to a bank in Japan for banking services based on the Banking Arrangement (B/A)
(2) To ensure prompt unloading and customs clearance upon entry into Cambodia and transportation inside Cambodia, for the goods purchased for the implementation of the Project
(3) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work
(4) To exempt Japanese nationals from the customs duty, internal taxes and other fiscal levies imposed in Cambodia with respect to the supply of the products and services under the verified contract
(5) To maintain and use properly and effectively the facilities constructed and

	equipment provided under the Grant Aid
(6)	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment

4-4 Technical Notes (Explanation on Draft Report 2)

TECHNICAL NOTES
ON THE PREPATORY SURVEY (BASIC DESIGN)
OF THE PROJECT ON REPLACEMENT AND EXPANSION
OF WATER DISTRIBUTION SYSTEM
FOR PURSAT, SIHANOUKVILLE AND BATTAMBANG
IN THE KINGDOM OF CAMBODIA
BETWEEN
MINISTRY OF INDUSTRY, MINES AND ENERGY
AND
JICA PREPARATORY SURVEY TEAM

Phnom Penh, February 3rd, 2011

Nobuki Abe
Chief Consultant
JICA Preparatory Survey Team
Japan

Tan Sokchea
Director of Potable Water Supply Department
Ministry of Industry, Mines and Energy
The Kingdom of Cambodia

After confirmation of main items of a draft outline design report (hereinafter referred to "the Draft Report") between the Japan International Cooperation Agency (hereinafter referred to "JICA") and the Ministry of Industry, Mines and Energy (hereinafter referred to as "MIME") on January 12, 2011, JICA Preparatory Survey Team (hereinafter referred to as "the Team") held a series of discussions with the concerned officials of MIME from 31st January to 3rd February, 2011 on the modification of the components of Draft Report. Based on the above discussions, the following items were confirmed between both sides.

1. Components of the Draft Report

The Cambodian side agreed and accepted in principle the following modification of the basic plan of Sihanoukville Waterworks explained by the Team.

1-1. Modification of proposed pipelines

The Cambodian side agreed and accepted the concept of modification of replacement and expansion of the proposed pipelines. In this connection, the total length of distribution pipes to be expanded shall be modified from 91.8 km to approximately 90.6 km.

1-2. Provision of remote control system of flow control

The Cambodian side agreed and accepted the concept of provision of remote control system of flow control. In this connection, the installation of primary power supply to flow control valve shall be undertaken by the Cambodian side.

2. Operation and Maintenance Cost for Flow Monitoring System

The Team explained that the required cost for operation and maintenance of flow monitoring system shall be shouldered by the Cambodian side, since it is important to operate and maintain telemetry in order to carry out appropriate distribution flow management considering the experience of PPWSA. The Cambodian side understood the point explained by the Team and agreed that respective waterworks will shoulder operation and maintenance cost.

3. Monitoring for Construction Environment

Project Implementation Unit (PIU) to be formed by the Cambodian side together with Contractor and Consultant of Japanese side shall conduct environmental monitoring during construction stage. The results will be provided to JICA by filling in the Monitoring Sheet as ANNEX-1. Monitoring items shall be considered below:

1) Noise and vibration
2) Wastes
3) Air pollution
4) Traffic

ANNEX-1 Environmental Monitoring Sheet

ANNEX-1 Environmental Monitoring Sheet

Identification		Measurement (Contractor)				Monitoring Frequency	
Category	Item	Value or Status	Application	Method	Place	Weekly	Monthly
Noise	Construction Machinery	To be recorded daily at every subject sites during the construction period. Staffs from the WWs and the Consultant will supervise the activities.	Cambodian Standard	Meter	Near the site where construction machinery is being used.	Daily records will be analyzed every week statistically by the Consultant.	Monthly meeting will be held at MIME in Phnom Penh. Joint site visit will be done according to the meeting result.
	Generator						
Vibration	Construction Machinery		To be proposed by the Consultant using Japan Standard (local government code).				
	Generator						
Air Pollution	Emission Gas		Cambodian Standard	Standard method specified in Guideline of Ministry of Environment			
	Dust						
Wastes	Fragments		To be coordinated with the local government concerned.	Visual	The site where pipe laying works were completed.		
	Excess soil						
	Debris						
Traffic	Signboard				The circumference site where pipe laying works are on-going.		
	Traffic Guard						

Appendix-5 Soft Component Plan

(1) Background

In implementation of the Project, replacement of distribution pipes will be accompanied by reconnection of the existing service pipes with the distribution pipes to be newly installed. Service pipe materials for reconnection are to be provided by the Japanese side and the Cambodian side undertakes plumbing work. The number of reconnection of service pipes varies from 700 to 2,700 according to water works. In order to accomplish reconnection of service pipes within limited implementation period of the Project, it is required for respective water works to secure manpower by employing plumbers temporarily aside from current staff of waterworks.

Although there are no private contractors of plumbing work in the respective provincial capitals, waterworks are required to temporarily employ unpracticed workers as plumbers. Thus, it is necessary to provide training on plumbing work such as fitting saddle clamps, replacing service pipes and others for casual workers in addition to current staff of water works. It is considered possible that respective water works employ casual plumbers, since they have hired casual workers as required so far.

In replacement and expansion of distribution pipes, the existing service area will be divided into blocks together with provision of flow monitoring system in distribution pipe network in order to improve operation and maintenance of distribution facilities.

Flow monitoring system is introduced to respective water works for the first time, which aims at appropriate distribution flow management including detecting unusual water flow such as water leakage through monitoring, data logging and analyzing as a routine work. It is necessary to provide technical training for respective water works in order to operate and manage the system properly.

To achieve the above objectives, a strong engineering support to ensure smooth startup of facility operation of the Project, the following soft component program is planned.

- Technical training on service pipe connection
- Technical training on flow monitoring system

Manipulation of flow monitoring system is not included in this soft component program, since initial training in commissioning is to be conducted by the contractor.

(2) Objective

The mission of the water works is to provide safe, reliable and adequate water supply to the people with sufficient facility operation and management. In order to achieve this mission, this soft component program aims at supporting water works so as to develop, operate and maintain water supply facility properly by strengthening technical capability.

(3) Achievement

This soft component program will expect the following achievements:

< Technical training on service pipe connection >

The trainees will acquire the skill of re-connecting service pipes properly in replacement of distribution pipes and the required knowledge and skills including customer services and others in re-connecting service pipes and resuming water supply.

< Technical training on flow monitoring system >

The trainees will acquire appropriate manner of operation and management of the system and prepare action plan together with understanding objectives, component and function of the system

(4) Manner of Verifying Achievement

Table A5-1 shows the manner of verifying the objectives and achievement performed in each

module. Trainers will verify and evaluate training results such as degree of understandings and performance of practical training of trainees based on items in Table A5-1a and b.

(5) Activities and Input Plan

The activities and input of this soft component program are described below. Details are referred to Table A5-2.

< Activities >

- Technical training on service pipe connection

  The eligible trainees are current staff in charge of service pipe installation of respective water works and casual plumbers as shown below. This training program will be conducted by going round in duration of about 1week respectively by contracted-out 3 national consultants (one engineer and 2 skilled plumbers) under supervision of Japanese consultant. Training material (Service pipe installation manual) and demonstration materials (pipe materials, pressure tester, etc.) to be used will be prepared in advance.

Numbers of Eligible Trainees

Position	Pursat	Battambang	Sihanoukville
Staff in charge of service pipe installation (current number)*	3 (4)	3 (4)	3 (8)
Casual plumber	4	8	8
Total	7	11	11

Note: * excluding managerial staff

Contents of the training program are composed of class room and practical trainings. Followed by class room training using training manual, the practical training using demonstration materials will be conducted at water treatment plant site, targeting all trainees in order to acquire quality control and work sequence. Especially, training on service pipe connection will be put emphasis to casual plumbers, while trainings on connecting water meter, preparing as built drawing including offset note, customer services according to reconnection of service pipes and resuming water supply are provided targeting the staffs of water works.

- Technical training on flow monitoring system

  The eligible trainees are managerial staff of engineering department, staff in charge of network section and responsible person of water treatment plant as shown below. This training program will be conducted by going round at each water works twice in duration of about one week each by contracted-out 2 national consultants (system engineer and data analysis specialist) under supervision of Japanese consultant. Training materials (Guideline of operation and management) and reference materials (monthly report, analysis graphs) to be used will be prepared in advance.

Numbers of Eligible Trainees

Position	Pursat	Battambang	Sihanoukville
Managerial staff of engineering department* (current number)	1 (4)	1 (3)	1 (4)
Staff of network section (current number)**	2 (4)	2 (4)	2 (8)
Responsible staff of water treatment plant (current number)	1 (1)	1 (1)	1 (1)
Total	4	4	4

Note: * including deputy director **excluding managerial staff

Contents of the training are composed of class room and practical trainings, which are designed to provide technical transfer including advice/training for preparing action plan. In class room training, in addition to field trip (base and satellite stations) and training of operation and management of the system, appropriate manner of cooperation between distribution flow management and operation of water treatment plant will be considered.
Since the system is newly introduced to water works, manner of data logging, tabulation of periodical report (monthly/weekly report, etc.) as well as data analysis and visualization will be trained.
As for preparing action plan, the draft plan prepared in the first stage will be improved in the second stage in collaboration with trainers and trainees.

< Input >

The following table represents inputs of trainers.

Inputs of Trainers

Inputs	Service pipe connection	Flow monitoring system	Total
Japanese consultant	1.50 MM	2.00 MM	3.50 MM
National consultant	3 persons, each 1.33 MM	2 persons, each 1.67 MM	7.33 MM
Total	5.49 MM	5.34 MM	10.83 MM

Roles of Japanese consultant

- ✓ Technical training on reconnection of service pipes
  - To prepare and manage overall training program
  - To prepare composition and contents of training material (Service pipe installation manual)
  - To provide technical training in cooperation with local consultants and check/evaluate achievement of the training.
- ✓ Technical training on distribution flow monitoring system
  - To prepare and manage overall training program
  - To prepare composition and contents of training material (Guideline for operation and management of distribution flow monitoring system)
  - To provide technical training in cooperation with local consultants and check/ evaluate achievement of the training

Roles of national consultant

- ✓ Technical training on reconnection of service pipes
  - To prepare training material (Service pipe installation manual, Khmer version) in cooperation with Japanese consultant
  - To conduct technical training including lecture on quality control and points of service pipe installation and practical training, and check/evaluate achievement of training in cooperation with Japanese consultant
- ✓ Technical training on flow monitoring system
  - To prepare training material (Guidelines for operation and management of distribution flow monitoring system, Khmer version) in cooperation with Japanese consultant
  - To conduct technical training on operation and management of distribution flow monitoring system, and check/evaluate achievement of training in cooperation with Japanese consultant

(6) Human Resources

Considering that it is not easy for most of trainees to communicate in English, utilization of national resources will be necessary.
In Cambodia, however, PPWSA having experiences of implementing many Japanese ODA projects is operating flow monitoring system at present. PPWSA has provided also technical assistance for provincial waterworks. In this regard, it is considered appropriate to contract out

to PPWSA in implementing soft component program under overall supervision/management of Japanese consultant. In addition, it will be expected that PPWSA can follows up waterworks after completion of the soft component program.

(7) Implementing Schedule

As for the reports of this training program, the interim report after preparing training materials and the final report after completion of the training program will be submitted.

< Technical training on service pipe connection >

The following chart shows the implementing schedule.

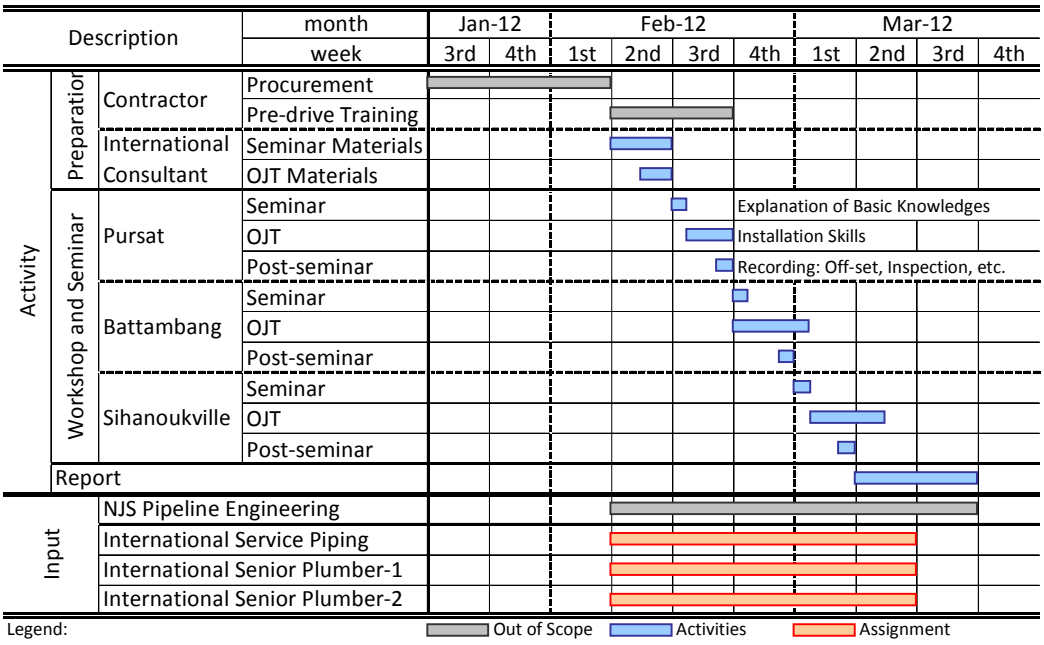


Figure A5-1a Implementing Schedule for Service Pipe Connection

The training on service pipe connection aims at reconnecting service pipes smoothly in replacing work of distribution pipes simultaneously. It is necessary to complete before commencement of replacement work of distribution pipes. Training period will be proposed as 1.5 months starting in the middle of April 2012 to complete in the end of May 2012.

＜Technical training on flow monitoring system＞

The following chart shows implementing schedule.

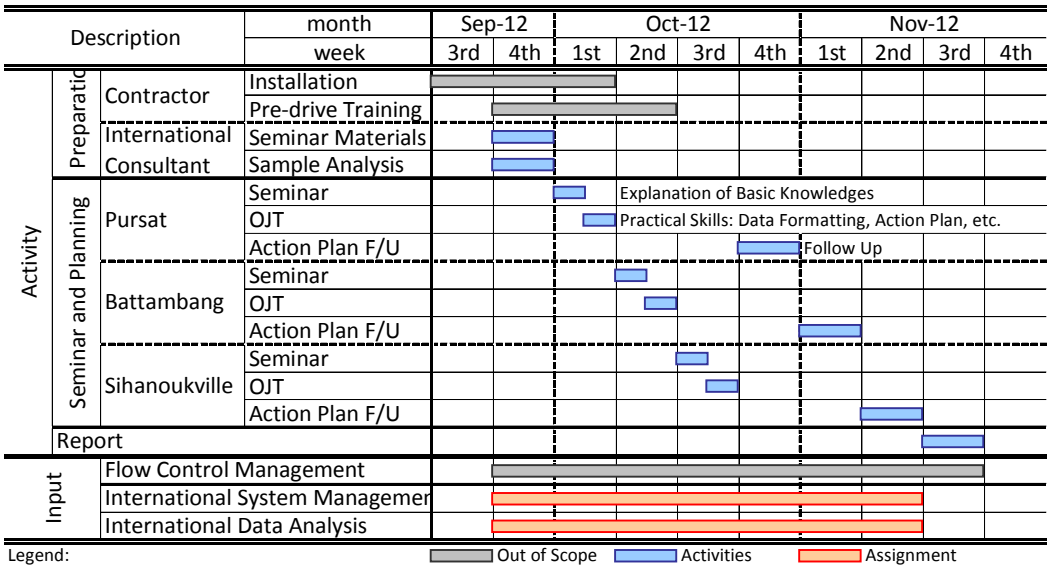


Figure A5-1b Implementing Schedule for Distribution Flow Management

Technical training on flow monitoring system will be carried out after interim inspection (note: training will be carried out after completion inspection for Pursat) scheduled in September 2012 when the system can be operated. Total training period is to be allotted for 2 months starting early November 2012 to complete in late December 2012.

(8) Outputs

Outputs of this soft component program are proposed as below:

< Technical training on service pipe connection >

- ✓ Technical training plan
- ✓ Technical training material (Service pipe installation manual: English and Khmer version)
- ✓ As built drawing of plumbing work (offset note, etc.)
- ✓ Evaluation report of trainees

< Technical training on flow monitoring system >

- ✓ Technical training plan
- ✓ Technical training material (Guideline for distribution flow monitoring system: English and Khmer version)
- ✓ Action plan of distribution flow monitoring
- ✓ Evaluation report of trainees

(9) Responsibility of RGC

In order to achieve the object, it is required for the implementing agency to secure/ appoint the trainees (staff of water works and casual staff) before the commencement of each module.

As for reconnection of service pipes, the implementing agency has accepted that reconnection of service pipes together with employing casual plumbers will be borne by the Cambodian side. Respective water works are required to secure/ appoint the concerned staffs together with employing casual plumbers before the middle of April 2012.

For technical training on flow monitoring system, water works are required to secure/ appoint the concerned staffs before November 2012. Especially as for Pursat and Battambang water works, it is recommended to increase the staff (one each) in order to avoid disadvantage in routine work and resuming water supply in replacement work of distribution pipes, considering the current staff number of network section.

Table A5-1 Achievement of Each Module and Items for Verifying Achievement

Module	Achievement	Items for verifying achievement
1. Service pipe connection	Staffs in charge of piping and casual plumbers acquire skills necessary for service pipe connection together with understanding component and objectives of service pipe installation	1. To understand composition and function of service pipe 2. To understand importance of quality control and points of service pipe installation 3. To cut/connect service pipes properly 4. To fit saddle clamp, stop cock and other fittings properly 5. To conduct pressure testing properly To prepare plumbing record/drawing properly
2. Flow monitoring system	Technical staff (Network section and WTP) acquire manner of operation and management of the system together with understanding composition/objectives/function of flow monitoring system	1. To have understanding of composition, objectives and function of distribution system 2. To have understanding of objectives and function of block distribution system 3. To have understanding of characteristics of various kind of flow (seasonal/daily/hourly change, effective NRW, etc.) 4. To tabulate various kind of flow data 5. To analyze various flow data 6. To detect unusual flow and verify its causes 7. To cooperate with WTP in distribution flow control 8. To prepare action plan of flow management

Table A5-2 Plan of Activities (1/2)

	Activities	Achievement	Manner of Activities	Inputs	Remarks
1	**Technical training on service pipe connection**				
	1. Seminar on composition and function of service pipe 2. Seminar on importance of quality control and points of service pipe installation 3. Technical training on cutting/connecting service pipes 4. Technical training on saddle clamps, stop cocks and other fittings 5. Technical training on pressure testing 6. Technical training on preparation of plumbing record/drawings	• Technical training plan • Training material (Service pipe installation manual) • As built drawing of plumbing works • Evaluation report of trainees	• Class room training using training material • OJT using demonstration materials (Distribution pipes & service pipes) • Trainees Pursat (Staffs in charge of piping work 3, casual staff 4) Total 7 persons Battambang (Staffs in charge of piping work 3, casual staff 8) Total 11 persons Sihanoukville (Staffs in charge of piping work 3, casual staff 8) Total 11 persons	• Japanese consultant (water supply engineer) Planning/Preparation/Report: 1 person×0.50MM Implementation 1 person×1.00MM • Local consultant (Instructor 1, Skilled plumber 2) Planning/Preparation: 3 persons×0.33MM Implementation: 3persons×1.00MM	Eligible staffs shall be appointed before commencement of soft component program

Table A5-2 Plan of Activities (2/2)

	Activities	Achievement	Manner of Activities	Inputs	Remarks
2	**Technical training on flow monitoring system**				
	1. Seminar on understanding of composition, objectives and function of distribution system 2. Seminar on understanding of objectives and function of block distribution system 3. Seminar on understanding of characteristics of various kind of flow (seasonal/daily/hourly change, effective NRW, etc.) 4. Technical training of preparing tabulation of various kind of flow data 5. Technical training on analyzing various flow data 6. Technical training on detecting unusual flow and verifying its causes 7. Technical training on cooperation with WTP in distribution flow control 8. Technical training on preparing action plan of flow management	• Technical training plan • Training material (Guideline of operation and management) • Flow records (Daily record, Monthly record, etc.) • Action plan on distribution flow management • Evaluation report of trainees	• Class room training using training material • OJT using actual system • Trainees Pursat (Responsible person of technical department, Staffs of Network section 2, Responsible staff of WTP 1) Total 4 Battambang (Responsible person of technical department, Staffs of Network section 2, Responsible staff of WTP 1) Total 4 Sihanoukville (Responsible person of technical department, Staffs of Network section 2, Responsible staff of WTP 1) Total 4	• Japanese consultant (Water supply engineer) Planning/Preparation/Report: 1 person×0.50MM Implementation: 1 person×1.50MM • Local consultant 2（System manager1 , data analyst 1） Planning/Preparation 2 persons×0.33MM Implementation 2 persons×1.34MM	Eligible staffs shall be appointed before commencement of soft component program

Appendix-6 Other Relevant Data

6-1 Prioritization Criteria and Findings (Result of 1st Field Survey)

Table for Prioritization Criteria and Findings

Information		Waterworks				
Criteria	**Parameter**	**Pursat**	**Battambang**	**Kampong Thom**	**Sihanoukville**	**Svay Rieng**
Request confirmed by WWs	Replacement and Expansion of Distribution pipe	Total : 27.7 km Replacement : 4.7 km Expansion : 23.0 km	Total : 50.6 km Replacement : 21.0 km Expansion : 29.6 km	Total 49.0 km Replacement :3.0 km Expansion : 46.0 km	Total : 29.5 km Replacement : 8.2 km Expansion : 21.3 km	Total : 28.7 km Replacement : 2.7 km Expansion : 26.0 km
	NOTE: Above mentioned requested length shall be evaluated in the 2nd survey.					
	Provision of construction machinery	Not requested	Same as the original request			
	Provision of distribution management system	Same as the original request				
1. Criteria to screen the priority project						
Operation and maintenance of water treatment plant inclusive of financial status	General *) Population in administrative area **)estimated by MIME in 2008	Population in Service area : 46,734 *) Served population : 15,180 Service coverage: 32.5 % **) NRW:23 % (M/P, 2008) No. of Connections: 3,643 Tariff: 1,300 Riel per cu m Fee of New Connections: • US$100-120	Population in Service area : 157,009 Served population : 40,220 Service coverage: 25.6 % **) No. of Connections: 7,895 Tariff: 1,500 Riel per cu m (Yearly Report) Fee of New Connections: • Average cost: US$100-120 • For poor: US$80	Population in Service area : 31,987 Served population : 9,632 Service coverage: 30.1 % **) NRW: 24 % (M/P, 2008) No. of Connections: 2,080 Tariff: 1,500 Riel per cu m Fee of New Connections: • US$110	Population in Service area : 65,515 Served population : 24,395 Service coverage: 37.2 % **) NRW: 18.2 % (2009) No. of Connections: 3,845 Tariff: • Grade 1 (0-7m^3): 1,500 Riel m^3 • Grade 2 (8-15m^3): 1,800 Riel m^3 • Grade 3 (>m^3): 2,000 Riel m^3 Fee of New Connections: • US$150-200	Population in Service area : 43,815 *) Served population : 6,550 Service coverage: 14.9 % **) NRW: 25 % (M/P, 2008) No. of Connections: 1,385 Tariff: 1,200 Riel per cum^3 Fee of New Connections: • US$137 (for a 10-meter connection)
		Service connection : 2009 – 3,643 connections 2008 – 2,877 connections 2007 – 2,503 connections	Service connection : 2009 – 8,582 connections 2008 – 8,024 connections 2007 – 7,895 connections	Service connection : 2009 – 2,080 connections 2008 – 1,880 connections 2007 – 1,683 connections	Service connection : 2009 – 3,845 connections 2008 – 3,683 connections 2007 – 3,100 connections	Service connection : 2009 – 1,311 connections 2008 – 1,175 connections 2007 – 1,097 connections
	Water Resource	Surface water – Prusat River Stable operation in dry season.	Surface water – Sangkae River Stable operation in dry season.	Surface Water - Sen River Stable operation in dry season.	Surface water – Preak Tob Lake And treated water from private sector (ANCO BROTHERS Co.,Ltd).	Groundwater – 3 wells Iron and Manganese are highly contained in raw water.
	WTP operation	WTP capacity : 5,700 m3/d Supply record: 2,850 m3/d Loading Ratio : 49%	WTP capacity :11,520 m3/d Supply record: 8,500 m3/d Loading Ratio : 73%	WTP capacity : 5,760 m3/d Supply record: 2,000 m3/d Loading Ratio : 34%	WTP capacity : 7,680 m3/d Supply record: 6,500 m3/d Loading Ratio : 84%	WTP capacity : 4,800 m3/d Supply record: 1,700 m3/d Loading Ratio : 32% Water treatment flow is not matched to raw water quality. Supply water quality dose not

						meet C.W.Q.S. Treatment process must be improved accordingly.
Operation and maintenance of water treatment plant inclusive of financial status	Organization	Total No. of Personnel: 28 • Management: 4 • Technical and Planning: 11 • Admin and Finance: 13	Total No. of Personnel: 38 • Management: 3 • Technical and Planning: 15 • Admin and Finance: 20	Total No. of Personnel: 31 • Management: 4 • Technical and Planning: 23 • Admin and Finance: 4	Total No. of Personnel: 45 • Management: 3 • Technical and Planning: 26 (One person concurrently holding two positions) • Admin and Finance: 16 (One person concurrently holding two positions)	Total No. of Personnel: 19 • Management: 3 (at present filled positions, 2) • Technical and Planning: 12 • Admin and Finance: 5
	Outsourced or Casual	Meter reading: None Bill Collection: None Service Connection: None Leak Repair: None	Meter reading: None Bill Collection: None Service Connection: None Leak Repair: None	Meter reading: None Bill Collection: None Service Connection: None Leak Repair: None	Meter reading: None Bill Collection: None Service Connection and Leak Repair: Hires 2 to 3 persons to augment five regular personnel (as one team who "do everything") on need basis	Meter reading: None Bill Collection: None Service Connection and Leak Repair: Hires 2 to 3 persons on need basis
	Training	Ten out of 28 personnel received various training Average days of training / year 2007 – Not Indicated 2008 – Not Indicated 2009 – Not Indicated	Four out of 38 personnel received various training in 2010 Average days of training / year 2007 – Not Indicated 2008 – Not Indicated 2009 – Not Indicated	Seven out of 31 personnel received various training from 2007-2009 Average days of training / year 2007 – 125 days 2008 – 76 days 2009 – 24 days	Four out of 47 personnel received various training from 2007 to 2009 Average days of training / year 2007 – 10 days 2008 – 33 days 2009 – 83 days	Thirteen out of 19 personnel received various training from JICA/MIME (undated) Average days of training / year 2007 – Not Indicated 2008 – Not Indicated 2009 – Not Indicated
	Facility O/M	No written O&M Manuals Reports Generated: • Water Quality Report: Twice monthly • Twice daily for chlorine and color • Water Sample Report: Get samples from - Reservoir tap - Customers' house - Network drain-out • Pre-Chlorine Testing: Quarterly (send samples to Battambang • Financial Reports: Monthly / Yearly to MIME	No written O&M Manuals Reports Generated: • Pump Maintenance Schedule - Greasing Schedule - Adding Schedule - Lubricant Changing Schedule - Types of Grease Used • Existing Distribution Network - Installation Year - Types of Pipes - Specification of Installed Pipes • Financial Reports: Monthly / Yearly to MIME	No written O&M Manuals Reports Generated: • Production Reports - Record of WTP opertion (thrice daily for an average of 7 hours operation time) - Raw Water Intake Record - Reservoir Record - Dosing Record - Water Quantity Record - Elevated Tank Level Record • Financial Reports: Monthly / Yearly to MIME	No written O&M Manuals Reports Generated: • Technical Reports - Monthly Production Record - Weekly Production Record - Water Quality Analysis Record - Water Quality Analysis Record - Chlorine Residual Record - Daily Record Water Quality - Treated Water Record - Customer Complaint Record - New Customer Record	No written O&M Manuals Reports Generated: • Technical Reports: - Daily Control for Distribution Pump - O&M Record for Control Panel - Daily Control Machinery Report - O&M Record for Generator - Monthly and Yearly Repair Record • Financial Reports: Monthly / yearly to MIME

		•	Information management for pipeline is well organized. This can be effective source for plan and design. Maintenance schedule for mechanical is improved only in this water works.	•	- Daily Power Meter Record - Daily Operation Record – Pumping House - Daily Pump Check Sheet - Weekly Pumping Station Record	
	Customer Services	Service Connection: •One team (4 persons/team) •Average 5 HH connections/day Complaints: •Smell of water	Service Connection: • Average 6 HH connections/day Meter Reading and Leak Repair: • Four teams (3 persons/team) Complaints: • Quality of water • Smell of chlorine	Service Connection: • Three teams (2 persons/team) • Average 6 HH connections/day Complaints: • Quality of water	Service Connection and Leak Repair: • One "multi-purpose" team (5 persons) • Average 2 HH connections/day Complaints: • Quality of water	Service Connection: • Two to 4 people • Average 3 HH connections/day Complaints: • Quality of Water
	Performance	Collection Efficiency 2009: 97 to 98% Staff Productivity Index: 7.7 Operating Ratio: 2009 – 1.55	Collection Efficiency 2009: 100% for Domestic; Problems with Government and Military Staff Productivity Index: 4.8 Operating Ratio: 2007 – 1.15 2008 – 1.26 2009 – 1.17	Collection Efficiency 2009: 93% Staff Productivity Index: 14.9 Operating Ratio: 2009 – 0.74	Collection Efficiency 2009: 101.56% Staff Productivity Index: 11.7 Operating Ratio: 2007 – 1.01 2008 – 0.89 2009 – 1.00	Collection Efficiency 2009: No data Staff Productivity Index: 13.7 Operating Ratio: No financial data
		LEGEND				
		Collection Efficiency	In percentage, is the [total annual collections (Riel) / total annual billings (Riel)] x 100 (Some utilities may have collection efficiency higher than 100%. This may indicate that total collections for the period included payment of bills for the previous period.).			
		Staff Productivity Index	In ratio, is the [number of utility staff] / [number of utility connections/1,000].			
		Operating Ratio	In ratio, is the [annual O&M cost (Riel)] / [annual operating revenue (Riel)] excluding Administrative costs.			
Residents' willingness to connect/pay for water service	Residents' willingness – income group	Definite number of households willing to connect	High willingness to pay based on housing structures (refer to item city development plan for discussion).	High willingness to pay based on housing structures.	High, medium and low income residential areas.	No development yet in the expansion area, hence no determination of housing structures.
		Income Group (based on housing structures) – At present, there is no available family income and expenditure study; no income classification and definition of "poor households". A primary survey has to be conducted to determine willingness to connect/pay for the water service.				
	Pending Application	50 households	No pending applicants	No pending applicants	No pending applicants	No pending applicants
Overlapping with other donors	UN-Habitat	No overlapping with proposed JICA project.	N / A	No overlapping with proposed JICA project.	N / A	No overlapping with proposed JICA project.
	JICA Technical Assistance	Replacement of distribution pipe (1 km) was completed.	Replacement of distribution pipe (1 km) was completed.	Replacement of distribution pipe (1 km) is on-going.	Replacement of distribution pipe (1 km) is on-going.	Replacement of distribution pipe (1 km) is on-going..
	Others	Service area was expanded without hydraulic consideration in 2008 and 2009 by	Revision of master plan is to be considered.	N / A	ANCO Brothers Co.,Ltd. is supplying treated water to water works. Maximum wa-	N / A

		water works. This area was not included in Master Plan.			ter supply capacity is 10,000 cu m per day. The cost is 1,000 Riel/cu m.	
2. Criteria to select more effective project						
Population served/served coverage	Service Population Increase - Expansion - Replacement *	 7,000 5,200	 18,500 10,500	 16,500 5,200	 13,000 7,000	 7,000 4,400
	Service coverage Increase (exp+rep)	32.5 % to 58.5%	25.6 % to 44.0 %	30.1 % to 98.0 %	37.2 % to 67.8 %	14.9 % to 41.0 %
	Population increase/1 km expansion	290	620	310	590	310
Rate of loading of water treatment plant	Current/ Estimate	49 % to 79 %	73 % to 93 %	34 % to 85 %	84 % to 100 %	32 % to 63 %
Socio-economic impact of project (commerce and /or industry)	Large consumer	Domestic water is major consumption. Commercial water is relatively small among five provinces.	Commercial area located in urban central and is larger than other provinces.	Domestic water is major consumption. Commercial water is relatively small among five provinces.	Special economic zone and hotel area are located in expansion service area.	Domestic water is major consumption. Commercial water is relatively small among five provinces.
Priority of Cambodian side	Province	Given same priority				
	Type of pipelines	1. Replacement (main pipe) 2. Replacement (secondary pipe) 3. Expansion (main pipe) 4. Expansion (secondary pipe)				

* Estimations of service population to the increased by the project was based on the 10% reduction of current NRW and replaced by the amount of distribution. Unit water consumption of 110 Lpcd (2010) was adopted according to the study result at Siem Reap. Details of assumption will be confirmed by the 2nd field survey.

6.2 Scoping on Social and Environmental Considerations

Table A6-2-1 Scoping on Social and Environmental Considerations

	Impacts	Rating			Brief Description
		Pursat	Battambang	Sihanoukville	
Social Environment: Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.					
1	Involuntary Resettlement				
2	Local economy such as employment and livelihood, etc.				
3	Land use and utilization of local resources				
4	Social institutions such as social infrastructure and local decision-making institutions				
5	Existing social infrastructures and services				
6	The poor, indigenous and ethnic people				
7	Misdistribution of benefit and damage				
8	Cultural heritage				
9	Local conflict of interests				
10	Water Usage or Water Rights and Rights of Common				
11	Sanitation				
12	Hazards (Risk): Infectious diseases such as HIV/AIDS				
Natural Environment					
13	Topography and Geographical features				
14	Soil Erosion				
15	Groundwater				
16	Hydrological Situation				
17	Coastal Zone: Mangroves, Coral reefs, Tidal flats, etc.				
18	Flora, Fauna and Biodiversity				
19	Meteorology				
20	Landscape				
21	Global Warming				
Pollution					
22	Air Pollution	B	B	B	During pipe installation work
23	Water Pollution				
24	Soil Contamination				
25	Waste	B	B	B	During pipe installation work
26	Noise and Vibration	B	B	B	During pipe installation work
27	Ground Subsidence				
28	Offensive Odor				
29	Bottom sediment				
30	Accidents	B	B	B	During pipe installation work

Rating: A: Serious impact is expected.
B: Some impact is expected.
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)
No Mark: No impact is expected. IEE/EIA is not necessary.

Table A6-2-2 Check List of Environmental Considerations

Environmental Item		Main Check Items	Confirmation of Environmental Considerations
I Permits and Explanation	(1) EIA and Environmental Permits	Are Environmental Impact Assessment reports (EIA reports) needed to be prepared?	It was confirmed to hearing of State Environment Agency that implementation of EIA in Cambodia is not needed. Because the project is replacement and expansion of existing water supply system.
	(2) Explanation to the Public	① Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public?	Before implementation of the project, adequate explanation of contents of the project are made to the public and it is required to understand the cooperation of the installation, reconnection of service pipes, prompt connection of new service pipes, etc. These matters need to response cooperation with the Client, the Consultant and the Contractor.
		② Are proper responses made to comments from the public and regulatory authorities?	
II Mitigation Measures	(1) Air Quality	Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?	There is no working condition because change of existing water treatment process and chlorine storage tank in existing water treatment plant is not planed.
	(2) Water Quality	Do pollutants, such as SS, BOD, COD, pH, etc. contained in effluents discharge by the facility operations comply with the country's effluent standards?	There is no significant impact in the project because change of existing water treatment process is not planed and effluents discharges comply with the country's effluent standards as before.
	(3) Wastes	Are wastes, such as sludge generated by the facility operations properly treated and disposed of in accordance with the country's standards?	There is no significant impact in the project because change of water treatment process is not planed and wastes treated and disposed properly as before.
	(4) Noise and Vibration	Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	There is no significant impact in the project because change of water treatment system is not planed.
	(5) Subsidence	In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	There is no significant impact in the project because extraction of groundwater is not planed.
III Natural Environment	(1) Protected Area	Is the project site located in protected areas designate by the country's laws or international treaties and conversions? Is there a possibility that the project will affect the protected areas?	There is no protected area in the project.
	(2) Ecosystem	① Does the project site encompass primeval forests, tropical rain forests, ecologically habitats (e.g., coral reefs, mangroves, or tidal flats)?	There is no impact to ecosystem because new water resource is not planed in the project.
		② Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	
		③ If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	
		④ Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate taken to reduce the impacts on aquatic environments, such as aquatic organisms?	
IV Social Environement	(1) Resettlement	① Is involuntary resettlement caused by the project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	There is no resettlement by the project implementation because the project is replacement and expansion of distribution pipes and the installations of pipes are all inside of existing public road.
		② Is adequate explanation on relocation and compensation given to affected persons prior to resettlement?	
		③ Is the resettlement plan, including proper compensation, restoration of livelihood and living standards and living standards developed based on studies on resettlement?	
		④ Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities and indigenous peoples?	
		⑤ Are agreements with the affected persons obtained prior to resettlement?	

Environmental Item		Main Check Items	Confirmation of Environmental Considerations
		⑥ Are the organizational framework established to properly implement resettlement? Are the capacity and budged secured to implement the plan?	
		⑦ Is a plan developed to monitor the impacts of resettlement?	
	(2) Life and Living	① Does the project affect person's life and living in bad? If bad affect is caused, is mitigation measures made to minimize to the bad affects?	There are limited affect of noise, vibration, wastes, transportation, etc. Necessary environment mitigation measures are to be implementing during the project.
		② Does water intake (surface water, groundwater) in the project affect existing water usage?	There is usually no significant impact because the project is not included new water resource development.
	(3) Cultural Heritage	Do the archaeological, historic, cultural, religious heritage and historic place, etc. are damaged in the project? If damage is caused, is appropriate measure taken into account comply with the country's laws?	There is no heritage and historic place in the project area.
	(4) Landscape	Does landscape affected bad in special? If affect is caused, is appropriate measure taken into account?	There is no affect landscape in the project because the project is replacement and expansion of distribution pipes.
	(5) Ethnic Minority and Indigenous People	① Does the law of right among ethnic minority and indigenous people?	There is no significant affect to ethnic minority and indigenous people.
		② Does mitigation measures be taken into account to cultural and style of living to ethnic minority and indigenous people?	
V Others	(1) Working Conditions	① Does mitigation measure prepared to pollutant (noise, vibration, dust, exhaust gas, wastes, etc.) dulling construction work?	Air Quality: There are some affect of dust to exiting house by installation of distribution pipes inside of existing public road in the city. It need to shortage time of excavation/backfilling and maintenance of road after backfilling. Wastes: It needs to transport and dispose the existing pipes which taken up to minimize the effect to surroundings. Noise and vibration: It need to avoid the insulation in night and holiday to minimize the effect to surroundings.
		② Does construction work affects bad to natural environment (ecosystem)? If affect is caused, is mitigation measure taken into account to the affect?	There is no significant affect to natural environment because the installation of distribution pipe is inside of existing public road.
		③ Does construction work affects bad to social environment? If affect is caused, is mitigation measure taken into account to the affect?	There is no significant affect to social environment because the installation of distribution pipes is inside of existing public road.
		④ Is appropriate safety training (traffic safety, public sanitation, etc.) taken to plan and implemented for worker involved in the project?	Condition of contract of construction is needed to plan of safety training (traffic safety, public sanitation, protection of accident etc.) in the project.
	(2) Monitoring	① Does environmental monitoring plan will be developed by the Client?	Monitoring such as noise, vibration, dust, exhaust gas, wastes, etc. is needed.
		② Do monitoring item, method, frequency evaluate in the plan?	
		③ Does monitoring institution (organization, manpower, equipment, budged, continuity, etc.) by the Client be developed?	
		④ Does the method of report, frequency from the Client to Authorities be regulated?	

6-3 Social Survey

It is necessary for water works to accelerate new service connections after completion of the project in order to uplift access to water supply. This social survey was carried out in manner of hearing by contract-out to collect following baseline data to use for project design and evaluate the post-project effect.

- Current condition of water use of domestic and commercial purposes
- Request of water users against water services
- Willingness to connect and water tariff system of non-connected residents in existing service area
- Willingness to connect and water tariff system of non-connected residents in future service area to be expanded
- Request of poor households to water supply services
- Current condition of water related diseases to be utilized for project evaluation

(1) Method of Survey

Survey area and sample numbers were classified into current service area (connected/ non-connected residents) and un-served area. Survey was conducted in manner of hearing to households and commercial utilities with sample number of each 100/site (300 in total). Table A6-3-1 shows the number of sample in the above areas.

Table A6-3-1 Classification and Number of Sample

Classification		Pursat		Battambang		Sihanoukville		Total	
		HHs	Others	HHs	Others	HHs	Others	HHs	Others
Service area	Connected	20 (10)	10	36 (16)	10	32 (14)	7	88 (40)	27
	Non-connected	20 (20)	0	4 (0)	0	8 (4)	3	32 (24)	3
Un-served area*[1]		50 (30)	0	40 (16)	10	40 (20)	10	130 (66)	20
Total		90 (60)	10	80 (32)	20	80 (38)	20	250 (130)	50
		100		100		100		300	

Note*1 Survey sites of un-served area were villages along pipeline routes to be expanded. Number of poor families in parenthesis was estimated by judging using building condition

Sample numbers were allocated as below.
Initially, [Existing service area (connected: non-connected) : Un-served area = 50（25 : 25）: 50, Households : Commercial establishment = 80 : 20] was planned, however, finally allocation was determined as shown in Table x-x considering the actual situation (For example: All business establishments are situated in the existing service area in Pursat, etc.).
Information on poor families was referred to poverty line of statistic department of Ministry of Planning. In applying criteria, building type was considered and almost a half of samples were subject to information collection of poor households. In hearing survey, the sample numbers of estimated poor households are indicated in a parenthesis of Table A6-3-1.

- Poor family: Wooden construction with single room
- Middle class family: Not in poor and middle class family
- High income family: Concrete construction with 2 floors

(2) Question items

Common question items and particular items for residential and business establishment are shown below.

< General Information >

- Location: Address, Service area or un-served area
- Audience: Sex, Age
- Condition of water use: Water source, Water consumption, Water tariff,

• Willingness to participate in the project:	Water quantity, water quality, Sewerage Willingness to connect/ Affordability to pay/ Connection fee, Cooperation in construction works

< Question Items for Residents >

• Economic:	Family income,
• Expense:	Electric/ Telephone, Housing condition/area
• Others:	Occupation, Family size, water related diseases

< **Question Items for Business Establishment >**

• Business type:	Hotel/ Guesthouse/ Restaurant,
• Scale:	Establishment year/ Number of rooms/ Seats/ area

(3) Results and Analysis

< Households >

To judge appropriateness of selecting criteria of poor households by building types, income/ house space/ family size were compared as shown in Table A6-3-2. Although there is difference among provincial capitals, the households surveyed were considered to be poor and others.

Table A6-3-2 Average Householder Income/ Housing Area/ Family Size of Poor Households judge by Housing Style

Classification		Pursat		Battambang		Sihanoukville	
		Poor 60	Others 30	Poor 32	Others 48	Poor 38	Others 42
Householder Income (US$/month)	Served area	78	248	255	300	232	698
	Un-served area	107	199	85	170	210	406
Housing Area (m^2)	Served area	33	67	76	147	96	113
	Un-served area	33	56	48	211	41	75
Family Size	Served area	5.4	5.5	4.6	5.6	5.6	5.3
	Un-served area	5.2	5.2	4.9	5.4	5.5	5.6

Poverty survey in nation and provincial level was not conducted. Poverty rate in Sihanoukville (2009) was reported as less than 0.50 US$/person-day but it was not analyzed by survey results.

Based on the international poverty line of 1.00 US$/person-day used by the WB survey, poverty line of householder income with 150 US$/month on conditions of 5 persons per household was adopted to analyze the cost of public services in Table A6-3-3. On this statistical data, there was no answer of total family income.

Table A6-3-3 Cost of Public Services classified by Householder Income

Classification				Pursat		Battambang		Sihanoukville	
Householder Income			US$/month	< 150	150 ≤	< 150	150 ≤	< 150	150 ≤
Sample HHs			Number	59	31	33	47	14	66
			Occupation	66 %	34 %	41 %	59 %	18 %	82 %
Householder Income			US$/month	71	252	100	286	74	467
Average Expense	Electricity		US$/month	6.86	17.42	9.69	20.69	15.57	32.64
			Rate per Income	9.7 %	6.9 %	9.7 %	7.2 %	21.0 %	7.0 %
	Telephone		US$/month	7.97	15.48	6.09	17.13	6.64	10.50
			Rate per Income	11.2 %	6.1 %	6.1 %	6.0 %	9.0 %	2.2 %
	Water	Total	US$/month	0.45	2.35	0.78	3.56	1.14	2.74
			Rate per Income	0.6 %	0.9 %	0.8 %	1.2 %	1.5 %	0.6 %
		User	US$/month	2.42	8.10	3.67	5.77	3.20	6.70
			Rate per Income	3.4 %	3.2 %	3.7 %	5.8 %	4.3 %	1.4 %
Per Capita GDP*[1]				385 US$/person-year		441 US$/person-year		1,235 US$/person-year	

Note*[1]: Source of IDE-JETRO, 2010. National average of per capita GDP was 509 US$/person-year.

Comparing of (a) poverty rate of 50 % by building type according to the Ministry of Planning and (b) poverty rate adopted householder income and international poverty line, per capita GDP has strong influence on poverty rate in survey areas. Generally, the tendency of Sihanoukville < Battambang < Pursat can be seen in poverty rate.
Based on the householder income, water tariff was the most low expenses rate among the public services. The reason of low expenses may be accessibility to other water sources other than public water supply. Since the data of waterworks users were analyzed, expense rate were estimated at 3 to 4 % of householder income, which has and extent of the mean value in developing countries.

< Business Establishment >

Business establishments were selected from restaurants and accommodation facilities of which ratio of service connection and water consumption were considered as relatively large. Criteria between hotel and guesthouse were based on accommodation of 10 people in their lobby. Table A6-3-4 shows the business scale by type within service area or un-served area.

Table A6-3-4 Business Scale by Type and Area

Site		Pursat		Battambang		Sihanoukville		Total	
Area		Served	Un-served	Served	Un-served	Served	Un-served	Served	Un-served
Restaurant	sample	5	0	3	10	2	7	10	17
	Seat	76	-	79	44	65	32	75	39
	Area m^2	434	-	289	366	115	226	327	309
Guesthouse	Sample	3	0	7	0	5	3	15	3
	Nos. of rooms	9	-	22	-	24	20	20	20
	Area m^2	238	-	143	-	498	211	280	211
Hotel	Sample	2	0	0	0	3	0	5	0
	Nos. of rooms	32	-	-	-	24	-	27	-
	Area m^2	393	-	-	-	365	-	376	-
Parameter	Sample	10	0	10	10	10	10	30	20
	Occupation	100 %	0 %	50 %	50 %	50 %	50 %	60 %	40 %

< Water use >

Target areas were classified by two categories of (a) Served area or un-served area, (b) connected or non-connected. Table A6-3-5 shows comparison regarding water source/ water quantity/ water quality/ water related diseases. Private water includes water from neighbor, water tanker, water by vendor and others.

As for Pursat, there is considerable number of households using pond and rain water. The relation between cause and effect was not cleared. However, the number of water related diseases in Pursat was higher than other provincial capitals in 2009. Likewise, it has been seen that the households connecting water supply maintain hygiene condition in Battambang and Sihanoukville.
With regard to service level of water works, the users evaluate water quality but negative water quantity. Especially in Battambang, there are problems of rationed water supply due to operation hour of water treatment plant (20 hrs/day) and insufficient capacity of distribution facility.

Water use, problems in terms of quantity and quality, sanitation facility were compared and shown in Table A6-3-6.
Followed by using public water supply at majority of business establishment in Pursat, private water (un-treated) using in Battambang and groundwater (well) using in Sihanoukville are outstanding. Since groundwater in Pursat and Battambang contains high iron concentration, some business establishments connect public water supply or use water tankers loading surface water. While, there is sufficient of groundwater and many business establishments are using wells in Sihanoukville. There was a hearing sample of saline water intrusion.

Table A6-3-5 Water Source, Quantity/Quality and Water Related Diseases

Water use (lower: sample nos.)		Pursat			Battambang			Sihanoukville		
		Served		Un-served	Served		Un-served	Served		Un-served
		Connected	Non connected		Connected	Non connected		Connected	Non connected	
		20	20	50	36	4	40	32	8	40
Water source	Pond/ Rainwater	-	13	36	-	0	9	-	0	0
	Private water	-	7	1	-	3	3	-	0	18
	Private + Well	-	0	0	-	0	2	-	0	0
	Well	-	0	13	-	1	26	-	8	22
	Public	20	-	-	35	-	-	25	-	-
	Public + Private	0	-	-	1	-	-	0	-	-
	Public + Well	0	-	-	0	-	-	7	-	-
Quantity	Low Pressure	7	-	-	12	-	-	5	-	-
	Rationed supply	6	-	-	35	-	-	7	-	-
Quality	Taste	0	10	12	0	3	15	0	2	0
	Odor	0	11	14	0	1	9	0	0	0
	Color/ Turbid	0	12	14	0	1	18	0	1	0
Water related diseases	Cholera	0	1	3	0	0	0	0	0	0
	Diarrhea	0	9	13	1	0	6	1	0	0
	Typhoid fever	0	7	12	0	0	1	0	0	3
	Malaria	0	3	4	0	0	0	0	0	0
	Dengue fever	0	4	15	1	0	1	0	0	1
	Skin disease	1	5	8	3	0	3	0	0	1

Table A6-3-6 shows comparison of water source/ quantity/ quality/ sanitation by business type.

Table A6-3-6 Water Source, Quantity, Quality and Sanitation by Area

Water use (below: sample nos.)		Pursat		Battambang		Sihanoukville	
		Served	Un-served	Served	Un-served	Served	Un-served
		10	0	20	10	20	10
Water source	Private water	0	0	10	9	3	3
	Well	0	0	0	1	10	7
	Public water	10	0	10	0	2	0
	Public + Well	0	0	0	0	5	0
Quantity	Low pressure	1	0	2	0	3	0
	Rationed supply	5	0	5	4	1	0
Quality	Taste	0	0	7	4	1	1
	Odor	0	0	3	4	0	0
	Color/Turbid	7	0	11	4	0	0
Sanitation	Sewerage	0	0	0	0	9	3
	Septic tank	10	0	9	3	0	1
	No treatment	0	0	11	7	11	6

< Possibility of Connection by Poor HHs and Business Establishments >

Table A6-3-7 represents survey result on un-served poor HHs with willingness to connect. As for Battambang and Sihanoukville, there were no respondents of poor HHs in service area.

High rates of willingness to connect were obtained at each provincial capital with condition of water tariff and connection fee. Most of respondents show their willingness as less than 5 US$/month and this corresponds to water consumption of 10 to 12 m^3/month. Subscribers may judge the water tariff system as normal according to the result in Table A6-3-3.

Table A6-3-7 Willingness to Connect and Pay, and Affordability for Connection

Un-served Poor HHs		Pursat		Battambang		Sihanoukville		Total	
		Served Area 18	Un-served Area 30	Served Area 0	Un-served Area 26	Served Area 2	Un-served Area 7	Served Area 20	Un-served Area 63
To Connect	HHs	15	29	-	15	0	6	15	50
	Occupation	83 %	97 %	- %	58 %	0 %	86 %	75 %	79 %
To Pay	1-2 US$/month	8	9	-	1	-	1	8	11
	2-5 US$/month	6	18	-	6	-	2	6	26
	5-7 US$/month	1	0	-	3	-	0	1	3
	> 7 US$/month	0	2	-	1	-	0	0	3
	As consumed	0	0	-	4	-	3	0	4
Affordability for Connection	< 25 US$	3	5	-	1	-	4	3	10
	25 - 50 US$	0	7	-	6	-	1	0	14
	50 − 75 US$	10	4	-	3	-	1	10	8
	75 - 100 US$	2	2	-	4	-	0	2	6
	> 100 US$	0	15	-	1	-	0	0	16
	Ave. US$	50	79	-	67	-	34	50	70

Gradual increasing tariff charge system was applied only at Sihanoukville. Water tariff system including basic tier rate by connection pipe diameter and gradual increasing will make better influences for un-served poor HHs, since any water tariff system for poor HHs was not enforced yet as of now.

Majority of respondents show their affordability to pay for connection fee as less than 75 US$. As for the HHs with householder income of less than 150 US$/month, 20% of them show affordability to pay for connection fee as more than 100 US$. It may be caused of householder income. The said HHs would be fallen on middle or high class if family income was considered.

Figure A6-3-1 shows relation between connection fee and number of willingness to connect. There are possibility to include samples of middle and/ or high income households, however, it indicates that more than 75% of poor HHs are willing to connect within 40 US$ of connection fee. According to the present connection fee system, it will be possible to reduce the said fee up to 40 US$ if saddle clamp and water meter are free of charge. Additionally, service connection to small service pipes makes the connection fee exemption, which was included into this project. Some respondents expressed that connection fee should be included in water tariff.

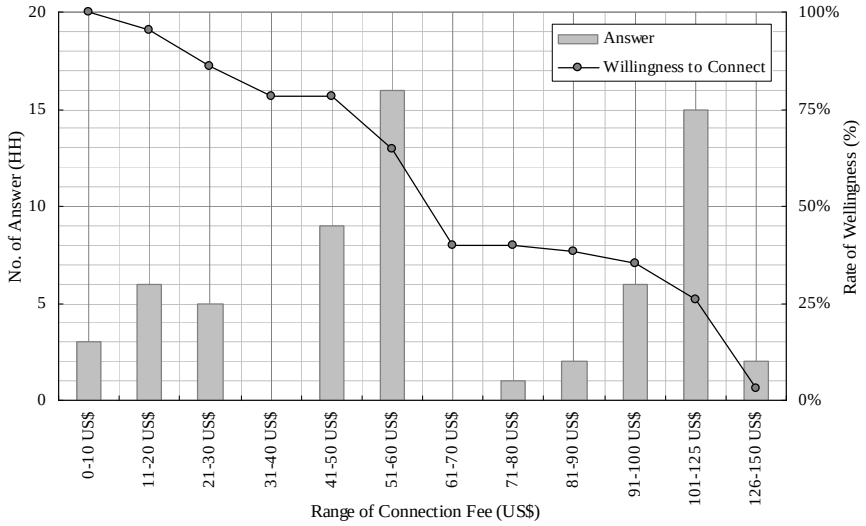


Figure A6-3-1 Relation between Connection Fee and Willingness to Connect by Poor HHs

Provision of connection materials will be effective to promote the service connection by poor HHs upon completion of this project. To design the provision number of materials until the

project target year, following information was analyzed as shown in Table A6-3-8. The materials to be used for the service connection to existing pipeline, poor rate of present users was adopted because poor rate of un-served users in service area has vary widely.

- To new Pipeline: Poor HHs Rate by International Poverty Line within un-served area and willingness to connect
- To existing Pipeline: Poor HHs Rate of users by International Poverty Line within service area

Table A6-3-8 Poor HHs Rate for Promotion of New Connection

Conditions		Pursat	Battambang	Sihanoukville
To New Pipeline	HHs with service area and want to connect	66	21	36
	HHs within International Line among above	41	15	6
	Poor HHs Rate along expansion area	62 %	71 %	19 %
	Poor HHs Rate to be adopted	60 %	70 %	20 %
To Existing Pipeline	Number of Users	20	36	32
	HHs within International Line among above	11	7	5
	Poor HHs Rate within existing service area	55 %	19 %	16 %
	Poor Rate to be adopted	55 %	20 %	15 %

Although samples of non-connected business establishments are small (23), it is considered that 87 % of poor HHs are willing to connect as shown in Table A6-3-9. Un-served business establishment has own water source. Connection number will be gradually increased because their facility depreciation and cost for connecting public water supply.

Table A6-3-9 Willingness to Connect, Affordability to Pay and Connection Fee

Type Sample nos.		Restaurant 17	Guesthouse 4	Hotel 2
Willingness to connect	Sample	15	4	1
	Ratio	88 %	100 %	50 %
Water tariff	5-10 US$/month	1	1	0
	10-20 US$/month	5	0	1
	> 20 US$/month	0	0	0
	by Consumption	9	3	0
Connection fee	< 25 US$	3	1	0
	25 - 50 US$	3	1	0
	50 − 75 US$	1	0	0
	75 - 100 US$	7	1	1
	> 100 US$	1	1	0
	Ave. US$	72	74	100

(4) Considerations

Based on the mentioned above, the findings are below.

- Request of current users is water services with are proper water supply pressure and 24 hours water supply.
- It is estimated that there is difference in water related diseases between connected and non-connected residents even though the relationships were un-cleared.
- It is necessary to carry out promotion/ public information in order to encourage business establishments using other water sources to connect public water supply.

The following matters are recommended in planning of the project.

- Promotion of new connection by poor HHs will be expected by subsidy (provision of service connection materials/ mitigation of connection fee).

6-4 Topographic Survey

Topographic survey was conducted in order to grasp current topographic conditions including ground elevation, layout of buildings along proposed distribution pipelines for planning and designing distribution pipelines.

Table A6-4-1 Quantity of Topographic Survey

Items	Discription
Route survey longitudinal profile	Distribution pipelines 1) Pursat: L= 27.7km 2) Battambang: L= 50.6km 3) Sihanoukville: L= 29.5km Measuring interval: Max. 100m, detailed survey was done at changing points such as crossing bridge, culvert, etc. Scale H=1/1000、V=1/100
Cross section	Measuring interval: 100m, 50m cross section Scale H=1/100、V=1/100

6-5 Technical Specifications of Major Materials to be procured

(1) Flow Monitoring System

＜Water Flow Meter＞

Type:	Electro Magnetic or Turbine Type Flow Meter	
	Flange Connection (PN16), IP68, Built-in Battery Type	
Material:	Body:	FDC450 or equivalent (Manufacturer Standard)
	Inner pipe:	SUS 304 or equivalent (Manufacturer Standard)
	Turbine:	SUS 304 or equivalent (Manufacturer Standard)
Accuracy:	± 2.0 %or less	
Indicator:	Built-in digital indicator, Flow rate and total	
	Output:	analog 4-20 mA with Cable Termination
Power:	Built-in Lithium Battery	
Battery Life:	Approximately 10 years or more	

＜GSM Modem (Local Station)＞

Type:	Built-in Battery Powered GSM Telemetry Data Logger, IP68	
Power:	Built-in Lithium Battery	
Battery Life:	Approximately 10 years or more	
Main Function:	Data Logger:	minimum 200 DI/O per day with minimum 30 days backup
	Data Upload:	to send the storage data per day automatically
	Alarm:	to send message by SMS immediately
	LCD Display:	for setting

＜Telemeter Central Panel＞

Type:	Metal enclosed, Self-standing, Indoor use, IP21	
Power:	AC220V (UPS)	
Main Component:		Breaker: MCCB 50A,MCBx5
	1ndicator:	Voltmeter
	Transducer:	Manufacturer Standard
	PLC:	for data processing and transmission
	GSM modern:	SIM slot, RS-232 interface, DTR triggered for dialing and SMS,
		Antenna

＜Monitoring System＞

Type:	PC monitoring System for flow data
Local Station:	5-10 1ocations
Data:	Flow rate of every 10 minutes, Max flow rate, Min flow rate, Total flow (for each station daily)
Industrial PC:	Latest Intel CPU, Windows OS, 20-in LCD display
Software:	General use software such as Excel to show the data, trend and report
Printer:	Laser printer, A4
UPS:	3kVA 30 minutes back-up
Other:	Monitoring desk and chair

(2) Flow Control System

＜Valve Control Panel (Master Station)＞

Type:	Indoor use, metal enclosed, corrosion resistant, with steel base (IP42)
Quantity:	1 unit
Function:	a. Power receiving by 3-phase 380V b. Telemetry and telecontrol for three numbers of valves two for by control cable and one for by optic communication
Main components:	Manufacturer’s standard

MCCBs
Relays and protection devices
PLC, I/O converter, 1 set
Opening degree indicators, 3 sets
Control switches, 3 sets
Status indications, 3 sets
Alarm indicators, 3 sets

＜Valve Control Panel-1 (Local Station)＞

Type: Outdoor use, metal enclosed, corrosion resistant, with steel base (IP54)
Quantity: 2 units
Function: a. Power receiving by 3-phase 380V
b. Control of butterfly valve (adapted motor 0.75 kW of 1 unit)
c. telemetry and telecontrol by cable communication (local station)
Main components: Manufacturer's standard
MCCBs
Relays and protection devices
Ammeter, 1 set
Voltmeter, 1 set
Opening degree indicator, 1 set
Changeover switch, 1 set (local-remote)
Control switch, 1 set
Status indication, 1 set
Alarm indicator, 1 set

＜Valve Control Panel-2 (Local Station)＞

Type: Outdoor use, metal enclosed, corrosion resistant, with steel base (IP54)
Quantity: 2 units
Function: a. Power receiving by 3-phase 380V
b. Control of butterfly valve (adapted motor 0.75 kW of 1 unit)
c. telemetry and telecontrol by optical cable communication (local station)
Main components: Manufacturer's standard
MCCBs
Relays and protection devices
PLC, I/O converter, 1 set
Ammeter, 1 set
Voltmeter, 1 set
Opening degree indicator, 1 set
Changeover switch, 1 set (local-remote)
Control switch, 1 set
Status indication, 1 set
Alarm indicator, 1 set

＜Optical Cable＞

Type: 4 core quartz single-mode
Distance: 680 m, Master station to valve control panel (C)
Communication test shall be included for each section and other necessary equipment for data transmission such as terminals shall also be included in the cost.

(3) Materials for Service Pipe Connection

＜Water Meter＞

Description: Volumetric Type defined in ISO 4064-1.
Material: Main Casings: Totalizer cap/ cover shall be either a copper alloy containing;
(a) not less than 75% copper or

(b) not less than 57% copper with anti-corrosion treatment.

	Connections:	Threaded to BSP male 15A made from material
	Painting:	NOT to be painted.
	Seals:	All meters shall be sealed before shipment with non-corrosion.
	Marking:	Being marked on the casing with the following information. Size, Flow Direction, Brand, Year and the S/N
	Registers:	Being housed in a shockproof synthetic polymer container.
Functions:	Class:	The class “C” of the ISO 4064/1
	Accuracy:	not less than 98 % nor more than 102 %
	Performance:	actual meter performance curves verified by authorities
	Head loss:	not exceeding 10 meters
	Pressure:	16 Bars with test pressure of 22.5 Bars

(4) Connector of HDPE

＜Connector for HDPE＞

Type:	Socket fusion connector	
Functions:	Size:	Applicable from the size of 15A to 65A
	Input Power:	220 V
	Consumption:	800 W
	Wight:	less than 3.0 kg including case