Cambodia

Ex-Post Evaluation of Japanese Grant Aid Project
"The Project for Improvement of Water Supply System in Siem Reap Town"

Yukiko Sueyoshi, Global Link Management Inc.

## 1. Project Description


Project Location

Reservoir(left),Pomp Station (right),
Elevated Water Tank(back right)

### 1.1 Background

The main infrastructure in the Kingdom of Cambodia was constructed during the colonial period of France, however, operation and maintenance of the facilities was not properly conducted for a long time due to the civil conflict from 1970s. Therefore, the development and the rehabilitation of infrastructure had been important issue in Cambodia.

In 2003, only 5.8 percent of the population had access to safe and clean drinking water provided by piped water supply system. Approximately 40 percent of the population used shallow dug wells, and 28 percent relied on untreated surface water from rivers and lakes.

The town of Siem Reap, the project target area, was located approximately five kilometer south of the Angkor Heritage. There had been a rapid population inflow to the town, and more than 550,000 tourists visited yearly in 2002. The capacity of the existing water supply system was only 1,400 $m^3$ / day which covered only 10% of population in Siem Reap Town. The water treatment facilities couldn't cater to the increasing water demands. Thus, the development of water supply system was the urgent issue in Siem Reap Town.

### 1.2 Project Outline

The objective of this Project is to provide stable and safe water for the population in Siem Reap Town (Svay Dankum, Sala Kamraeuk, Sla Kram, Kokchak) by constructing new water supply system. The location map and the project outline are shown in Figure 1 and Table 1.

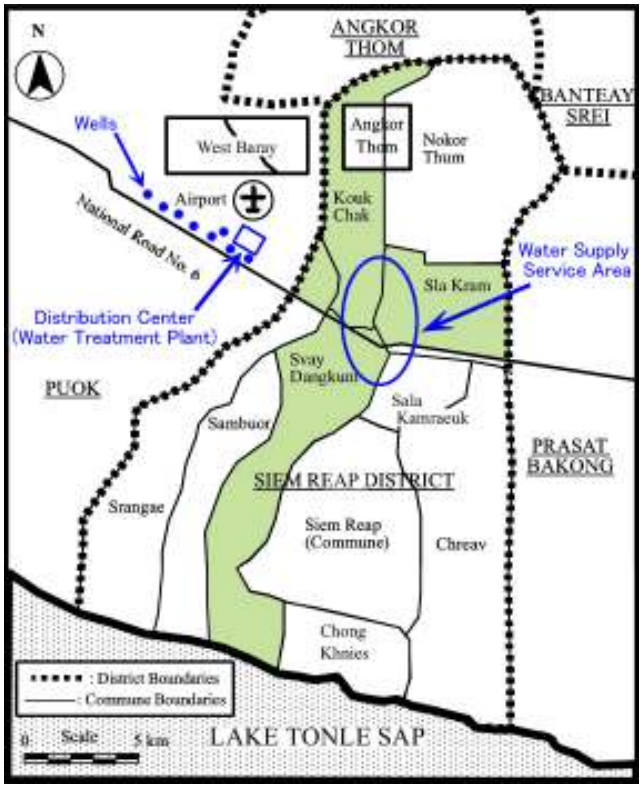



Figure 1 Location Map

Table 1 Project Outline

| | |
|---|---|
| Grant Limit / Actual Grant Amount | 1,537 million yen / 1,535 million yen |
| Exchange of Note Date | May, 2004 |
| Implementing Agency | During the project period;<br>Siem Reap Water Supply System (SRWSS),<br>Department of Portable Water Supply, Ministry of Industry, Mines and Energy (MINE)<br><br>After the project Completion;<br>Siem Reap Water Supply Authority (SRWSA) |
| Project Completion Date | March, 2006 |
| Main Contractor | Hazama Corporation |
| Main Consultant | NJS Consultants Co., Ltd. |
| Basic Design | "Basic design study report on the project for improvement of water supply system in Siem Reap town in the Kingdom of Cambodia", NJS Consultants Co., Ltd.,<br>First phase: February, 2003 – September, 2003<br>Second phase: October, 2003 – December, 2003 |
| Detailed Design | From February 2004 to October 2004 |
| Related Projects | JICA, "Basic design study report on the project for Siem Reap generating facilities in the Kingdom of Cambodia", (1996-2000)<br>JICA, "The Project for Capacity Building for Water Supply System in Cambodia (Phase I 2003-2006, Phase II 2007-2011)"<br>JICA, "Preparatory Survey for Siem Reap Water Supply Extension Project in Cambodia" (2009-2010) |

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Yukiko Sueyoshi, Global Link Management Inc.

### 2.2 Duration of Evaluation Study

Duration of the Study: November, 2009 – September,2010

Duration of the Field Study: February 26, 2010 - February 31, 2010, June 1, 2010 - June 7, 2010

### 2.3 Constrains During the Evaluation Study

No particular limitation was identified.

## 3. Results of the Evaluation (Overall Rating: A)

### 3.1 Relevance (Rating: a)

#### 3.1.1 Relevance with the Development Plan of Cambodia

At the time of planning[13], the national development plan "Second Five Year Socioeconomic Development Plan:2001-2005" under "National Poverty Reduction Strategy" (NPRP) setting the Millennium Development Goals raised the access to safe water as one of main development goals for poverty reduction in Cambodia. In order to promote this agenda, the NPRP set following targets;

1. To provide safe drinking water to 40 % of the population in the rural area by 2005
2. To provide safe drinking water to 87 % of the population in the urban area by 2005

At the time of the ex-post evaluation, the national development plan "National Strategic Development Plan (2006-2013)" also emphasizes the improvement of the access to safe water, and sets target as below;

1. To provide safe drinking water to 50 % of the population in the rural area by 2015
2. To provide safe drinking water to 80 % of the population in the urban area by 2015

At the sector level, the Ministry of Industry, Mines and Energy(MIME) sets key strategies to develop water supply system and service in the urban area as follows; 1) human resource development and capacity building, 2)institutional building and strengthening, 3)improving financial efficiency and management, and 4)maintaining and improving infrastructures and improving technical efficiency.

[13] At the time of Basic Design in 2003

### 3.1.2 Relevance with the Development Needs of Cambodia

At the time of planning, the water supply coverage in Siem Reap Town was only 10% in 2000 which was much lower than those of national average of 48% in Cambodia. Moreover, as a result of the high Non-Revenue Water rate[14] (NRW: about 50%) and the increase in water demand resulting from the increase in tourists and population in the region, the absolute amount of the water supply was inadequate. Accordingly, almost all regions were forced to use personal wells which had poor water quality, and this resulted in the increase in the case of waterborne diseases. Under this situation, the expansion of water supply system and providion of stable and safe water were urgently needed in this area.

At the time of the ex-post evaluation, the new water supply facilities constructed under the Project have been operating properly with its water capacity of 8,000 liters per day. The water supply coverage has been improved owing to the Project, however it can't catch up with the water demand due to continual growth of population and tourists[15]. According to SRWSA, many local residents and hotels have to use groundwater from their own wells because the water resource of SRWSA relys on only groundwater, and faces lack of water amount due to the limitation of intake water to avoide land sabsidence around the remains. The water supply rate in this city is about 18.9%, which is much below the national average of 54.4 % of Cambodia in 2009. Therefore, the development needs for improvement of the water supply is still high.

### 3.1.3 Relevance with Japan's ODA policy

According to Japan's ODA policy at the time of planning, 'Japanese Country Assistance Program for Cambodia in 2002', improvement of water supply service was included under the issue of 'support for the socially vulnerable', which was one of the priority areas[16] of the Program.

This Project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

[14] Non revenue water rate is the ratio of the water that has been lost before it reaches the customer against the water that has been produced.
[15] Number of tourists who visited Siem Reap was 200 million in 2008 (total population in Siem Reap was 113 thousand)
[16] The Country Assistance Program has four priority areas; 1) the realization of sustainable economic growth and a stable society, 2) support for the socially vulnerable, 3) measures to respond to global issues, and 4) support to rectify disparities among the ASEAN countries.

3.2 Efficiency (Rating: a)

3.2.1 Project Outputs

The project scope at the planning stage was as follows. All facilities were constructed almost as planned. The project outputs form Cambodian side such as land provision, construction of electricity lines and staff allocation for water supply management were properly provided. The project outputs of Japanese side is shown in Table 2.

Table 2 Project Output (Planned and Actual)

| Output | Plan | Actual |
|---|---|---|
| 1. Raw Water Intake Facility | Capacity of 1,100 $m^3$/day x8 | As planned |
| 2. Water Treatment Plant | Capacity of 8,000 $m^3$/day | As planned |
| 3. Pumping Station | 1 station | As planned |
| 4. Elevated Water Tank | 1 tank | As planned |
| 5. Power Generating Unit | 1 unit | As planned |
| 6. Transmission Pipelines | 4,050m | As planned |
| 7. Distribution Pipelines | 25,843 m | As planned |
| 8. Rehabilitation of Existing Distribution Pipelines | 6,060 m | As planned |
| 9. Procurement of Equipment | -Tools and spare parts for equipment<br>- Equipment for water quality test<br>-Equipment for management | As planned<br>-Tools and spare parts for equipment (water meters 4,000 units, intake pumps, conveying pumps, etc)<br>- Equipment for water quality test (analyzers, chemicals, glassware, etc)<br>-Equipment for management (computers, etc) |
| 10. Soft component | <Component 1><br>Engineering training<br><Expected Outcome><br>The proposed water supply system will be properly operated and maintained by the staff of SRWSA.<br><br><Component 2><br>Support for organizational strengthening<br><Expected Outcome><br>The water supply system will be organizationally and financially managed.<br><br><Component 3><br>Support for public education program<br><Expected Outcome><br>Residents understand the water supply business and shows willingness to pay for water. | <Component 1><br>Technical trainings for engineers were conducted as planned. Guideline for O&M was developed compiled from specifications and blueprints etc. This guideline was distributed all engineers in SRWSA and shared knowledge on O&M.<br><br><Component 2><br>Technical trainings were conducted as follows: 1)training for managerial staff, 2)training for administrative staff, 3)training on business processing system and 4)training on computer system<br><br><Component 3><br>A total of 6 workshops on the water business and sanitation were conducted with more than 100 participants from the |

| | | |
|---|---|---|
| | | residents and local government. |

Source: the Basic Design Report, JICA Report, Results of Questionnaire

Elevated Water Tank

Receiving Well

Administration Building

3.2.2 Input

3.2.2.1 Project Cost

The Japanese grant ceiling amount was 1,537 million yen and 23 million yen was to be locally funded. The Japanese grant disbursement was 1,535 million yen (94% of the planned cost) and the equivalent to 18 million yen (78% of the planned cost) was locally funded. Therefore, the project cost was lower than planned.

3.2.2.2 Project Period

The planned project period was 25 months whereas the actual project period was from April 2004 (signing of Exchange of Notes) to March 2006 (commencement of operation) with a total period of 23 months. The project period was shorter than planned (92% of the planned period). According to the Japanese consultant and MIME, during the project period there were some delays in negotiating the price for the site on which the water treatment plant was to be built and in selecting the water intake site that would serve as the water source, but the construction overall was completed ahead of schedule.

Both project period and project cost were within the plan, therefore efficiency of the project is high.

3.3Effectiveness (Rating: a)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation Indicators

(1) Water Supply Capacity and Facility Utilization Rate

Prior to the Project, there was a water supply facility with capacity of 1,378 $m^3$/ day (2003) in Siem Reap which was constructed by French government in 1995. Upon completion of this Project, new water facility with capacity of 8,000 $m^3$/ day (2008) was constructed and the aged existing facility was abandoned. Water supply capacity and facility utilization rate in Siem Reap are shown in Table 3.

As shown in table below, the maximum water production amount was 9,156 $m^3$/ day in 2008 and 9,197 $m^3$/ day in 2009 which were beyond the target of 8,000 $m^3$/ day for 2008 (114% of the target for 2008). Likewise, the average water production amount at the target year was 8,781 $m^3$/ day in 2008 and 9,116 $m^3$/ day in 2008 which were also beyond the target of 6,000 $m^3$/ day (146% of the target for 2008).

Both maximum and average facility utilization rate are beyond 100%. Therefore, it can be concluded that the planned amount of water have been supplied and the facilities have been fully utilized since the completion of the Project.

Table 3 Water Supply Capacity and Facility Utilization Rate (Planned and Actual)

| Indicators (unit) | Baseline 2003 | Target 2008 | Actual 2008 | Actual 2009 |
|---|---|---|---|---|
| Water supply capacity ($m^3$/day) | 1,378 | 8,000 | 8,500 | 8,500 |
| Maximum water production amount ($m^3$/day) | 1,083 | 8,000 | 9,156 | 9,197 |
| Average water production amount ($m^3$/day) | 850 | 6,000 | 8,781 | 9,116 |
| Maximum facility utilization rate (%) | 79 | 100 | 108 | 108 |
| Average facility utilization rate (%) | 62 | 75 | 103 | 107 |

Source: Baseline in 2001 and target in 2009 are from the Basic Design Report. Actual figures are from SRWSA

(2) Population Served and Average Water Usage per Person

Population Served and Average Water Usage per Person in the target area are shown in Table 4.

Table 4 Population Served and Average Water Usage per Person (Planned and Actual)

| Indicators (Unit) | Baseline 2003 | Target 2008 | Actual 2008 | Actual 2009 |
|---|---|---|---|---|
| Population in the target area (persons) | 53,657 (2001) | 74,000 | 112,902 | 116,318 |
| i. Population served (persons) *Note 1 | 3,185 | 26,000 | 20,088 | 21,211 |
| ii. Population served (persons) *Note 2 | | | **27,156** | **28,674** |

| | | | | |
|---|---|---|---|---|
| Average water usage per person (ℓ/day person) *Note 3 | 100 | 120 | 230 | 190 |

Source: Baseline in 2003 and target in 2009 are from the Basic Design Report. Actual figures are from SRWSA.
Note 1: The actual number of population served in 2008 and 2009 is calculated by multiplying 5.4 persons per households (estimation by SRWSA) and the number of connections in the target area.
Note 2: The actual number of population served in 2008 and 2009 is calculated by multiplying 7.3 persons per households (result from social survey in 2009[17]) and the number of connections in the target area.
Note 3: The average water usage per person is calculated by dividing the average water consumption per connections by 7.3 persons per households (result from social survey in 2009)

The actual population served was 20,088 persons in 2008 (77% of the target for 2008) and 21,211 persons in 2009, which was below the target of 26,000 persons for 2008. Based on the calculation method of SRWSA, the actual number of population served is calculated by multiplying 5.4 persons per households (estimation by the SRWSA) and the number of connections in the target area (i). However, SRWSA mentioned the actual family size is supposed to exceed their estimation because of continuous increase of long-term-stay tourists and migrant workers. According to the result of social survey conducted by the Cambodian private consulting firm in 2009, the average family size was 7.3 persons in the target area. Assuming that the current family size is 7.3 persons, the actual population served is presumed to reach 27,156 persons in 2008 (104% of the target for 2008) and 28,674 persons in 2009 (ii).

Thus, it seems reasonable to adopt the results of the latest social survey and conclude that the target population served was achieved based on the calculation with the latest data.

The average water usage per person in 2008 was 230 ℓ/day (191% of the target for 2008) and 190 ℓ/day in 2009, which was also beyond the target of 120 ℓ/day.

(3) Water Supply Hour

Table 5 Water Supply Hour

| Indicators（Unit） | Baseline 2003 | Target 2008 | Actual 2008 | Actual 2009 |
|---|---|---|---|---|
| Water supply hour (hours) | - | 24 | 24 | 24 |

Source: Baseline in 2003 and target in 2009 are from the Basic Design Report. Actual figures are from SRWSA.

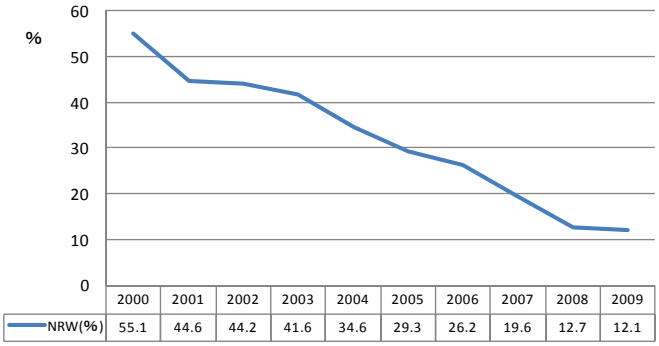
Water Supply Hour in Siem Reap is shown in Table 5. According to SRWSA, the residents suffered a lot of water interruption prior to the Project, however, they are now receiving water supply service for 24 hours after the Project. Accordingly, the result of beneficiary survey[18] shows that more than 30 % of households had water supply for less

[17] Key Consultants, August 2009
[18] A beneficiary survey on the effects and impact of this Project was conducted during this ex-post evaluation exercises. Interview survey was implemented to the water users, in total 115 households and 40 hotels in the Project target area.

than 20 hours per day prior to the Project. At the ex-post evaluation, almost all households currently have nearly 24 hour water supply.

(4) Non-Revenue Water

Non-revenue Water Rate of SRWSA from 2000 to 2009 is shown in Figure 2. NRW rate of SRWSA has sharply decreased from 41.6% in 2003 to 12.1% in 2009. This Project contributed to reduce non-revenue water through constructing water distribution lines and installation of new water meters in the target area. In addition, SRWSA has been focusing on the efforts to strengthen the efficient water usage, and implementing water leakage control activities such as leakage detection, replacement of the aged pipes, replacement of defective water meters and analysis of water distribution amount.




| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| NRW(%) | 55.1 | 44.6 | 44.2 | 41.6 | 34.6 | 29.3 | 26.2 | 19.6 | 12.7 | 12.1 |

Figure 2 Non-Revenue Water Rate of SRWSA (%)

Source: SRWSA

(5) Water Pressure and Water Quality

At the planning, the water pressure was 0.5-1.0 kg/cm$^2$ in 2003. The actual water pressure as of 2008 reaches 2.2 kg/cm$^2$, which exceeds the target of 2.0 kg/cm$^2$ in 2008. As shown in Table below, 47.5 % of the hotels responded that water pressure is sufficient for their business operation, while 27.5 %, 22.5 % of them answered that it is only to some extent and not at all. 77.2 % of the households responded that water pressure is sufficient for their daily life, while 14.0% of the household think only some extent. The result of beneficiary survey on Water Pressure is shown in Figure 3.

Regarding the water quality, the water quality parameters based on the WHO standard are monitored on a regular basis (daily, every 2 weeks, monthly and quarterly) by SRWSA. It is also reported that the chlorine residual is detected in drinking water, meaning that a sufficient amount of chlorine was added initially at the water treatment plant to inactivate the bacteria and viruses.

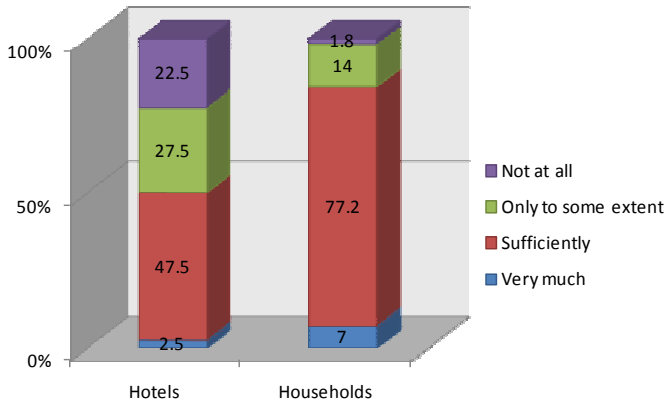



Figure 3 People's Satisfaction on Water Pressure
Source: Beneficiary survey

### 3.3.2 Qualitative Effects

Under the Project, soft components were conducted as follows; 1) Engineering training, 2) Support for organizational strengthening and 3) Support for public education program. Interviews with participants undertaken under the ex-post evaluation confirmed following effects.

#### 3.3.2.1 Engineering training

The expected outcome of the technical trainings on operation and maintenance (O&M) was that SRWSA's engineers acquired O&M skill of new water supply system. Interviews with participants who are in charge of maintenance undertaken under the ex-post evaluation confirmed that they were able to acquire the knowledge and techniques needed for appropriate operation of the new water supply system. O&M guidelines as training materials were also developed and shared among all engineers in SRWSA. Since the completion of the Project, SRWSA has been continually providing planned amount of water and operating without serious troubles associated with O&M. Thus, it can be concluded that the expected outcome was achieved.

#### 3.3.2.2 Support for organizational strengthening

Through the trainings on business management, it was expected that SRWSA's managerial staff acquired knowledge on the efficiency of business management. Managers learned about business administration, such as financial reports, budget management, cost analysis, personnel evaluation, setting water charges, etc. In addition,

business managers learned about clerical work, such as processing money received and disbursed, journal processing, preparing financial reports, etc. Interviews with participants undertaken under the ex-post evaluation confirmed that technical instructions such as invoicing, collections and customer management helped to shorten the fee collection period and increase fee collection. It can be concluded that this training contributed to the efficiency of operations of SRWSA since service revenue from the collection of water tariffs has consistently increased after the completion of the Project (for details to 3.5.3)

3.3.2.3 Support for public education program

The expected outcome of the public education program was that residents understood the water supply business and showed willingness to pay for the treated-water. Through the activities, relevant organizations on the water works could gain the method to educate their customer to understand about the water service and its tariff, and residents also could have a chance to learn the importance of water works and sanitation. These activities have not been implemented by SRWSA after the completion of the Project, however, the increase of water connections and the high level of water collection rate are showing the customers' willingness to connect and pay to the water service of SRWSA. Moreover, ahead of the water tariff revisions in 2009, SRWSA carried out educational programs explaining the new tariff by utilizing the knowledge acquired in these activities.

In addition, currently JICA provides the technical cooperation project for Capacity Building for Water Supply System which may contribute for enhancing the operation, and to this date, total of 14 out of 40 staff of SRWSA received technical guidance in the field of as water quality control, pipe installation and water pump maintenance.

This Project had largely achieved its objectives, therefore its effectiveness is high.

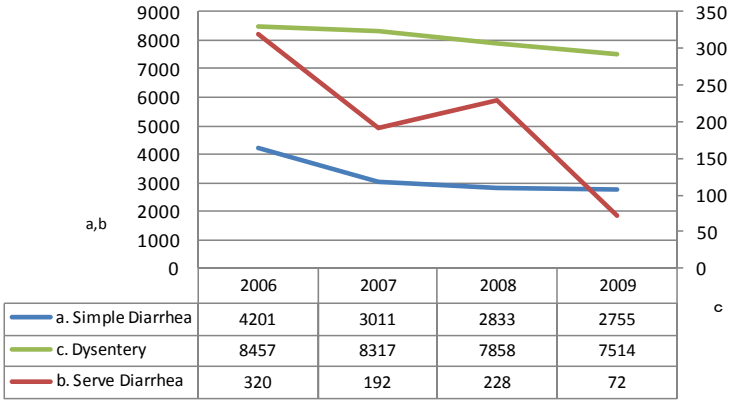
3.4 Impact

3.4.1 Intended Impacts

3.4.1.1 Reduction in Cases of Water-borne Diseases

According to the beneficiary survey, the respondents were most affected by the improved sanitary conditions. Interviews at the Siem Reap Referral Hospital and the Provincial Health Department confirmed that there are no clear evidences to show the difference of health condition among people who uses wells and water taps, however, water-borne diseases have been decreased in Siem Reap as a whole. This is attributed due to the consumption of pipe-borne water as well as the improvement of nutrition and sanitation. The case of water-borne diseases in the target area has been decreased after the

Project completion, and its results are shown in Figure 4.




| | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| a. Simple Diarrhea | 4201 | 3011 | 2833 | 2755 |
| c. Dysentery | 8457 | 8317 | 7858 | 7514 |
| b. Serve Diarrhea | 320 | 192 | 228 | 72 |

Figure 4 Cases of Water-borne Diseases

Source: Provincial Health Department of Siem Reap

3.4.1.2 Reduction in Water Fetching Works

According to the beneficiary survey, percentage of households who went for fetching water was reduced from 50% prior to the Project to 30% after the Project. They also answered they can spend their time more for business (72%) and in-house works (24%) because they no longer go for fetching water. According to the interview with beneficiaries (housewives) in the project target area, they had to go for fetching water 2-3 times per day at a time in the past, but after installation of water taps at their home, they become more active in their business such as selling vegetables, fruits and handicrafts.

3.4.1.3 Impact on Tourism Industry

According to the beneficiary survey to hotels, positive impacts from this Project are reported as follows; 1)improvement of sanitation (60%), 2)increase of customers' satisfaction (32%), 3)increase of laundry (6%) and 4)improve of management efficiency (i.e. reduce of amount of purchased water from vendors) (2%).

On the other hand, a lot of requests were made toward SRWSA for improvement of water service. Although 43% of respondents answered they are satisfying with SRWSA's service, 55% answered some countermeasures should be taken to improve water service such as decrease of water tariff (65%), increase of water amount[19] (35%) and increase of water pressure (33%).

3.4.2 Other Impacts

3.4.2.1 Impacts to the Natural Environment

[19]Many hotels use both the private wells and the public water supply. The private well is used for mainly pool and gardening. They hope to increase water amount of the public water because it is sometime insufficient for their business during the tourist season.

SRWSA set up monitoring wells in 10 places to monitor land subsidence which is possibly caused by pumping groundwater in these regions. As of the ex-post evaluation, no symptoms of land subsidence are observed. When SRWSA make decisions on the amount of intake water, they have to gain approvals from the authorization of the Board of Director for Water in Siem Reap in order not to cause land subsidence. This board meeting is held one every 3 months, and attended by Authority for the Protection and Management of Angkor and the Region of Siem Reap (APSARA) which preserves archaeological sites, MIME, Ministry of Economy and Finance, Governor of Siem Reap and SRWSA. In addition, results on the monitoring wells of groundwater levels in this region have been shared monthly among SRWSA and APSARA, but they don't discuss countermeasures on a regular basis because there are no concerns about land subsidence so far.

Regarding impact on the shallow wells used by local residents, the Ministry of Water Resources and Meteorology has jurisdiction over surface and ground water resources, but they do not carry out systematic surveys, so it is not possible to acquire information on this Project's impact on shallow wells. Residents also made no comments in the beneficiary surveys on the impact on shallow wells.

#### 3.4.2.2 Land Acquisition and Resettlement

During the Project implementation, lands for the water supply facilities were acquired without problems. The site for the water treatment plant was changed due to negotiations over the site acquisition, and the location of the intake facility was changed taking into account of the possibility of land subsidence in the archaeological remains. There was no resettlement of houses.

#### 3.4.2.3 Impacts on Management of SRWSA

SRWSA used to be a division within MIME, but it became a public water corporation aiming for independent profitability in March 2007. As a result of the new establishment and expansion of water supply facilities through the Project, service revenue from the collection of water tariffs has increased and has helped to stabilize the current account. Service revenue has consistently increased since the Project completion. SRWSA's management indicators are shown in Table 6.

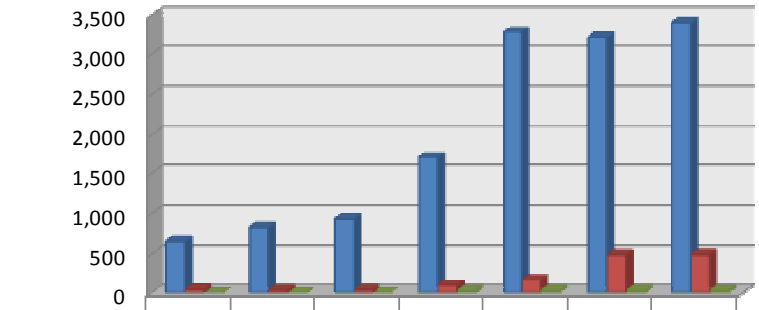
Table 6 SRWSA's Management Indicators (unit: Million KHR)

| Items | 2007 | 2008 | 2009 |
|---|---|---|---|
| Service revenue | 2,662 | 3,896 | 4,077 |
| Net income | 992 | 1,010 | 834 |
| Debt/equity ratio (D/E)[20] | 0.02 | 0.03 | 0.02 |

Source: SRWSA

[20] D/E is a measure of company's financial leverage calculated by dividing its total debt by equity.

In addition, the number of service connections to the SRWSA in Siem Reap City as a whole increased from 3,279 in 2007 to 3,407 in 2009 for household, from 170 in 2007 to 493 in 2009 for commercial and from 26 in 2007 to 28 in 2009 for governmental institutions respectively[21]. SRWSA could not increase the water supply amount because of restrictions on the amount of groundwater that could be pumped up. New connections were restricted from January 2009, and the period for resumption has not been decided yet. Number of service connection from 2003 to 2009 is shown in Figure 5.




| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| Residence | 658 | 835 | 935 | 1,706 | 3,279 | 3,204 | 3,407 |
| Commercial | 41 | 35 | 37 | 99 | 170 | 489 | 493 |
| Government | 0 | 0 | 0 | 25 | 26 | 27 | 28 |

Figure 5 Service Connection in Siem Reap

Source: SRWSA

Positive impacts of this Project such as 1) decrease of water-borne diseases, 2) reduction of water fetching works and 3) impact on tourism industry were confirmed during the evaluation survey. Negative impacts are not reported so far.

### 3.5 Sustainability (Rating: a)

#### 3.5.1 Structural Aspects of Operation and Maintenance

The new water facilities have been operated and maintained by SRWSA. The efficiency of organizational arrangement has been improving since SRWSA became a public water corporation in 2007.

At the time of planning, SRWSS had conducted operation and maintenance with total of 12 employees, consisting of 7 full-time employees and 5 temporary employees. It was recommended by Japanese consultant that the number of SRWSA staff was insufficient, and should be increased up to 33 employees (1 director, 2 administrators, 7 employees in sales, and 23 technicians) for proper operation and maintenance.

At the time of ex-post evaluation, SRWSA has been run and managed as an

[21]The number of connection was decreased for the residence in 2008 and the commercial in 2003. This is because the number of disconnection due to moving house was beyond the new connection.

independent business since it became a public corporation in March 2007. Currently, based on the recommendation by the Japanese consultant, it has increased its employees to 40 full-time employees, with 1 director, 2 deputy directors, 9 administrators, 25 employees in the production and water supply division and 3 in the planning and technical division. Latest organization chart of SRWSA is shown in Figure 6.


Figure 6 Organization Structure of SRWSA

### 3.5.2 Technical Aspects of Operation and Maintenance

SRWSA staff has received technology transfer under the soft components of the project and the technical cooperation project for Capacity Building for Water Supply System phase 2, and acquired basic skills for operation and maintenance except repair skills required advanced technology. There have not been any significant problems with the daily maintenance and management. Operation and maintenance manuals compiled from specifications and blueprints were prepared under the Project, and utilized by the engineers. Further, its status as a public corporation has enabled it to hire skilled technicians from outside (including the private sector), and its system for operations and maintenance has strengthened.

### 3.5.3 Financial Aspects of Operation and Maintenance

(1) Financial Status of SRWSA

SRWSA's financial statement is shown in Table 7. Since SRWSA adopted self-support accounting system in 2007, its financial status considered to be appropriate due to the following reasons; 1) the total income and the water billing is continuously increasing, 2) the balance of payment is remained in surplus and 3) the repair and maintenance costs is increasing but below the total profits.

Table 7 SRWSA's Financial Statement (Unit: million KHR)

| | Items | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| INCOME | Water billing | 2,264 | 3,465 | 3,839 |
| | Other revenue | 5 | 119 | 230 |

| | | | | |
|---|---|---|---|---|
| | New connection | 391 | 311 | 7 |
| | Total income | 2,662 | 3,896 | 4,077 |
| EXPENDITURE | Salary | 94 | 467 | 482 |
| | Utility | 212 | 408 | 622 |
| | Chemical & electricity | 724 | 920 | 964 |
| | Repair and Maintenance | 156 | 554 | 632 |
| | Security rental fee and other | 481 | 534 | 540 |
| | Total Expenditure | 1,669 | 2,885 | 3,243 |
| PROFIT | INCOME-EXPENDITURE | 992 | 1,010 | 834 |

Source: SRWSA

(2) Water Tariff in Siem Reap

SRWSA's Water Tariffs for households at the time of planning and ex-post evaluation are shown in Table 8. SRWSA's water tariff was revised from the flat-rate to the measured-rate in August 2009[22]. Prior to the Project, the tariff collection rate has remained at 73% in 2001. After the completion of the Project, the average collection rate was high at 94% in 2008 and 97% in 2009 even after its tariff was raised.

Table 8 SRWSA's Water Tariffs for Household (Unit: KHR/$m^2$)

| Siem Reap<br>As of basic design | Siem Reap<br>(As of ex-post evaluation) |
|---|---|
| Households:1,200 | 0-7 $m^3$ : 1,100<br>8-15 $m^3$ : 1,500<br>16-30 $m^3$ : 1,800<br>30- $m^3$ : 2,000 |

Source: Water tariff of Siem Reap is from SRWSA

3.5.4 Current Status of Operation and Maintenance

An inspection of the facilities and materials during the ex-post evaluation confirmed that the facilities and equipment are well maintained through the daily inspections, and no serious failures of the facilities that would hinder the water supply business have been reported. However, as indicated below, some part of facilities and equipment are not properly been functioned. Countermeasures should be taken are summarized in Recommendations.

1) The power line communication (PLC) system was damaged due to lightning, and it was observed at the time of ex-post evaluation that the monitoring panels (the panel of whole water supply system and the panel of intake wells) still have defects in its displays even after exchange of its system. To this date, no problems resulting from these malfunctioned monitors have been occurred, however, it requires continual care because it may cause a delay in detecting problems in the case of trouble with the intake wells. To prevent other similar incidents from lightning, SRWSA has taken measures to install lightning conductors.

[22]According to the beneficiary survey, 57% of residents and 65% of hotels responded they hope to be reduced the current water tariff.

2) According to SRWSA, for the water stains on the elevated water tank, it has been repaired from outside of the tank by the local constructor.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

## 4. Conclusion, Recommendations and Lessons Learned

### 4.1 Conclusion

This Project has been highly relevant with Cambodia's national policies, development needs both at the time of planning and ex-post evaluation and Japanese ODA policy at the time of planning. The Project has achieved its objectives, and its effectiveness is high. Both project period and project cost were within the plan, therefore efficiency of the Project is high. No major problems have been observed in the operation and maintenance system, therefore, sustainability of the project is high. In light of the above, this Project is evaluated to be highly satisfactory.

### 4.2 Recommendations

#### 4.2.1 Recommendation to SRWSA

<u>For ensuring the sufficient water supply in Siem Reap Town (effectiveness)</u>

The water supply rate in Siem Reap is about 18%, which is still below the national average of 54 % in 2009. It is apparent that the absolute amount of the water supply is inadequate in Siem Reap at present. During the beneficiary survey undertaken by the ex-post evaluation, a lot of requests were made toward SRWSA for improvement of water service. In order to address the urgent needs on water supply in Siem Reap Town, it is recommended for SRWSA to accelerate consideration of expansion of the water supply facilities with new water resources.

<u>For the improvement of skills on O&M (sustainability)</u>

Some of the equipment and facility (the monitoring panel and the elevated water tank) provided under this Project have malfunctioned, therefore, it is recommended that SRWSA to define the causes and adopt proper countermeasures for repair and prevent recurrences.

#### 4.2.2 Recommendation to JICA

<u>For ensuring the sufficient water supply in Siem Reap Town (effectiveness)</u>

In order to address the needs of SRWSA, JICA is currently undertaking Preparatory Survey for Siem Reap Water Supply Extension Project, and considering the possibility for a project to the new water supply facilities (intake facility, conveyance facility, treatment plant,

transmission and distribution networks) in Siem Reap. In light of the urgent issue, to sustain the Project effectiveness to provide stable and safety water, it is recommended for JICA to accelerate the procedure on reviews and approvals of the above planned project.

4.3 Lessons Leaned

Implementation of soft component and collaboration with technical cooperation (good practice)

During the planning stage, it was judged that the improvement of technical capability of operation and maintenance was necessary for the business expansion, and the soft component of personnel training was decided to implement by the Japanese consultant. Likewise, the water supply business of SRWSA has been conducted in close relation with "The Project for Capacity Building for Water Supply System in Cambodia" conducted under the technical cooperation by JICA since 2003. As a result of the soft component and the technical cooperation, SRWSA is currently providing safe water supply to the people of Siem Reap with sufficient facility operation and management based on sound water supply business management.

Therefore, in the future similar projects, during the planning stage, it is recommended to assess the existing capacity of implementing agency, and to identify the necessary capacity to deal with new facilities and system. Based on the assessment, it is desired that soft component or technical cooperation project should be implemented or collaborated in order to enhance effectiveness and sustainability of project outcome.

**Third Party Opinion**

Dr. Visoth CHEA
Assistant General Director
Phnom Penh Water Supply Authority

The ex-post evaluation report made by the Japanese consultant is very comprehensive and summarized based on the fact gained from the document review, field interviews and beneficiary survey. As indicated in this report, the water supply service and the utility in Siem Reap were in very poor condition before the Japanese grant aid project, however, the current condition has been drastically improved. Regarding effectiveness and sustainability of the project, the facilities provided under the project have been properly maintained and utilized by SRWSA, and giving full benefit to the consumers in Siem Reap. As for the implementation process of the project which is not indicated in the report, it was found that some small construction defects, such as pieces of wood remained inside the pipeline resulting in the broken of water meters. These construction defects were detected and fully-repaired by the contractor. Regarding the recommendation to SRWSA 'For ensuring

the sufficient water supply in Siem Reap Town' stated in the report, it is sure that SRWSA should take into serious consideration because the growing water demand is higher than the existing supply capacity even the facility utilization rate is over 100%. Nowadays, SRWSA is looking for new water resource in order to catch up with the water demand in close cooperation with JICA.

Based on the experiences worked with many foreign projects from Japan, WB, ADB and France, I would like to emphasize the importance of a capacity assessment of the implementing agency during the design stage in the same way as this project. It should be examined both current capacity and required capacity in the future operation after the project completion. In particular, these items such as number of operators, technical level of engineers and finance situation should be checked carefully. After this assessment, the transferred technology should be selected appropriately based on the actual capacity and conditions of the agency. Because I have observed many projects which received high technology and modern facilities but failed in operation and maintenance. It is also important that the operators must join the process to learn and to know about the facilities during the construction period. In order to enhance the project sustainability, they must be trained and upgrade their knowledge and skill to be able to operate and maintain the new facilities properly.