FY2012 Report of the International Cooperation Project Study Committee in the Water Supply Sector

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JICWELS

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Introduction

Water supply facilities for safe drinking water have not been sufficiently developed in developing countries, and it is a basic human needs (BHN) issue necessary to be improved. International cooperation in the water supply sector has been provided mainly through facility development and technical cooperation; however, there remain many issues, including the gap between urban and rural water supply, the relationship between water supply and sanitation, public-private partnerships, the application of diversified technologies to local situations, the development of appropriate technologies, and cooperation across various sectors.

Commissioned by the Ministry of Health, Labour and Welfare (MHLW), Japan International Corporation of Welfare Services (JICWELS) established the International Cooperation Project Study Committee in the Water Supply Sector, which studies "the role of international cooperation in the water supply sector". The past studies include "organizing information about objectives, topics, and materials of existing trainings in Japan, and specifying issues for the future" in 2009; "organizing information about trainings related to technical cooperation projects or implemented by other donors" in 2010; and "following up of trainees based on questionnaires and a field survey, and discussing an effective training implementation structure and method with public-private partnerships based on questionnaires" in 2011.

In developing countries' water supply sector, there is still a strong need for the expansion of water supply facilities as well as the development of engineers' capacity. On the other hand, since the development of facilities has started in the early stages in relatively large urban areas with the help of ODA and other assistants, aging and renewal of such facilities have become issues recently. Therefore, it is necessary to soundly manage projects with well-planned implementation of facility expansion and renewal of aging facilities. Most of the assistance for developing countries has been in a tangible manner such as facility development and operation and maintenance (O&M); however, it is expected to be more important to promote assistance and information sharing that enables developing countries' water utilities to independently create and implement project planning and management planning.

For this fiscal year, we studied, based on the result of the 2011 report, the role of assistance that has strong needs in developing countries, such as water demand projection, facility development planning, facility renewal planning, performance indicators (PI), visions for local water supply, and project planning with asset management (hereinafter referred to as "water supply planning"). Specifically, we organized information about JICA's technical cooperation projects and trainings for developing countries from the perspective of water supply planning and its

implementation. We also conducted a field survey with interviews to understand the current situation and issues in water supply planning in some developing countries. Using the results of these studies, we discussed the future direction of development assistance in water supply planning and implementation. This report summarizes the outcome.

We expect that this report will help the independent management of water utilities in developing countries.

The names listed below are the members of the Study Committee for FY2012 and the observers who have provided their cooperation.

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The Study Committee met on 4 occasions during FY2012. The dates of the meetings are as follows:

- 1st Meeting Wednesday, September 12, 2012
- 2nd Meeting Friday, October 12, 2012
- 3rd Meeting Monday, February 4, 2013
- 4th Meeting Tuesday, March 5, 2013

Chapter 1: Background

1.1 Background

International cooperation in the water supply sector has been mostly in facility development ("hard" aspects) as well as technical cooperation including operation and maintenance (O&M) and drinking water quality management.

In developing countries, there are strong needs for the development of water supply facilities in uncovered areas as well as for the expansion of existing facilities to correspond to the increasing water demand caused by population increase, economic development, and other reasons. Needs for engineers' capacity development necessary for such facility development are also strong. While most of the assistance has been provided for operation and maintenance techniques and non-revenue water reduction, it is necessary to recognize the importance of support for project planning, financing, and management. As for developing countries, they still tend to focus on facility development, but they also need to share the importance of the planning of project management and soundness of financing and management. Also, executive officers in developing countries, there are strong needs for the management of the overall water supply operation instead of assistance in specific skills, which indicates their understanding for the importance of these issues.

It would be important for sustainable development of water utilities in developing countries that they themselves make and renew plans for overall water supply operation then implement projects as they planned. However, although past assistance has put in place frameworks for planning and monitoring, there are still many utilities that are unable to make and renew short-term plans by themselves. Moreover, there is a lack of frameworks for project planning based on mid- and long-term water demand forecast and financial balance projection, which is necessary for the expansion and renewal of water supply facilities; therefore, most water utilities do not have mid- and long-term operation plans.

Responding to such situations in developing countries, Japan International Cooperation Agency (JICA) started technical cooperation projects aiming at the "enhancement of capacities for water supply planning and implementation" and "improvement of capacities for financial management planning" in 2012. This type of cooperation for planning and implementation of overall water supply operation is expected to increase in the future.

Past technical cooperation projects tended to focus on specific techniques, in which counterpart water utilities learned manuals and case studies in Japan, created training materials, and then disseminated relevant techniques. However, mere introduction of manuals would not help self-reliant planning and implementation of water supply operation. The recent projects mentioned above are also experiencing a process of trial and error, and a key issue that would determine the success of the projects is whether counterpart utilities will understand the importance of sustainability and be independent-minded. The understanding

and cooperation of high-rank officials in developing countries is important for this matter.

In addition, while systems and economic situations greatly differ among developing countries, they also differ within a country. Levels of water supply also vary. Therefore, it is necessary to take into consideration the actual situation of the target country or region when discussing assistance policies for developing feasible operation planning and future visions. In this matter, there are issues in the selection of pilot project cities for technical cooperation projects. Moreover, Japan has some issues as a donor; for example, Japan's knowledge about water supply operation is mostly held by water utilities, but it is difficult to dispatch officials knowledgeable about operation planning and management abroad because their organizations will face another challenge to find staff for their vacancy positions.

1.2 Objective

Corresponding to the background mentioned above, the objective of our study this year is to discuss the role of development assistance in planning and implementation for overall water supply operation (hereinafter referred to as "water supply planning"). Specifically,

- We organized information about the past trainings and technical cooperation projects for developing countries from the perspective of water supply planning and its implementation.
- We conducted a field survey with interviews to understand the current situation and issues in water supply planning in some developing countries.

Using the result of these studies, we discussed the future direction of development assistance in water supply planning and implementation, which takes into account the actual situation of developing countries.

Chapter 4: The role of development assistance in water supply planning and implementation

4.1 Organizing assistance information and categorizing topics based on a field survey

In Chapter 2 of this report, we clarified which topics in water supply planning are covered by JICA's past technical cooperation projects and trainings. The result is partly shown in Table 4-1.

In Chapter 3, we grasped the levels of "understanding of the current situation," "achievement," and "priority" in water supply planning by interviewing 14 water utilities in Cambodia and Laos (see Table 4-2). Questions asked to determine "the level of understanding of the current situation" and "the level of achievement" are shown in Tables 4-3 and 4-4. In this report, we consider "the level of understanding of the current situation" and "the level of achievement" to be "high" when all cities answered "yes" for each topic. On the other hand, we consider "the level of understanding of the current situation" and "the level of achievement" to be "low" when at least one city answered "no." Also, we consider "priority" to be "high" if interviewees think the topic is important and "medium" for others.

In this chapter, we put together the result of Chapter 2 and 3 in order to discuss the future direction of development assistance. Although "sufficiency of electricity" is not considered in Chapter 2, we include this topic in this chapter as "others", because securing sufficient electricity seems quite important for stable water supply, with many interviewees commenting on the lack of electricity during the field survey.

We were not able to conduct enough interviews on future plans and asset management during the field survey. However, similar topics are included in water supply planning such as "current condition of facilities, facility renewal plan, and assets" in facility planning, and these topics are interrelated. Therefore, we take future plans and asset management into consideration as much as possible when analyzing solutions.

Table 4-1: Past assistance and topics

Past assistance	Topics
1. Technical cooperation projects: many Trainings: many	● drinking water quality standards ● facility development - water purification plant capacity - population served and water supply volume - facility capacity - non-revenue water rate ● dissemination of house connection ● management/finances ● customer services
2. Technical cooperation projects: many Trainings: few	● facility renewal plan ● human resource development system
3. Technical cooperation projects: few Trainings: many	● volume of water resources ● contingency plan ● implementation of environmental measures
4. Others	● sufficiency of electricity

Table 4-2: Interviewed cities

Laos		Cambodia		
Major Cities	Regional Cities	Major Cities (with TC*)	Regional Cities (with TC*)	Regional Cities (without TC*)
● VIENTIANE ● LUANG PRABANG	● KHAMMOUANE	● SIEM REAP	● KAMPOT ● KAMPONG CHAM ● KAMPONG THOM ● SIHANOUK VILLE ● SVAY RIENG ● BATTAMBANG ● PURSAT	● STOENG TRENG ● STOUNG ● TAING KRASAING

* TC: technical cooperation projects

Table 4-3: Questions to grasp the level of understanding of the current situation

a-1	Whether they understand the capacity of existing water purification plants (water purification plant capacity)
a-2	Whether they understand the current number of population served and the past record of water supply volume (population served and water supply volume)
a-3	Whether they understand the capacities of existing water distribution facilities and pump stations (facility capacity)
a-4	Whether they understand the current level of non-revenue water (non-revenue water)
a-5	Whether they understand the capacities of existing water resources (volume of water resources)
a-6	Whether they understand the current number of house connections (dissemination of house connections water supply)
a-7	Whether they have drinking water quality standards (drinking water quality standards)
a-8	Whether they understand the current situations of management and finances (management/finances)

Table 4-4: Questions to grasp the level of achievement

b-1	Whether they are able to supply water 24 hours a day (facility development)
b-2	Whether they have enough water resources to ensure a stable supply (volume of water resources)
b-3	Whether they are able to supply by house connections (dissemination of house connections)
b-4	Whether they are able to supply water that meets their national drinking water quality standards (drinking water quality standards)
b-5	Whether they have an independent accounting system (management/finances)
b-6	Whether they have a contingency plan for emergency situations including water quality problems, water leakage accidents, and disasters (contingency plan)
b-7	Whether they understand the current situation of aging facilities and have plans for renewing them (facility renewal plan)*
b-8	Whether they are committed to improving services such as customer service windows, information provision and disclosure, and tariff payment options (customer services)
b-9	Whether they are committed to providing human resource development, education, and trainings in order to secure waterworks engineers and enhance their skills (human resource development system)
b-10	Whether they are committed to environmental measures including energy saving and waste recycling (implementation of environmental measures)
b-11	Whether they have sufficient electricity for water supply (sufficiency of electricity)

* This question is asking both the level of understanding and the level of achievement

4.2 Proposed solutions for each topic

4.2.1 Topics assisted by many technical cooperation projects and many trainings

(1) Drinking water quality standards

Assistance for improving "drinking water quality" has been intensive. Some projects have been implemented for securing drinking water quality standards, from water resources to water distribution, with reference to "Guidelines for Drinking-Water Quality (WHO)" and "Guidelines for Water Safety Plan (MHLW, in Japanese)". JICA's technical cooperation project, "Project on Human Resources Development for Water Sector in the Middle Region of Vietnam," is a good example of Japan's assistance.

In major cities in both Laos and Cambodia, levels of understanding and achievement are high and have seemingly reached a certain standard. As a result, priority is relatively low. For future assistance, it is important to keep assistance in the development and enhancement of systems that enable sustainable drinking water quality management.

In regional cities in Laos, the level of understanding is high with recognition of drinking water quality standards, but the level of achievement is low because they do not have sufficient systems for drinking water quality analysis. The reason for low priority despite the low level of achievement may be that the priority for facility expansion is higher. In regional cities in Cambodia, although one of the cities with technical cooperation projects shows low level of understanding, the level of achievement is high. On the other hand, cities without technical cooperation projects show low levels in both understanding and achievement. Priority tends to be relatively high in Cambodia's regional cities. Some cities may not have met WHO's guidelines due to their facilities and economic situations. For future assistance, it is important to support drinking water quality standards establishment and monitoring planning that take into consideration the local conditions.

Table 4-5: Levels of understanding of the current situation, achievement, and priority for "drinking water quality standards"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	High	High	High	Low	Low
Level of Achievement	High	Low	High	High	Low
Priority	Medium	Medium	Medium	High	High

Level of understanding: judged by "a-7 Whether they have drinking water quality standards"
Level of achievement: judged by "b-4 Whether they are able to supply water that meets their national drinking water quality standards"

(2) Facility development (water purification plant capacity, population served and water supply volume, facility capacity, and non-revenue water rate)

In developing countries, there are strong needs for facility development and expansion in order to correspond to the increase in demand, and there has been much assistance in this area.

It is particularly important to accurately understand the current situation of water supply operation; therefore, it is necessary to collect and organize information that would be a basis for water supply planning (including population served and past record and future projection of water supply volume) and to make a database of facility information.

The level of understanding for these topics is high in both major and regional cities. On the other hand, the level of achievement tends to be low, except in one major city in Cambodia, because most of them are unable to supply water 24 hours a day. Therefore, they still need to expand their operation regardless of major or regional cities, and this may be a reason for high priority in most cities.

"Design Criteria for Water Supply Facilities (Japan Water Works Association (JWWA))" has been used as a reference for these basic-planning-related topics. For future assistance, it is important to organize manuals and other existing information, to provide common formats, and to instruct water utilities in developing countries so that they themselves become able to make basic plans. As a first step, major cities themselves, which have sufficient human and financial resources, should become able to make a long-term basic plan including facility and operation improvement; then, a framework for disseminating such activities to regional cities should be provided.

Table 4-6: Levels of understanding of the current situation, achievement, and priority for "facility development"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	High	High	High	High	High
Level of Achievement	Low	Low	High	Low	Low
Priority	High	High	Medium	High	High

Level of understanding: judged by "a-1 water purification plant capacity", "a-2 population served and water supply volume", "a-3 facility capacity", and "a-4 non-revenue water"
Level of achievement: judged by "b-1 Whether they are able to supply water 24 hours a day"

(3) Dissemination of house connections

There has been much assistance in “dissemination of house connections”. The level of understanding is high in both major and regional cities, with all target cities answering that they understood the dissemination status of the current house connection. The level of achievement is also high in all cities because they are working on house connection in their service areas. Priority is also high in many cities.

On the other hand, some target cities have a low dissemination rate; therefore, continuous assistance in expanding house connection is necessary.

Similar to the topics under “facility development” mentioned above, understanding the current status and projecting future trends of “dissemination of house connection” are important to make basic plans for water supply operation. It is necessary to incorporate the dissemination of house connection into basic plans, while coordinating with upper-level plans such as city plans and regional plans.

For future assistance, it is important to support water utilities in developing countries so that they themselves become able to make house connection dissemination plans, taking into consideration the coordination with upper-level plans and long-term visions of water supply improvement. It is also important to provide a framework in which experience of major cities with relatively high house connection dissemination rates will be smoothly transferred to regional areas.

Table 4-7: Levels of understanding of the current situation, achievement, and priority for “dissemination of house connection”

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	High	High	High	High	High
Level of Achievement	High	High	High	High	High
Priority	High	High	Medium	High	High

Level of understanding: judged by “a-6 Whether they understand the current number of house connections”
Level of achievement: judged by “b-3 Whether they are able to supply by house connection”

(4) Management/finances

There has also been much assistance in “management/finances”.

Most utilities answered during the interview that they submit financial reports to governmental institutions. Therefore, the level of understanding is high regardless of major

or regional cities. There is only one agency with technical cooperation projects in Cambodia that showed low level of understanding.

In this report, we judge the level of achievement by the question “whether they have an independent accounting system”, and the answer was “yes” for all target cities.

We find that priority is relatively low through the interviews. Water utilities in developing countries may tend to think that a deficit is not a problem as far as they understand their financial situation. Currently, most water utilities, except a limited number of major cities and tourist cities, are quite far from the self-supporting accounting systems that we have in Japan. Therefore, when we actually try to ensure economic profitability in developing countries, it is necessary to discuss realistic management policies that suit the actual local situation, such as impossibility of operation management without assistance. As a first step of assistance, they need to accurately understand their financial status using a uniform perspective, with a reference to “Guidelines for the management and assessment of a drinking water supply service (JWWA Q100) (JWWA)”, and then consider a phased approach for recovering costs based on the actual situation, such as the local policies and economic conditions.

For future assistance, it is necessary to organize available management information as well as calculate the cost for future facility development and renewal and discuss measures for sound, sustainable management.

Table 4-8: Levels of understanding of the current situation, achievement, and priority for “management/finances”

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	High	High	High	Low	High
Level of Achievement	High	High	High	High	High
Priority	Medium	Medium	Medium	Medium	Medium

Level of understanding: judged by “a-8 Whether they understand the current situations of management and finances”
Level of achievement: judged by “b-5 Whether they have an independent accounting system”

(5) Customer services

For improving customer services, some assistance has been provided for the establishment of customer centers handling complaints and leakage problems and the enhancement of understanding for water tariff.

The level of achievement tends to be high in major cities and low in regional cities. Priority is relatively lower in both major and regional cities. However, during interviews, they seemed to recognize the importance of customer services including customer service window, tariff collection, and educational activities for sanitation.

For future assistance, there is a need for supporting publicity activities including health education and announcement of financial situation to residents using performance indicators (PI). For practical operation such as tariff collection and meter reading, "Manual of routine works in water supply services (JWWA, in Japanese)" may be a good reference. Furthermore, once they reach a higher level of water supply operation, it may be possible to introduce publicity activities, using "Manual of public relations in water supply services (JWWA, in Japanese)" and other similar materials.

However, given that the most important service for water utilities is to supply residents with water, it is important to set service-level goals with consideration for the fact that many cities are not yet able to supply water 24 hours a day.

Table 4-9: Levels of understanding of the current situation, achievement, and priority for "customer services"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	-	-	-	-	-
Level of Achievement	High	Low	High	Low	Low
Priority	Medium	Medium	Medium	Medium	Medium

Level of understanding is not identified.
Level of achievement: judged by "b-8 Whether they are committed to increasing customer services"

4.2.2 Topics assisted by many technical cooperation projects but few trainings

(1) Facility renewal plan

"Facility renewal plan" has been assisted mainly by technical cooperation projects. In the field site of developing countries, the necessity of facility renewal due to aging and other reasons started to be recognized.

The level of achievement tends to be low in regional cities. As for priority, while there was no clear comparison between major and regional cities, it tends to be relatively high from the perspective of facility development.

In developing countries, there are some cases where facility information (such as ages

and materials) is not fully available. In order to prepare for future maintenance and renewal, it is important to "diagnose facility functions" and to "calculate estimated cost for future facility renewal." Facility information and other necessary information started to be collected with JICA and other assistance.

For future assistance, it is important to support, from the viewpoint of asset management (AM), well-planned facility renewal planning and asset management. Phased assistance may be important in this field; in major cities, it is particularly important to support detailed review of existing facility information as well as long-term facility planning, and in regional cities, they may need assistance in accurate data gathering. Good references for providing such assistance are "Water Supply Facilities Renewal Guidelines (JWWA, in Japanese)", "Guidelines for Diagnosing Functions of Water Supply Facilities (MHLW, in Japanese)", and "the Guideline on Asset Management in Water Utility (MHLW, in Japanese)". At the same time, we also need to pay attention to the trend of international standards on asset management to be set by ISO/PC251 and ISO/TC224, which are planned to be issued in the near future. It may be one way of assistance to increase the number of trainings on those topics.

In addition, some interviewees answered that they "have data but no funding"; therefore, it may also be necessary to provide instruction in financing and other related key ideas of renewal planning.

Table 4-10: Levels of understanding of the current situation, achievement, and priority for "facility renewal plan"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	High	Low	High	High	Low
Level of Achievement	High	Low	High	High	Low
Priority	High	High	Medium	High	Medium

Both the level of understanding and the level of achievement are judged by "b-7 Whether they understand the current situation of aging facilities and have plans for renewing them"

(2) Human resource development system

Much assistance has been done for the "human resource development system", particularly in the form of technical cooperation projects. Also, there are an increasing number of countries where training centers have been established.

In major cities, the level of achievement is high. In contrast, the level of achievement in regional cities tends to be low. Priority was high in Cambodia. During interviews in Laos, they told us, "facility development is the most important, but human resource development is the next"; therefore, it is expected that priority is relatively high in all cities.

There are some references on the framework of human resource development, such as "Case Studies of Capacity Development: Human Resource Development in the Water Supply Sector (JICA, in Japanese)" as well as guidelines for human resource development formulated by local governments in Japan. We can use these documents as reference when providing assistance.

For future assistance, it is important not only to develop individual technical programs, but also to establish a framework at the national level with fundamental policies for ensuring technical basis and then to get the framework entrenched in the whole country or the whole region. It is also important to increase their knowledge about human resource development by showing Japan's training system through trainings.

A framework would better include not only human resource development in technical aspects, but also human resource management in proactive management and human resource exchange between the national and regional levels and among regional levels.

Table 4-11: Levels of understanding of the current situation, achievement, and priority for "human resource development systems"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	-	-	-	-	-
Level of Achievement	High	Low	High	Low	Low
Priority	Medium	Medium	High	High	High

Level of understanding is not identified.
Level of achievement: judged by "b-9 Whether they are committed to providing human resource development, education, and trainings in order to secure waterworks engineers and enhance their skills"

4.2.3 Topics assisted by few technical cooperation projects but many trainings

(1) Volume of water resources

While there are not many technical cooperation projects in "Volume of water resources", this topic is covered by many training lectures related to water resources. Even in developing countries, it is understood that water supply operation should ensure stability in both water

volume and drinking water quality.

The level of understanding is high in both major and regional cities. This may be because surveys on water resources were conducted at the early stage of assistance for water supply operation, and the counterparts well understood the importance. On the other hand, the level of achievement tends to be low even in major cities. However, there are some regional cities with a high level of achievement. It may be because water volume is subject to natural conditions. Priority is relatively lower in major cities, while it is relatively high in regional cities.

For future assistance, it seems to be necessary to provide support in planning and implementation for securing stable water resources, corresponding to the increase in water demand.

Technical cooperation projects in this topic usually included "integrated water resource management", which is a framework for water resource development and management as well as for fair and effective water use and control in cooperation with other water-related sectors such as agriculture. There have also been some trainings in this topic. However, there have been a limited number of projects in securing water resources mainly for water supply operation.

Through technical cooperation projects and trainings, it is important to show Japan's knowledge and experience in "integrated water resource management" to water utilities in developing countries, and to instruct them in water resource management including drinking water quality control, water resource management, and effluent treatment particularly for water supply operation.

Table 4-12: Levels of understanding of the current situation, achievement, and priority for "volume of water resources"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	High	High	High	High	High
Level of Achievement	Low	High	Low	Low	High
Priority	Medium	Medium	Medium	High	High

Level of understanding: judged by "a-5 Whether they understand the capacities of existing water sources
Level of achievement: judged by "b-2 Whether they have enough water resources to ensure a stable supply

(2) Contingency plan

"Contingency plan" is generally understood as a secondary step in developing countries where water supply operation is still developing; however, considering the case of Thailand, which experienced a flood disaster in 2011, it became more important to prepare countermeasures and plans in emergency situations, such as preparing water tank trucks, securing drinking water, and facility backup.

The level of achievement tends to be high in major cities, while it tends to be low in regional cities. Priority tends to be low in both major and regional cities. Also, in Cambodia, one of their responses was that "there is a contingency plan for power cut but not for disasters."

For reference, "Manuals of emergency in earthquake and disasters (JWWA, in Japanese)" illustrates the establishment of a support system and actual execution of support activities by water utilities and related institutions, and "Lessons from Water Supply Accidents (JWWA, in Japanese)" shows how to respond to various accidents. Since many emergency measures have been introduced in training lectures, technical cooperation in this field is also possible for the future, taking into account local needs and conditions. For such assistance, because the types, scales, and frequencies of emergency situations (such as disasters and accidents) differ by regions and countries, it is necessary to take phased steps appropriate for the target regions and countries, based on basic information about their natural conditions and economic situations.

It is also important here to provide assistance in the development of a phased framework in which national-level measures are determined first, and then regional-level implementation structures are established.

Table 4-13: Levels of understanding of the current situation, achievement, and priority for "contingency plan"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	-	-	-	-	-
Level of Achievement	High	Low	High	High	Low
Priority	Medium	Medium	Medium	Medium	Medium

Level of understanding is not identified.
Level of achievement: judged by "b-6 Whether they have a contingency plan for emergency situations"
* In Cambodia, they responded that they have no measures for disasters.

(3) Implementation of environmental measures

Both the level of achievement and priority for the "implementation of environmental measures" are not high regardless of major and regional cities. During interviews in Laos, they answered that they were "interested in energy saving but do not know what kind of technologies are actually available". Due to the lack of electricity and the high tariff, the interest in energy saving is increasing in developing countries. Particularly, there is a strong need for reducing the amount of power needed for water distribution.

Also, in Vientiane, they dump sludge from water purification plants into the Mekong River. It illustrates that they have little sense of waste treatment in developing countries, including effective utilization of sludge.

For future assistance, it would be possible to provide support in planning and implementations of energy savings and other measures, by introducing and assisting energy saving pumps and water supply management planning, with reference to "Guidelines for Environmental Measures in Water Works Operations (MHLW, in Japanese)" and "environmental accounting" reported by water utilities in Japan. It is also important here to provide assistance in technologies that can be introduced in phased steps, based on information about actual situations of energy use and waste treatment as well as economic scales. Moreover, it is important to consider the introduction of facilities that use the least possible energy.

Table 4-14: Levels of understanding of the current situation, achievement, and priority for "implementation of environmental measures"

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	-	-	-	-	-
Level of Achievement	Low	Low	Low	Low	Low
Priority	Medium	Medium	Medium	Medium	Medium

Level of understanding is not identified.
Level of achievement: judged by "b-10 Whether they are committed to environmental measures including energy saving and waste recycling"

4.2.4 Others

(1) Sufficiency of electricity

For the "sufficiency of electricity", we asked only about the level of achievement with a

question “whether they have sufficient electricity for water supply”. In all target cities, regardless of major or regional cities, they responded that they were not able to secure sufficient electricity.

While we do not fully understand the level of understanding and priority because we did not ask relevant questions during interviews, it is expected that they understand the current situation to a certain degree and priority is also relatively high, for many interviewees told us that they “suffer from the lack of electricity and want electricity expenses to go down”.

For future assistance, it is important to support counterparts in developing countries to be able, by themselves, to estimate the current electricity shortage and the amount of power needed in the future, and to plan and implement water supply plans that take into consideration the plans for securing stable electricity for stable water supply.

Table 4-15: Levels of understanding of the current situation, achievement, and priority for “sufficiency of electricity”

	Laos		Cambodia		
	Major Cities	Regional Cities	Major Cities (with TC)	Regional Cities (with TC)	Regional Cities (without TC)
Level of Understanding	-	-	-	-	-
Level of Achievement	Low	Low	Low	Low	Low
Priority	-	-	-	-	-

Level of understanding is not identified.
Level of achievement: judged by “b-11 Whether they have sufficient electricity for water supply”

4.3 Direction of future assistance

We have discussed measures for each topic by putting together organized assistance information and the results of a field survey. In this chapter, we discuss the direction of assistance frameworks for supporting project planning of developing countries, which takes into consideration the difference in levels of water supply in terms of facilities and finances among countries as well as within a country.

Tables 4-16 and 4-17 show the result of the previous chapters and recommended future assistance by priority.

The level of understanding tends to be high in both major and regional cities. This suggests that the recognition of the current situation of water supply operations is high even in developing countries. On the other hand, the level of achievement tends to be lower compared to the level of understanding. Even in major cities, the level of achievement in

“facility development” is low, and they are still at the developing stage. The level of achievement tends to be relatively high in major cities and low in regional cities.

The difference in the level of achievement may be caused by the fact that the levels of water supply differ among countries and regions in developing countries. Therefore, development assistance should consider the difference in the levels of water supply operation. Assistance needs to be provided in a phased and planned way, taking into consideration the current situation and goals of target countries and regions. In other words, we need to support short- and long-term planning in line with the local conditions, while showing the future vision of water supply operations in the distant future, probably 30 to 50 years later. This phased approach should be taken in terms of both facilities and finances.

Development of water distribution facilities and drinking water quality management should be considered in terms of facilities. The establishment of standards suitable for their national policies and regional conditions is also necessary. Similarly, in terms of finances, some regions have high profit with smooth tariff collection, while other regions have low profit. It is also necessary here to consider management policies suitable for each region with a phased approach.

Such a phased approach based on the difference in the levels requires coordination with the national government and regional governments under which water utilities operate, because it deals with standards including drinking water quality and tariff. Therefore, it may be necessary to dispatch experts not only to water utilities but also to national institutes.

Given the difference in the levels of water supply operations, in order for developing countries to be able to create water supply plans by themselves, it is important to establish a system in which skilled human resources are developed in high-level major cities, who will then disseminate the skills to regional cities. One approach to realize this is to support the establishment of human resource development organizations such as education centers where the national government or major cities take initiatives.

Moreover, in order to promote sustainable development, not only mere technical support but also extensive knowledge and experience in overall management of water supply operations are required; therefore, Japan needs to develop and/or secure human resources who can meet such expectations.

Table 4-16: Summary of analysis and direction of future assistance (high-priority topics)

Topics with high priority *1	TC	Training	Understanding (☆★) Achievement (○●)*2 Low ⟷ High	Expected fields for future assistance
dissemination of house connections	Many	Many	○☆ ●★	Major : expansion of house connection based on a master plan Regional : expansion of house connection areas
facility development *3	Many	Many	○ ☆ ● ★	Major : self-sustaining and long-term planning Regional : self-sustaining planning
volume of water resources	Few	Many	○ ☆ ● ★	Major : integrated water resource management planning Regional : support for water resource planning
facility renewal plan *4	Many	Few	○☆ ●★	Major : information gathering and long-term renewal planning Regional : accurate information gathering, others
drinking water quality standards	Many	Many	○☆ ●★	Major : drinking water quality management planning from sources to distribution Regional : standard setting with consideration for the current situation, others
human resource development system *5	Many	Few	○ ●	Major : establishment of human resource development framework Regional : training provision, training participation
sufficiency of electricity *5	-	-	○ ●	Major : planning for securing stable electricity Regional : planning for securing stable electricity

☆ : level of understanding in major cities　○ : level of achievement in major cities　★ : level of understanding in regional cities　● : level of achievement in regional cities

*1 : Priority is determined for whole target cities.
*2 : Levels of understanding and achievement are determined by interview results (the number of "yes" answers for each major and regional city)
*3 : Level of understanding is determined by "water purification plant capacity," "population served and water supply volume," "facility capacity," and "non-revenue water rate." Level of achievement was determined by "whether they are able to supply water 24 hours a day."
*4 : Because the interview question was "whether they understand the current situation of aging facilities and have plans for renewing them," the levels of understanding and achievements are treated as the same.
*5 : Only the level of achievement is determined. We considered the priority to be high because amount of electricity supply is crucial for stable water supply.

Table 4-17: Summary of analysis and direction of future assistance (middle-priority topics)

Topics with middle priority *1	TC	Training	Understanding (☆★) Achievement (○●)*2 Low ⟷ High	Expected fields for future assistance
management/ finances *3	Many	Many	○☆ ★●	Major : long-term management planning Regional : management planning with phased approach
contingency plan *4	Few	Many	○ ●	Major : countermeasures based on the actual situation Regional : start with feasible countermeasures
customer services *4	Many	Few	○ ●	Major : Service extension including PR Regional : promotion of water supply services including sanitary education
implementation of environmental measures *4	Few	Many	○ ●	Major : planning of possible technologies that can be introduced by themselves Regional : introduction of and considerations for possible technologies

☆ : level of understanding in major cities ○ : level of achievement in major cities ★ : level of understanding in regional cities ● : level of achievement in regional cities

*1 : Priority is determined for whole target cities.
*2 : Levels of understanding and achievement are determined by interview results (the number of "yes" answers for each major and regional city)
*3 : Level of achievement is determined by "whether they have an independent accounting system."
*4 : Only the level of achievement is determined.

Chapter 5: Summary and Issues

5.1 Summary

This study discusses the direction of future assistance in water supply planning and implementation based on the results of the analysis of the past assistance and field interviews in Laos and Cambodia.

5.1.1 Analysis of the past assistance in water supply planning and implementation in developing countries utilizing domestic and international guidelines

There have been a number of JICA's technical cooperation projects for "facility development" and "management/finances", which are the basis for water supply operations. On the other hand, there have been a limited number of technical cooperation projects for "contingency plans" and "implementation of environmental measures".

As for JICA's training, they have been providing extensive lectures on water utilities, in which many topics on water supply operations are covered. On the other hand, training in "human resource development systems" and "financial balance projection" is limited.

Due to the difference in nature between technical cooperation projects and training, some topics are extensively covered only in technical cooperation projects, while other topics are extensively covered only in training.

5.1.2 Overseas Field survey

The level of understanding of the current situation tends to be high regardless of major and regional cities in both Laos and Cambodia. However, some regional cities show low level of understanding for some topics such as "facility renewal plan".

The level of achievement for "dissemination of house connection" is high, while that for "facility development" is low in many cities. Water supply by house connection has been advancing in all cities. The levels of achievement for "drinking water quality standards" and "human resource development systems" are high in major cities, but low in some regional cities. This implies the levels of water supply differ by region.

Priority for "facility development and renewal" is relatively high in both major and regional cities in Laos. In Cambodia, priority of "human resource development systems" is high in major cities, while that of "water resources, drinking water quality management" and "human resource development systems" is high in regional cities.

Because the level of understanding, level of achievement, and priority differ by countries and regions, it is necessary to provide assistance taking into consideration the actual situation and need in each country or region based on such differences.

During opinion exchange for technical cooperation projects, the importance of information sharing was confirmed, such as common visions that enable smooth project

operation in the future. It was also pointed out to be important to consider the direction of the future technical cooperation through the discussion of project progress and related issues.

5.1.3 The role of development assistance in water supply planning and implementation

In order to provide assistance to developing countries, it is necessary to take into consideration the difference in "level of understanding of the current situation", "level of achievement", and "priority" by countries and regions. Therefore, a phased approach that corresponds to the current situation of the target country or region is needed for development and planning. This phased approach should be considered in both facilities and finances.

Such a phased approach based on the difference in the levels requires coordination with the national government and regional governments under which water utilities operate, because it deals with standards including drinking water quality and tariff. Therefore, it may also be necessary to dispatch experts to national institutes.

5.2 Issues

5.2.1 Considerations for details in each topic

In this study, we determined, based on guidelines for creating local water supply visions, priorities of topics contained in Japan's water supply planning. However, in actual planning, there are many sub-topics in each topic. For example, various plans are necessary for drinking water quality management, starting from "institutional framework" to "monitoring". Thus, we need to consider these sub-topics in actual assistance in the field.

5.2.2 Application of guidelines and manuals to developing countries

A number of manuals and guidelines have been developed and issued in developed countries including Japan. It is necessary to closely examine which parts of these manuals and guidelines can be applied when assisting in developing countries. It is also an issue for future assistance that there are few English manuals in Japan.

Moreover, some technical topics may require consideration for patent and corporate interest. There seems no such issue within the scope of this study, but we need to pay attention when considering detailed simulations for asset management.

5.2.3 Effective and concrete assistance

Although this study analyzes the current situations and issues of water supply planning and discusses the direction of future assistance, a discussion for effective assistance is not sufficient. For this matter, we need to discuss not only priorities in developing countries but also Japan's comparative advantage in order to discuss concrete assistance with a large impact.

It is also necessary to be discussed from the perspective of contributions to Japanese

water utilities and private corporations such as technology transfer and human resource development. Private-public partnerships were discussed in the Study Committee in 2008, and it may be necessary to collect and analyze successful case studies of private-public partnerships in ODA for the promotion of further partnerships.

5.2.4 Additional information gathering

This study is conducted based on existing JICA's project documents; therefore, we need to be careful about applying this study to countries and regions where JICA has not provided assistance.

Also, since the field survey was conducted only in Laos and Cambodia, additional information about other countries and regions is necessary for generalization.

Moreover, analysis on the levels of understanding and achievement is not sufficient. As for drinking water quality standards, for example, we need to collect information to determine whether "they are about to fulfill the standard" or whether "they are far below the standard".

Furthermore, during the field survey, we could not collect enough information on future planning and asset management. It is necessary to understand the level of water supply planning and implementation including asset management in order to discuss the policies for future assistance.