

5. CONCLUSION AND RECOMMENDATIONS

5-1 Conclusion of the Evaluation

The project purpose and overall goal are valid in line with water sector policy of the Government of the Cambodia as well as the principle of Japanese cooperation toward the Kingdom of Cambodia.

Through the achievement of each Output, the Project purpose has been mainly achieved owing to the strong commitment and motivation of the Cambodian counterparts in the activities for improvement of (1) the capacity to operate and maintain water supply facilities in PPWSA and (2) staff training system for the water supply system in Cambodia.

Regarding the facilitating factor for the smooth implementation of the Project, the high management capacity in PPWSA including the appropriate allocation of the counterparts and positive exchange of idea based on strong reliance between the Japanese experts and counterparts should be emphasized.

To improve capacity (not only facility but also human resource development) of PPWSA, the cooperation of the donors was extremely significant. Since 1990s, many donors such as UNDP, WB, ADB, AfD and Japan have supported PPWSA. The history of cooperation to PPWSA is shown in Annex 11.

The project purpose will be expected to achieve by the end of the project, although there are still some remaining activities such as the finalization of the manuals. Therefore the Cambodian authorities concerned and the Japanese Team agreed that the Project will be terminated in October 2006 according to the original plan.

PPWSA established a status as the “top-runner” through own efforts and a variety of assistance by the donor agencies including this Project. On the other hand, the capacity of provincial waterworks is still limited. To raise the level of provincial waterworks, the implementation of the Phase 2 on the “project on capacity building for water supply system in Cambodia” is approved between the Government of the Cambodia and Government of Japan.

5-2 Recommendations

* Recommendations are written down separately for Cambodian side, and for both sides.

The Joint Evaluation Team recommends the Project and related authorities the followings:

5-2-1 Subjects toward the end of the Project period

< Cambodian side >

(1) Necessity of securing the daily operation of the facilities in the training period at PPWSA

For both the trainers and trainees who are involved in the training at PPWSA, each waterworks is requested to secure the daily operation of the facilities during their absence.

At the same time, it is requested to create a working environment where contents learned in the training are effectively used. Monitoring and follow-up actions for each

training are also required to MIME/DPWS.

<Both sides>

(2) For a better training course designing

It was found important to set up the contents, teaching speed, level, style (classroom or practice in the field), period, and frequency of each training course according to the trainee's capacity and the requests from the provincial waterworks.

(3) Necessity of monitoring the usage of equipment

Related to the above (2), it seems to be necessary to monitor the usage of the provided leakage detection equipment from the Project. In some provincial waterworks, the equipments were not effectively used. Analyzing the reason and taking necessary follow-up actions is required.

(4) Necessity of completion of manuals

Manuals for 1) operation of the WTP, 2) maintenance of electrical and mechanical facilities in Phum Prek WTP, and 3) water quality management are not fully completed. It is requested that these manuals are finalized by the end of the Project.

Moreover, implementation of daily work using these manuals is highly requested.

5-2-2 Subjects to achieve the Ultimate Development Goals and Overall Goals

<Cambodian side >

(1) Necessity of improvement of financial weakness of MIME/DPWS and the provincial waterworks

As mentioned in Chapter 4-5 (3), the financial sustainability of MIME/DPWS and the provincial waterworks seems to be limited. It is highly requested that MIME and the provincial waterworks will strengthen the financial capability for sustainable implementation of the activities of the Project to play their crucial role.

(2) Necessity of additional staff for routine maintenance of electrical facilities

While chemical personnel were adjusted responsively to the daily work, number of staff for the field of "electricity" still seems to be not enough in PPWSA as a whole. It is highly recommended that PPWSA have enough staff in order to carry out the routine maintenance based on the manual made in the Project.

(3) Clarification of the role of MIME/DPWS

In this Project the workshop (seminar style) at the province was used as a occasion to raise the capacity of MIME/DPWS taskforce members as a starting point. It is required that these taskforce members fully understand their role as the policy maker and the coordination body. It is expected that they take the necessary steps for the capacity building of provincial waterworks.

(4) National Drinking Water Quality Standard

Concerning the National Drinking Water Quality Standard (NDWQS) in Cambodia, it is highly requested that MIME/DPWS with the cooperation of PPWSA make the implementation plan on how to meet NDWQS and monitor the water quality regularly.

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(5) Cooperation between MIME/DPWS and PPWSA

It is highly requested that MIME/DPWS and PPWSA keep and develop their close relationship to improve the situation of the water supply system countrywide.

< Both sides >

(6) Necessity of replacement of the Telemeter (Data Monitoring) System

The Telemeter System in PPWSA plays very important roles on financial sustainability. Replacement of the existing system which is using "Windows 3.1" is highly necessary. At present, Windows 3.1 is not able to obtain it regularly. That means if the existing software breaks down, it is the end of the existing system. A plan has to be made to implement the smooth replacement.

5-3 Lessons Learnt

The Joint Evaluation Team has found the following lessons learnt from the Project:

(1) On-the-job training system

The "On-the-job training (OJT) system" had well functioned compared to the past "Training center system" which was adopted in other countries' projects. This system could be introduced to other projects which aim to raise the level of water supply system efficiently.

At the same time, however, continuous effort is requested to improve this OJT system. Some counterparts expressed the difficulty to maintain the balance between their daily work and the amount of time requested to use for the Project activity. This matter should be kept in mind and appropriate designing of the project is expected.

(2) Training, training materials in own language

Training in the Project was designed for the maximum involvement in the Cambodian trainers who provide lectures to trainees directly instead of the Japanese experts. This could be realized because the Project promoted the capacity development of the Cambodian trainers through the training of trainers. Cambodian trainers were very much appreciated by the trainees of provincial waterworks. This was also the same for training materials in Khmer language. It has undoubtedly pushed up the effectiveness of the training.

Translation of the training materials into Khmer language was achieved by the enormous efforts by PPWSA staffs, JICA Project Team members, and support of Kitakyushu Waterworks Bureau. Importance of training and training materials in own language should be kept in mind when the project is formulated.

(3) Training with necessary minimum equipments

Among every aspect on capacity building in water supply sector, it has been found that human resource development has the top priority. In order to realize this, minimum equipments has to be provided to the trainees to continue what they have learned in their daily work.

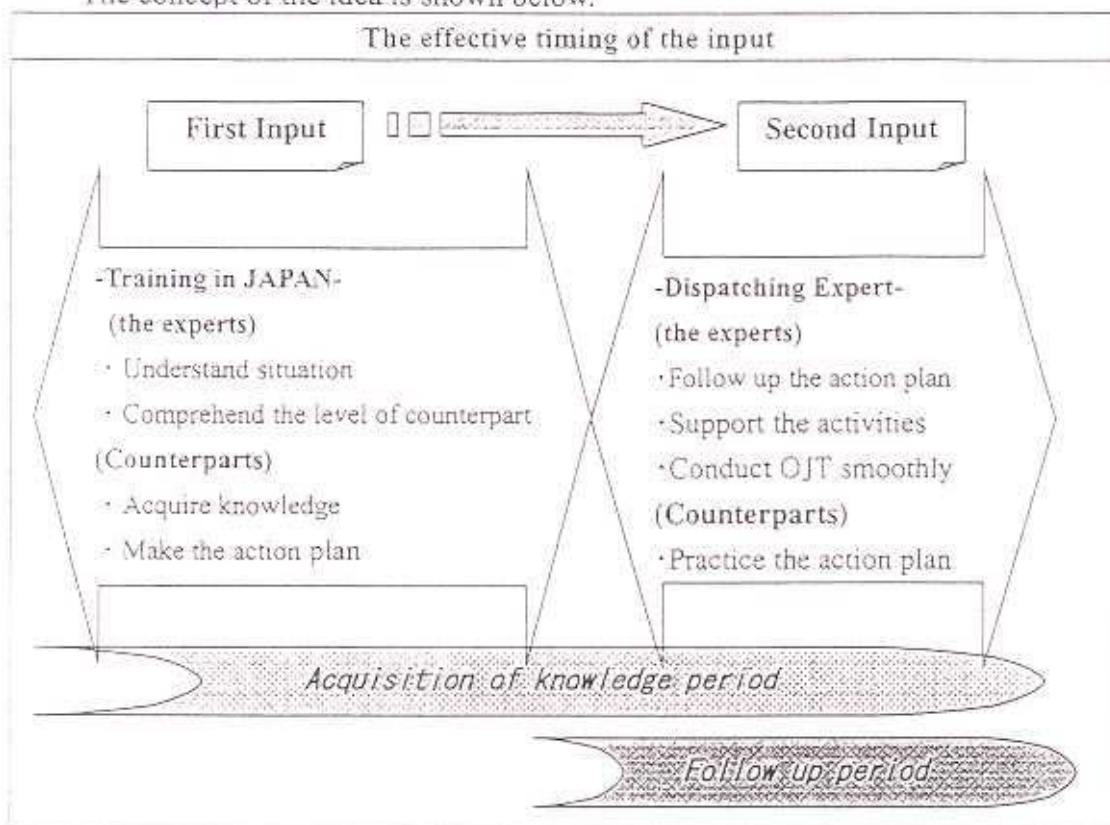
(4) The effective input about Training programme and dispatching experts

In this Project, the input about Training programme in Japan and dispatching Japanese expert was planed strategically. The example is shown in Annex 12. The most of Japanese experts were dispatched to Cambodia after counterpart training

programme in Japan. As a result, the Japanese experts could (a) understand the issues in this field and (b) comprehend the level of counterpart at training programme. They also could follow up the activities of counterparts in Cambodia.

Such kind of strategic input brought good result regarding the human resources development. This approach is not only for water supply project but adaptable to other projects on capacity development.

The concept of the idea is shown below.



(5) Repeated or continuous assignments of the Japanese experts

Repeated or continuous assignments of the Japanese experts are effective to secure the cooperation between the counterparts and the experts since it takes time to understand the local conditions for the experts.

(6) Utilizing the long-term training abroad for new managers and specialists

It should be considered to send the expected new managers and specialists for long-term training abroad. By doing this, it is able to realize bringing up new managers and specialists or to complete the back-up system in the organization.

(7) Donor coordination

Coordination among the donors in this sector has been realized since after the civil war until now. The coordination was made both in hardware and software. The achievement today in Phnom Penh could not been made only by either of the donor itself.

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One of the reasons that made this possible was the strong leadership of PPWSA. Now, MIME/DPWS is starting to play this important role. Continuous coordination among stakeholders is expected towards the future.

6. OTHERS

(1) The case of Siem Reap

A variety of inputs was made using Japanese government and JICA scheme to Siem Reap Water Supply System (SRWSS). Coordination between these schemes went quite well and lead to a certain level of achievement.

(2) Necessity of “Public education on safe water”

Cambodian side regards the “public education” as an important issue. PPWSA implements this activity continuously. SRWSS also expressed the impact of this activity and thanked the support from Japanese grant aid.

Many situations can be seen in Phnom Penh that because of private receiving tanks and private pipelines being dirty, the water is contaminated in the domestic area and people are not drinking this water. Public education is needed otherwise same situation will last. Continuous effort is required to MIME/DPWS, PPWSA and provincial waterworks to raise the people’s awareness.

(3) Introduction of New Technology

The introduction of the new technology “Telemeter system (Data Monitoring System)” together with the support from Japanese experts was one of the turning point for the development of water supply in Phnom Penh.

Brave decision for installation of new technology is also one of the factors for successful achievement.

(4) Discussion on the Strategy on Water Sector

The way of cooperation among MIME/DPWS, PPWSA, and the provincial waterworks had been deeply discussed in the course of the Project. The above mentioned Siem Reap case had been the actual example of cooperation and had great impact towards providing some ideas in the future water sector structure in Cambodia. Further discussion will be held by monitoring the situation of the SRWSS and other provincial waterworks’ operation.

(5) Efforts towards the implementation of the Phase 2 project

To improve the capacity of the provincial waterworks is a big challenging issue. Monitoring of the staff of the provincial waterworks who received the training in this project is required. At the same time, the efforts to set up the strategy for sound management of provincial waterworks are highly needed.

Annex 1 Project Design Matrix (PDM)

Project Title: The Project on Capacity Building for Water Supply System in Cambodia
 Project Implementation Agency: Phnom Penh Water Supply Authority (PPWSA), Ministry of Industry, Mines and Energy Department of Potable Water Supply (MIME/DPWS)
 Target Group: Approximately 70 Engineers and Technicians of PPWSA, approximately 5 Staff of MIME/DPWS, approximately 20 Engineers and Technicians of provincial waterworks

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p>Ultimate Development Goals Access to safe water will increase in urban area</p>	<p>1. Access to safe water in urban area will increase to 80% by the year 2015.</p>	<p>1-1 Annual reports 1-2 Millennium Development Goals(MDGs) reports</p>	
<p>Overall goals Capacity to operate and maintain water supply facilities will be improved in urban area.</p>	<p>1-1 Treated water quality will satisfy the Cambodian National Drinking Water Quality Standards on a continuing basis 1-2 Water supply facilities will be operated efficiently 1-3 Water supply will be stable</p>	<p>1-1 Water quality monitoring report 1-2 Annual Reports 1-3 Annual Reports</p>	<p>1. Number of water supply facilities will increase and existing water treatment facility will be rehabilitated 2. Inhabitants will be willing to use tap water.</p>
<p>Project Purposes 1. Capacity to operate and maintain water supply facilities will be improved in PPWSA</p>	<p>1-1 Leakage ratio will decrease from the ratio before installation in the area where telemeter system is installed 1-2 Water will be distributed in accordance with the demands in each area 1-3 Phum Prek Water Treatment Plant (WTP) will be operated appropriately using manuals 1-4 Treated water quality will satisfy the Cambodian National Drinking Water Quality Standards on a continuing basis in 3 WTPs 1-5 Electrical and mechanical facilities will be operated and maintained appropriately in 3 WTPs 1-6 Water quality of entire water supply facilities will be controlled appropriately in accordance with the result of water quality analysis</p>	<p>1-1 Operation report 1-2 Operation report 1-3 Operation report 1-4 Water quality monitoring report 1-5 Operation and inspection report 1-6 Operation report Water quality monitoring report</p>	
<p>2. Staff training system for the water supply system will be improved in the Kingdom of Cambodia</p>	<p>2-1 Capacity building will be undertaken in accordance with the human resources development plan in PPWSA 2-2 Staff of provincial waterworks will get training</p>	<p>2-1 Monitoring report of training. Materials in personnel division 2-2 Monitoring reports of workshop and training</p>	<p>1. Staff of waterworks in Cambodia will participate in training courses in PPWSA</p>

<p>Results/Outputs</p> <p>1. Capacity to control the distribution of treated water will be improved in PPWSA</p> <p>2. Appropriate operation and maintenance techniques in Phum Prek water treatment plant will be mastered</p> <p>3. Water quality monitoring system will be improved in PPWSA</p>	<p>1-1 4 staff related to telemeter system will be able to collect and analysis the data from telemeter system.</p> <p>1-2 4 staff related to telemeter system will be able to formulate water distribution plan</p> <p>1-3 4 staff related to telemeter system will be able to formulate countermeasures against non-revenue water</p> <p>1-4 Manuals for telemeter operation will be produced</p> <p>1-5 40 person in PPWSA (include the member of bomb) and external institution will understand the role of water distribution control</p> <p>2-1 Staff in charge of treatment process in Phum Prek WTP will be able to operate the plant in accordance with manuals.</p> <p>2-2 Manuals for operation of WTPs will be produced</p> <p>2-3 8 staff in charge of electricity in 3 WTPs will be able to maintain the facilities from power receiving to instrumentation equipment</p> <p>2-4 Manuals for maintenance of electrical facilities will be produced.</p> <p>2-5 8 staff in charge of machinery in 3 WTPs will be able to maintain the facilities</p> <p>2-6 Manuals for maintenance of mechanical facilities will be produced</p> <p>3-1 Monitoring plan for entire water supply facilities (joint and term of monitoring, item of water quality analysis) will be made in 3 WTPs, and 5 staff in charge of water quality will be able to analyse water quality in accordance with the plan.</p> <p>3-2 Result of water quality monitoring will be reflected in water treatment process</p> <p>3-3 Result of water quality monitoring will be reflected in the maintenance and management of entire water supply facilities</p>	<p>1-1 Collected and analysed telemeter data</p> <p>1-2 Formulated water distribution plan</p> <p>1-3 Formulated non-revenue water countermeasures</p> <p>1-4 List of manuals</p> <p>1-5 Report of workshop</p> <p>2-1 List of manuals Operation report</p> <p>2-2 List of manuals</p> <p>2-3 Operation and inspection report</p> <p>Reports by experts</p> <p>2-4 List of manuals</p> <p>2-5 Operation and inspection report</p> <p>Reports by experts</p> <p>2-6 List of manuals</p> <p>3-1 Monitoring plan Monitoring report</p> <p>3-2 Monitoring report Operation report</p> <p>3-3 Monitoring report Operation report</p>	<p>1 Electricity and chemicals will be supplied stably to PPWSA</p> <p>2 Staff will be allocated in a balanced manner</p> <p>3 Untoward situation will not develop in quality of raw water</p>
<p>4. Training programme based on human resources development plan will start in PPWSA</p> <p>5. Training programme based on the needs of provincial waterworks will be conducted</p>	<p>4-1 Study report on human resources development will be formulated</p> <p>4-2 2 staff in personnel division and 2 staff in training division will start the training based on human resources development plan.</p> <p>5-1 Study report on human resources development in provincial waterworks and programmes of human resources development programmes for 2 to 3 provincial waterworks will be formulated</p> <p>5-2 Staff of provincial waterworks will get training on introduction to waterworks and fundamental operation and maintenance techniques</p> <p>5-3 5 staff of MIME will conduct workshops on laws and policies related to waterworks in provinces</p>	<p>4-1 Report on human resources development</p> <p>4-2 Monitoring report on training</p> <p>5-1 Study reports on training needs</p> <p>5-2 Reports on training Reports on workshop</p> <p>5-3 Reports on workshop</p>	<p>4 Provincial waterworks will send the staffs to training course in PPWSA.</p>
<p>Activities</p> <p>(1) Project management system</p> <p>1-1 Establishment and holding of Joint Coordination Committee (JCC) meeting</p> <p>(2) Control of distribution of treated water in PPWSA</p> <p>2-1 Training on collector and analysis of data from telemeter</p>	<p>Inputs [Cambodian side]</p> <ul style="list-style-type: none"> Assignment of counterparts (PPWSA) 4 staff in charge of distribution control, 6 staff in charge of water treatment process (2 staff/WTP x 3 WTPs), 3 staff in charge of water quality control, 2 staff in charge of human resources development, 2 staff in charge of training skill, (MIME) 2-3 staff Provision of a project office (at PPWSA Training Center) Payment of transportation, accommodation and other costs of participants in training from provincial 	<p>1 Counterparts of certain level will be allocated</p> <p>2 National Waterworks Technology Training Institute(NWTTI) will accept trainees</p>	

<p>system (4) systems) installed by PPWSA.</p> <p>2-2 Training on formulation of water distribution plan</p> <p>2-3 Training on planning of countermeasures against non-revenue water.</p> <p>2-4 Preparation of manuals for practical use of telemeter system</p> <p>2-5 Holding of workshop on distribution data monitoring system and waterworks in Cambodia</p> <p>(3) Operation and maintenance techniques in Phnom Prek WTP</p> <p>3-1 Training on appropriate water treatment techniques at Phnom Prek WTP</p> <p>3-2 Preparation of manuals for operation and maintenance of Phnom Prek WTP</p> <p>3-3 Training on maintenance of electrical facilities in 3 WTPs</p> <p>3-4 Preparation of manuals for maintenance of electrical facilities in 3 WTPs</p> <p>3-5 Training on maintenance of mechanical facilities in 3 WTPs</p> <p>3-6 Preparation of manuals for maintenance of mechanical facilities in 3 WTPs</p> <p>(4) Water quality monitoring system in PPWSA</p> <p>4-1 Training on water quality analysis technology in laboratory and improvement of monitoring system of water quality</p> <p>4-2 Preparation of manuals for water quality analysis and monitoring system</p> <p>(5) Human resources development programme in PPWSA</p> <p>5-1 Formulation of long-term human resources development plan</p> <p>5-2 Training on management of human resources development programme</p> <p>5-3 Formulation of training plan</p> <p>5-4 Preparation of textbooks and materials</p> <p>5-5 Training on training skills</p> <p>5-6 Implementation of training programme in accordance with training plan</p> <p>(6) Training programmes based on the needs of provincial waterworks</p> <p>6-1 Study on human resource development in provincial waterworks and formulation of human resources development programmes for 2 to 3 provincial waterworks.</p>	<p>waterworks</p> <ul style="list-style-type: none"> ▪ Payment of Training Centre in operation and management cost ▪ [Japanese side] ▪ Dispatch of long-term expert(s) (1-2) ▪ Dispatch of short-term experts (14-18) ▪ Overseas training (counterpart training, country focused training) 16, 20 ▪ Provision of training equipment 	<p>Preconditions</p> <ul style="list-style-type: none"> 1 Telemeter System will be completely installed in all water supply areas by PPWSA.
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<p>6-2 Training for provincial waterworks staffs on introduction to waterworks and fundamental operation and maintenance techniques</p> <p>6-3 Holding of workshops on laws and policies related to waterworks by MIMF staff in provinces</p>	<p>Annex 1</p>
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Annex 2 the Plan of Operation (PO)

Activities	Year	Year 1								Year 2								Year 3							
		3/2004		4/2004		1/2004		2/2004		3/2004		4/2004		1/2005		2/2005		3/2005		4/2005		1/2006		2/2006	
		10	12	1	3	4	5	7	9	10	12	1	3	4	6	7	9	10	12	1	3	4	6	7	9
(1) Project Management System																									
1-1 Establishment and holding of the Joint Coordinating Committee (JCC) Meeting		□		●		●		●		□		●		●		●		□		●		●		●	
(2) Control of Distribution of treated Water in PPMWA																									
2-1 Training on collection and analysis of data from telemeter system (41 systems) installed by PPMWA		□		△		□		□		□		△		□		□		□		□		□		□	
2-2 Training on formulation of water distribution plan		□		□		□		□		□		□		□		□		□		□		□		□	
2-3 Training on planning of countermeasures against non-revenue water		□		□		□		□		□		□		□		□		□		□		□		□	
2-4 Preparation of manuals for practical use of telemeter system		→		→		→		→		→		→		→		→		→		→		→		→	
2-5 Holding of workshop on distribution data monitoring system and waterworks in Cambodia		□		□		□		□		□		□		□		□		□		□		□		□	
(3) Operation and maintenance techniques in Phum Prek WTP																									
3-1 Training on mastering appropriate water-treatment techniques at Phum Prek WTP		□		□		□		□		□		□		□		□		□		□		□		□	
3-2 Preparation of manuals for operation and maintenance of Phum Prek WTP		□		□		□		□		□		□		□		□		□		□		□		□	
3-3 Training on maintenance of electrical facilities in 3 WTPs		□		□		□		□		□		□		□		□		□		□		□		□	
3-4 Preparation of manuals for maintenance of electrical facilities in 3 WTPs		□		□		□		□		□		□		□		□		□		□		□		□	
3-5 Training on maintenance of mechanical facilities in 3 WTPs		□		□		□		□		□		□		□		□		□		□		□		□	
3-6 Preparation of manuals for maintenance of mechanical facilities in 3 WTPs		□		□		□		□		□		□		□		□		□		□		□		□	
(4) Water Quality Monitoring System in PPMWA																									
4-1 Training on water quality analysis technology in laboratory and improvement of monitoring system of water quality		□		□		□		□		□		□		□		□		□		□		□		□	
4-2 Preparation of manuals for water quality analysis and monitoring system		□		□		□		□		□		□		□		□		□		□		□		□	
(5) Human Resources Development Programme in PPMWA																									
5-1 Formulation of one-term human resources development plan		□		□		□		□		□		□		□		□		□		□		□		□	
5-2 Training on management of human resources development programme		□		□		□		□		□		□		□		□		□		□		□		□	
5-3 Formulation of training plan		□		□		□		□		□		□		□		□		□		□		□		□	
5-4 Preparation of textbooks and materials		□		□		□		□		□		□		□		□		□		□		□		□	
5-5 Training on trading skills		□		□		□		□		□		□		□		□		□		□		□		□	
5-6 Implementation of training programme in accordance with training plan		□		□		□		□		□		□		□		□		□		□		□		□	
(6) Training Programmes based on the needs of provincial waterworks																									
6-1 Study on human resource development in provincial waterworks and formulation of human resources development		□		□		□		□		□		□		□		□		□		□		□		□	
6-2 Training for provincial waterworks staffs on introduction to waterworks and fundamental operation and maintenance		□		□		□		□		□		□		□		□		□		□		□		□	
6-3 Holding workshop on laws and policies related to waterworks by MME staff in provinces		□		□		□		□		□		□		□		□		□		□		□		□	

Legend:

- Training for PPMWA
- △ Training for OPWS, MME / Provincial waterworks
- Training in Overseas
- Activities

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Annex 3 Achievement of the Project

Narrative Summary	Objectively Verifiable Indicators	Achievement
<p>Ultimate Development Goals Access to safe water will increase in urban area.</p>	<p>1 Access to safe water in urban area will increase to 80% by the year 2015.</p>	<p>The evaluation of super goal should be done in the long term perspective. It seems to be difficult to accomplish the Millennium Development Goals</p>
<p>Overall goal Capacity to operate and maintain water supply facilities will be improved in urban area</p>	<p>1-1 Treated water quality will satisfy the Cambodian National Drinking Water Quality Standards on a continuing basis. 1-2 Water supply facilities will be operated efficiently. 1-3 Water supply will be stable</p>	<p>The evaluation of overall goals also should be done in the long term perspective. As for the first indicator, MIME needs to show a path toward the effective use of the Cambodian National Drinking Water Quality Standards. Concerning the second indicator, capacity building for newly innovated 8 waterworks and improvement of facilities at other waterworks in urban area including capacity building will be needed.</p>
<p>Project Purpose 1 Capacity to operate and maintain water supply facilities will be improved in PPWSA</p>	<p>1-1 Leakage ratio will decrease from the ratio before installation in the area where telemeter system is installed 1-2 Water will be distributed in accordance with the demands in each area. 1-3 Phum Prek Water Treatment Plant (WTP) will be operated appropriately using manuals. 1-4 Treated water quality will satisfy the Cambodian National Drinking Water Quality Standards on a continuing basis in 3 WTPs. 1-5 Electrical and mechanical facilities will be operated and maintained appropriately in 3 WTPs. 1-6 Water quality of entire water supply facilities will be controlled appropriately in accordance with the result of water quality analysis.</p>	<p>1-1 NRW (non revenue water) ratio, which is equivalent to leakage ratio, was decreased from 16% in 2003 to 11% in 2005 based on the telemeter system. 1-2 Water is controlled in water flow and water pressure and distributed for 24 hours mostly in accordance with the demands in each block. 1-3 Manuals were almost prepared and scheduled for completion in September 2006. Based on the manuals completed, it is expected that Phum Prek WTP is operated and maintained on a routine basis. 1-4 At the laboratories, quality of treated water in 3 WTPs is checked in 33 to 37 parameters including accurate analysis for 3 parameters such as color, free available chlorine and total coliform. The result of analysis continuously satisfies the Cambodian National Drinking Water Quality Standards. 1-5 Manuals were almost prepared and scheduled for completion in September 2006. Based on the manuals completed, it is expected that electrical and mechanical facilities is operated and maintained at Phum Prek WTP on a routine basis. 1-6 Water quality of entire water supply facilities is controlled in accordance with the results of water quality analysis.</p>
<p>2. Staff training system for the water supply system will be improved in the Kingdom of Cambodia.</p>	<p>2-1 Capacity building will be undertaken in accordance with the human resources development plan in PPWSA. 2-2 Staff of provincial waterworks will get training.</p>	<p>2-1 Capacity building was undertaken. The long-term human resources development programme (draft) was already submitted in 2004. In response to the contents in the draft programme with additional support by the Japanese experts, several training courses were newly developed by PPWSA. 2-2 Staff of 8 provincial waterworks were trained based on the needs survey in 2005. In 2006, training at PPWSA is scheduled for the staff of 13 provincial waterworks. Moreover, workshops on fundamental water supply management for provincial waterworks were held at Kampong Chan, Battambang, Takeo, Sihanouk Ville and Svay Rieng.</p>

Narrative Summary	Objectively Verifiable Indicators	Achievement
<p>Output</p> <p>1. Capacity to control the distribution of treated water will be improved in PPWSA.</p> <p>2. Appropriate operation and maintenance techniques in Phum Prek water treatment plant will be mastered.</p> <p>3. Water quality monitoring system will be improved in PPWSA.</p>	<p>1-1 4 staff related to telemeter system will be able to collect and analyze the data from telemeter system.</p> <p>1-2 4 staff related to telemeter system will be able to formulate water distribution plan.</p> <p>1-3 4 staff related to telemeter system will be able to formulate countermeasures against non-revenue water.</p> <p>1-4 Manuals for telemeter operation will be produced.</p> <p>1-5 4/0 persons in PPWSA (include the member of board) and external institution will understand the role of water distribution control.</p> <p>2-1 Staff in charge of treatment process in Phum Prek WTP will be able to operate the plant in accordance with manuals.</p> <p>2-2 Manuals for operation of WTPs will be produced.</p> <p>2-3 7 staff in charge of electricity in 3 WTPs will be able to maintain the facilities from power receiving to instrumentation equipment.</p> <p>2-4 Manuals for maintenance of electrical facilities will be produced.</p> <p>2-5 8 staff in charge of machinery in 3 WTPs will be able to maintain the facilities.</p> <p>2-6 Manuals for maintenance of mechanical facilities will be produced.</p> <p>3-1 Monitoring plan for entire water supply facilities (point and term of monitoring, item of water quality analysis) will be made in 3 WTPs, and 5 staff in charge of water quality will be able to analyze water quality in accordance with the plan.</p>	<p>1-1 4 counterparts are able to collect and analyze the flow data from telemeter system. They can compile the collected data in "Daily Report of Distributed Water", almost every day (95.8% in 2006) and "Monthly Report of Distributed Water" every month. They check the abnormal flow in order to detect large scale leakage and illegal consumptions using flow trend charts which are compiled from the collected data.</p> <p>1-2 The collected data from the system was used to make the Master Plan of Greater Phnom Penh Water Supply (Phase 2) and expansion plans in the coverage area.</p> <p>1-3 4 Counterparts have already made the standard operation procedures (SOP) against non-revenue water (NRW) and carried out the countermeasures to reduce the NRW.</p> <p>1-4 Manuals for telemeter operation were produced. However, the telemeter system is not maintained on a regular basis since the maintenance schedule for telemeter system is not prepared.</p> <p>1-5 The seminar inviting more than 40 participants for understanding of the role of water distribution control, telemeter system in particular, is scheduled to be held in the final stage of the Project.</p> <p>2-1 Manuals were almost prepared and scheduled for completion in September 2006. Based on the manuals completed, it is expected that staffs in charge of treatment process in Phum Prek WTP operate the plant with manuals on a routine basis.</p> <p>2-2 Manuals for operation of WTPs were almost prepared and scheduled for completion in September 2006.</p> <p>2-3 7 Staff in charge of electricity has been trained. It is expected that they maintain the facilities from power receiving to instrumentation equipment on a routine basis using manuals.</p> <p>2-4 Manuals for maintenance of electrical facilities were almost produced and scheduled for completion in September 2006.</p> <p>2-5 Through OJT, it is expected that staff in charge of operation of Phum Prek WTP maintain mechanical facilities on a routine basis using manuals.</p> <p>2-6 Manuals for maintenance of mechanical facilities were almost produced and scheduled for completion in September 2006.</p> <p>3-1 Water quality monitoring manuals from raw water to tap were completed. Based on the manuals, 5 staff in analyzed water quality in 3 to 37 parameters including accurate analysis for 3 parameters such as color, free available chlorine and total coliform. It is expected that they analyze water quality in 12 of the main parameters in an accurate manner.</p>

<p>3-2 Result of water quality monitoring will be reflected in water treatment process</p> <p>3-3 Result of water quality monitoring will be reflected in the maintenance and management of entire water supply facilities</p>	<p>3-2 Based on the result of water quality monitoring, which is criteria on the dosing amount of chemicals, water treatment process is adjusted and controlled.</p> <p>3-3 In addition to the achievement above, residual chlorine and other factors such as turbidity, temperature and conductivity at 20 points in the distributed area, are checked once a week. Based on the results, dosing of chlorine is adjusted</p>												
<p>4. Training programme based on human resources development plan will start in PPWSA.</p> <p>4-1 Study report on human resources development will be formulated.</p> <p>4-2 2 staff in personnel division and 2 staff in training division will start the training based on human resources development plan.</p>	<p>4-1 The long term human resources development programme (draft) was already submitted in 2004. In response to the contents in the draft programme with additional support by the Japanese experts, several training courses were newly developed by PPWSA.</p> <p>4-2 2 staff in administration and human resources department have clarified the training needs of the staff based on the training needs survey.</p> <p>The number of staff in the training center was increased from 1 to 4. The staff can make the training plans, implement the training courses and evaluate the training courses.</p> <p>According to the records of the training center of PPWSA, number of participants for training courses (training by the Japanese experts and C/P, trainer's training, training courses planned and implemented by PPWSA) was increased as shown below:</p> <table border="1" data-bbox="670 940 877 1232"> <thead> <tr> <th>Year</th> <th>Number of participants</th> </tr> </thead> <tbody> <tr> <td>2001</td> <td>57 (net)</td> </tr> <tr> <td>2002</td> <td>28 (net)</td> </tr> <tr> <td>2003</td> <td>30 (net)</td> </tr> <tr> <td>2004</td> <td>175 (net) / 341 (cumulative)</td> </tr> <tr> <td>2005</td> <td>667 (cumulative)</td> </tr> </tbody> </table>	Year	Number of participants	2001	57 (net)	2002	28 (net)	2003	30 (net)	2004	175 (net) / 341 (cumulative)	2005	667 (cumulative)
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<p>5. Training programme based on the needs of provincial waterworks will be conducted</p> <p>5-1 Study report on human resources development in provincial waterworks and programmes of human resources development for 2 to 3 provincial waterworks will be formulated.</p> <p>5-2 Staff of provincial waterworks will get training on introduction to waterworks and fundamental operation and maintenance techniques.</p> <p>5-3 5 staff of MIMF will conduct workshops on laws and policies related to waterworks in provinces.</p>	<p>5-1 Needs survey report on capacity building for provincial waterworks in Cambodia was formulated in 2004. Training plans for 2 to 3 provincial waterworks were proposed in the report.</p> <p>5-2 In 2005, 64 staffs of 8 provincial waterworks participated in the training on introduction to waterworks and fundamental operation and maintenance techniques at PPWSA. Also, 17 staffs participated in the training on chlorine gas and another 16 staffs participated in the training on maintenance of water distribution pipe. Thus, the number of participants amounted to 97 in total in 2005. Since 99 participants are estimated in 2006, total number of participants will be 195 by the end of the Project.</p> <p>5-3 The task force (9 members) on workshops for provincial waterworks was established at MIMF. The staff of the task force made a need survey, formulated the workshop programmes, coordinated among stakeholders, and implemented the workshop at five places shown below.</p>												

BN

Date and Place	Number of participants	Number of waterworks
Oct. 18-19, 2004 Kampong Chhn	16	8
Dec. 15-17, 2004 Battambang	20	12
Feb. 2-4, 2005 Takeo	29	13
Oct. 12-13, 2005 Sihanouk Ville	19	10
Feb. 20-21, 2006 Sray Reung	25	8

Activities	Planned activities	Actual activities
(1) Project management system	1-1 Establishment and holding of Joint Coordination Committee (JCC) meeting.	1-1 JCC meetings were held in 6 times. The last one will be held before the termination of the Project.
(2) Control of distribution of treated water in PPWSA	2-1 Training on collection and analysis of data from telemetry system (41 systems) installed by PPWSA.	2-1 Training on collection and analysis of data from telemetry system (44 local stations) was done.
2-2 Training on formulation of water distribution plan.	2-2 Training on planning of countermeasures against non-revenue water.	2-2 The collected and accumulated data from the system was provided to staff in charge of the Master Plan of Greater Phnom Penh Water Supply (Phase 2) and expansion plans in the coverage area.
2-3 Preparation of manuals for practical use of telemetry system	2-3 Holding of workshop on distribution data monitoring system and waterworks in Cambodia.	2-3 The OJT for countermeasures against non-revenue water was carried out in the pilot zones.
(3) Operation and maintenance techniques in Phum Prek WTP	3-1 Training on appropriate water treatment techniques at Phum Prek WTP.	2-4 Manuals for practical use of telemetry system were completed.
3-2 Preparation of manuals for operation and maintenance of Phum Prek WTP.	3-2 Training on maintenance of electrical facilities in 3 WTPs.	2-5 The workshops will be held in the final stage of the Project (September 2006).
3-3 Training on maintenance of electrical facilities in 3 WTPs.	3-3 Preparation of manuals for maintenance of electrical facilities in 3 WTPs.	3-1 Most of the training was completed.
3-4 Preparation of manuals for maintenance of mechanical facilities in 3 WTPs.	3-4 Preparation of manuals for maintenance of mechanical facilities in 3 WTPs.	3-2 Manuals for operation and maintenance of Phum Prek WTP are almost prepared.
3-5 Training on maintenance of mechanical facilities in 3 WTPs.	3-5 Training on maintenance of mechanical facilities in 3 WTPs.	3-3 Most of the training at Phum Prek WTP was completed. As for two other WTPs, the training will be done by C/P.
3-6 Preparation of manuals for maintenance of mechanical facilities in 3 WTPs.	3-6 Preparation of manuals for maintenance of mechanical facilities in 3 WTPs.	3-4 Manuals for maintenance of electrical facilities at Phum Prek WTP are almost prepared. The manuals for two other WTPs will be done by C/P.
(4) Water quality monitoring system in PPWSA	4-1 Training on water quality analysis technology in laboratory and improvement of monitoring system of water quality.	3-5 Most of the training at Phum Prek WTP was completed. As for two other WTPs, the training will be done by C/P.
4-2 Preparation of manuals for water quality analysis and monitoring system.	4-2 Preparation of manuals for water quality analysis and monitoring system.	3-6 Manuals for maintenance of mechanical facilities at Phum Prek WTP are almost prepared. The manuals for two other WTPs will be done by C/P.
(5) Human resources development programme in PPWSA	5-1 Formulation of long-term human resources development plan.	4-1 Most of training was completed.
5-2 Training on management of human resources development programme.	5-2 Training on management of human resources development programme.	4-2 Manuals for water quality analysis and monitoring system are almost prepared.
5-3 Formulation of training plan.	5-3 Formulation of training plan.	5-1 Long-term human resources development plan (draft) was already submitted. Finalization will be needed.
5-4 Preparation of textbooks and materials.	5-4 Preparation of textbooks and materials.	5-2 Training on management of human resources development programme was conducted.
5-5 Training on training skills	5-5 Training on training skills	5-3 Training plans were formulated annually.
5-6 Implementation of training programme in accordance with training plan.	5-6 Implementation of training programme in accordance with training plan.	5-4 Textbooks and materials were already made and will be revised in June - July 2006.

<p>(6) Training programmes based on the needs of provincial waterworks</p> <p>6-1 Study on human resource development in provincial waterworks and formulation of human resources development programmes for 2 to 3 provincial waterworks</p> <p>6-2 Training for provincial waterworks staffs on introduction to waterworks and fundamental operation and maintenance techniques</p> <p>6-3 Holding of workshops on laws and policies related to waterworks by MIMÉ staff in provinces.</p>	<p>6-1 Needs survey report on capacity building for provincial waterworks in Cambodia was formulated. Training plans for 2 to 3 provincial waterworks were completed</p> <p>6-2 The first training (97 participants in total) was conducted in 2005. The second training (105 participants) will be conducted in June-August 2006.</p> <p>6-3 Workshops were held 5 times. Sixth workshop will be held in August 2006.</p>
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Input	Planned input	Actual input
Cambodian side		
(1) Assignment of counterparts (PPWSA)	(1) Assignment of counterparts: 50 staff as a whole	(1) Assignment of counterparts: 50 staff as a whole
4 staff in charge of distribution control,		
6 staff in charge of water treatment process (2 staff/WTP x 3 WTP's),		
3 staff in charge of water quality control,		
2 staff in charge of human resources development,		
2 staff in charge of training skill		
(MIME)		
2-3 staff		
(2) Provision of a project office (at PPWSA Training Center)		
(3) Payment of transportation, accommodation and other costs of participants in training from provincial waterworks		
(4) Payment of Training Centre in operation and management cost		

Japanese side													
(1) Dispatch of long-term expert(s) (1-2)	(1) Dispatch of long-term expert(s) 3 long-term experts were dispatched.												
(2) Dispatch of short-term experts (14-18)	(2) Dispatch of short-term experts												
(3) Overseas training (counterpart training, country focused training) (6-20)	<table border="1"> <tr> <td>Total</td> <td>32</td> </tr> <tr> <td>JFY 2003</td> <td>8</td> </tr> <tr> <td>JFY 2004</td> <td>8</td> </tr> <tr> <td>JFY 2005</td> <td>12</td> </tr> <tr> <td>JFY 2006</td> <td>4</td> </tr> </table>	Total	32	JFY 2003	8	JFY 2004	8	JFY 2005	12	JFY 2006	4		
Total	32												
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JFY 2006	4												
(4) Provision of training equipment	(3) Overseas training												
	<table border="1"> <tr> <td colspan="2">Counterpart Training in Japan</td> </tr> <tr> <td>Total</td> <td>29</td> </tr> <tr> <td>JFY 2003</td> <td>6</td> </tr> <tr> <td>JFY 2004</td> <td>10</td> </tr> <tr> <td>JFY 2005</td> <td>6</td> </tr> <tr> <td>JFY 2006</td> <td>7</td> </tr> </table>	Counterpart Training in Japan		Total	29	JFY 2003	6	JFY 2004	10	JFY 2005	6	JFY 2006	7
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Total	12												
JFY 2004	4												
JFY 2005	8												
	(4) Provision of equipment												
	<p>The equipment procured in Japan amounts to JPY 19,326,005. The equipment procured in Cambodia amounts to US\$ 82,283. Most of equipment is maintained in good conditions and utilized according to the requirement.</p>												

Process of Activities		
Major Check Points	Sub Check Points	Results
Process of activities in terms of the Plan of Operation		The Plan of Operation is revised based on the discussions at JCC.
Appropriateness in approach/method of technology transfer	Appropriateness of OJT method	For C/Ps, OJT training was effective in terms of capacity building.
Basic concept for development in water supply system	Appropriateness of Top runner – catch-up method	MIME highly evaluated top runner – catch-up method.
Project Management	Monitoring	The Project was well monitored by the Joint Coordination Committee (JCC). Important external conditions in PDM were not changed.
	Relationship and communication among C/P and Japanese experts	C/P and the Japanese experts were well communicated, although in the initial stage, communication through English is not so smooth. PPWSA provided the English training courses for the counterpart staff in order to strengthen their abilities on communication. The counterpart meeting (periodical meeting among C/P and the Japanese experts) were held once a month.
	Cooperation with JICA Cambodia office, JICA headquarters and the Embassy of Japan	The meeting among the Japanese experts and the staff of JICA Cambodia Office were held regularly.
Ownership of MIME and PPWSA in terms of the Project		The management staffs of MIME and PPWSA were positively involved in the Project. Budget was allocated for the Project. The number of C/P assigned for the Project was much larger than the one shown in PDM.
Coordination among donor agencies in the fields of water supply	Current situations on coordination among donor agencies	MIME is in charge of the coordination among donor agencies. As for human resources development/training, the Project provided training courses for the staffs of 8 provincial waterworks where the facilities were innovated or rehabilitated by ADB, World Bank and JICA.