

2-3 Obligation of Recipient Country

2-3-1 Obligation of RGC

To achieve the objectives of the Project and on the basis of the scope of works covered by GOJ, the costs for the following items shall be undertaken by RGC.

Before Project Implementation

- To organize a proper institution/organization for management of the proposed water supply system consisting of 33 personnel with the required qualification as shown in Appendix 6-4,
- To clear all the requirements for EIA,
- To secure the proposed project sites for well construction and WTP without mines and archeological problems,
- To obtain all the required permissions for construction of Project facilities,
- To obtain all the permissions for laying the pipes under the public road and acceptance for laying pipes under the private land, if any,
- To collect and analyze the recording data from the rehabilitated observation facilities for groundwater level and land subsidence on a continuous basis during and after project implementation.

During Project Implementation

- To dispatch the Project Team to the Project site,
- To construct gates and fences in and around the Project sites,
- To provide the electrical distribution line to the WTP site,
- To install the flow meters to be procured,
- To investigate and treat mines, if necessary,
- To investigate and treat buried ruins in the proposed Project sites, if necessary,
- To bear all the commissions to the Japanese bank for banking service based on the Banking Arrangement ,
- To ensure all taxes and custom clearance of the products for project., and

After Project Implementation

- To properly operate and maintain the facilities constructed and equipment purchased under the Project and
- To increase the personnel from 33 temporary staffs to 40 proposed staffs.

2-3-2 Project Cost Estimates

The total Project cost is estimated to be 1,663 million Yen. The expenses to be borne by the GOJ and RGC sides are shown in Table 2.28 and Table 2.29, respectively. The cost estimate is provisional and would be further examined by GOJ for the approval of the Grant.

2-3-3 Project Cost Borne by GOJ

A total cost to be borne by GOJ is 1,640 million Yen. Table 2.28 shows a detailed cost.

Table 2.28 Project Cost To Be Borne by GOJ

Descriptions	Estimated Cost (million Yen)
(1) Construction	1,461
a. Well construction	(46)
b. Conveyance pipe construction	(24)
c. WTP construction	(347)
d. Equipment installation	(26)
e. Distribution pipe construction	(171)
f. Mechanical/Electrical equipment, pipes, etc.	(847)
(2) Equipment procurement	27
(3) Detailed design and construction supervision	152
a. Detailed design and construction supervision	(133)
b. Soft component	(19)
Total	1,640

2-3-4 Project Cost Borne by RGC

A total cost to be borne by RGC is estimated to be 694 million Riels (23 million Yen). The detailed breakdown is shown in Table 2.29.

Table 2.29 Project Cost to be borne by RGC

Descriptions	Estimated Cost (million Riels)
Before Project Implementation	285
(1) Land acquisition for the proposed sites	(285)
During Project Implementation	409
(1) Dispatch for the project Team for Siem Reap	(19)
(2) Cost for personnel increase	(20)
(3) Gates and fences for the proposed sites	(67)
(4) Power distribution to the WTP site	(266)
(5) Bank commission	(26)
(6) Consumer flow meter installation	(11)
Total	694

2-3-5 Conditions of Cost Estimates

Time of cost estimate April 2003

Exchange rate US\$ 1 = 121.79 Yen (3,800 Riel)

Project implementation A total of 25 months, including 7 months for detailed design, 15 months for construction and 3 months for bidding and miscellaneous.

Others The Project will be implemented under the Grant Aid by the GOJ.

2-3-6 Cost Estimate for O&M

After Project completion, the production capacity will be increased to 8,000 m³/d from the present state of 1,400 m³/d. This will bring about expansion of service areas, resulting in increase of job capacities in administration and customer services. Consequently, the number of staff for the proposed three departments (production, administration and customer services) will also increase. A total cost for operation and maintenance will include electricity, chemicals, O&M for equipment/facilities, and personnel expenses.

Electricity is estimated to be 2,000 kW/day required for operation of raw water intake pumps, filter control valves, backwashing pumps, clear water lifting pumps, chemical feeding, and lighting. Chemicals include lime

and chlorine. O&M cost includes preventive maintenance cost for intake and WTP facilities which is estimated to be two percent of the facilities/equipment costs and fuels for vehicles. Water quality control cost is estimated to be 30 percent of chemical costs. Filter sand may be replaced periodically is also included with the cost. Personnel expenses are based on the level of PPWSA.

Present water tariff system applied is simply proportional for consumptions as shown in Table 2.30. The categories are only composed of resident and business.

Table 2.30 Present Water Tariff

Categories	Tariff (Riel per m ³)
Residents	1,200
Business	1,400

Financial statement showed a deficit in 2000, however got profit in 2001 and 2002. The deficit in 2000 was caused by foreign exchange loss due to that SRWSS manages its finance in US dollar and Cambodian Riels. Incomes from water supply was sufficiently covered the direct expenses including chemicals, electricity, and personnel.

Assumed as the above water tariff, approximately 100 percent collection ratio, and electricity cost, which may affect strongly for the O&M cost, will be maintained with moderate level, the estimated yearly tariff income in 2006 is 339 thousands dollars while O&M cost is 280 thousands dollars. It shows 59 thousands dollars surplus in 2006 as shown in Table 2.31. In 2008, the surplus is further extended to 287 thousands dollars as the water sales are increased.

Table 2.31 Estimated Income and O&M Cost in 2006 and 2008

	Year 2006		Year 2008	
	Per day	Per year	Per day	Per year
Ave. water supply	2,826m ³ /d	1,031,490 m ³ /year	5,121 m ³ /d	1,869,165 m ³ /year
Residents	2,008m ³ /d	732,920m ³ /year	3,126m ³ /d	1,140,990m ³ /year
Business	698m ³ /d	254,770m ³ /year	1,826m ³ /d	666,490m ³ /year
Public	120m ³ /d	43,800m ³ /year	169m ³ /d	61,685m ³ /year
Tariff income	929\$/d	339,000\$/year	1,713\$/d	625,000\$/year
Residents	634\$/d	231,000\$/year	987\$/d	360,000\$/year
Business	257\$/d	94,000\$/year	673\$/d	246,000\$/year
Public	38\$/d	14,000\$/year	53\$/d	19,000\$/year
O&M cost		280,000\$/year*		338,000\$/year

Note: O&M cost in 2006 is estimated proportionally based on the cost in 2008 (1\$=3,800Riels).

Table 2.32 Costs for Operation and Maintenance

Descriptions	Contents	Q'ty	Unit	Price	Monthly	Yearly
1. Electric power cost						
1) Intake and WTP	22 kV high tension	1,861	kW/d	0.195	10,888	130,700
2) Lighting and air conditioning		41.2	kW/d	0.226	279	3,400
2. Chemicals						
1) Oxidant/disinfectant	Chlorine	29.1	kg/d	1.000	872	10,500
2) pH adjustment	Lime	100.0	kg/d	0.141	423	5,100
3. O&M						
1) Generator	fuel	79.0	L/month	0.436	34	500
2) Vehicle	fuel	4.2	L/month	0.436	55	700
3) Mechanical/electrical equipment	2 % of equipment cost	1	lot/year	61,308	5,117	61,400
4) Water quality analysis	30% of chemicals	1	lot/year	4,680	392	4,700
5) Replacement of filter media		1	6615kg/year	3.50	1,929	23,200
6) others	Repair cost for building, etc.	1	lot/year	22,500	1,875	22,500
4. Man power						
1) Director		1	Man month	400	400	4,800
2) Deputy director	For administration	1	Man month	300	300	3,600
3) Deputy director	For customer service	1	Man month	300	300	3,600
4) Deputy director	For engineering	1	Man month	300	300	3,600
5) Section chief		7	Man month	200	1,400	16,800
6) Staff		28	Man month	100	2,800	33,600
7) Lab. staff		1	Man month	150	150	1,800
8) Security		6	Man month	100	600	7,200
Total					US\$338,000/year	

Note: The estimated O&M cost is based on that WTP supplies 8,000m³/d in 2008. In 2006, the production capacity will be less than 8,000 m³/d so that the O&M cost required in 2006 will be lower than that of 2008 due to pump operation, etc .

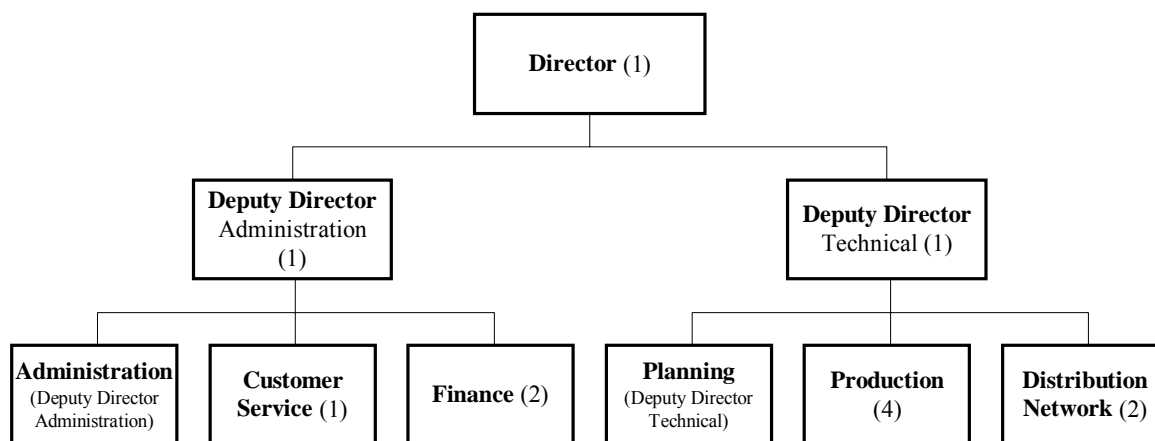
2-4 Project Operation Plan

2-4-1 Present Organization of Siem Reap Water Supply System

The water policy of Cambodia is planned and implemented by the Department of Water Supply, MIME. At the provincial level, the water supply system is managed by waterworks, one of the departments in the provincial office of MIME. In Siem Reap, presently, SRWSS manages the water supply system.

The organizational structure, roles, and responsibilities of SRWSS were determined by the royal degree of Cambodia, as Number 019605, at the date on 24 April 1999. This degree was implemented by the degree of MIME as the order of MIME for “On Going Water Supply Ordinance in Siem Reap” and present organization of SRWSS was established at the date of 25 April 1999.

Based on this ministry degree, SRWSS has two departments and 6 divisions shown as the Figure 2.21, Present Organization Structure of SRWSS.



Note: Number in parenthesis shows actual numbers of staff, totalling 12 including permanent and casual.

Figure 2.21 Present SRWSS Organization

At present, there are 12 staff members, 7 permanent and 5 temporary staff. They conduct the following work, however their qualifications are not necessarily sufficient.

- Director : Manage the water supply system
- Deputy directors : Support the director and manage the water supply system
- Administration : The deputy director, administration assumes this job, supervising meter reading, billing, and collection of water tariff at present. This post manages personnel affairs, education, and legal affairs to support the director in administrative works.
- Customer service : Conduct meter reading, billing, and collection of water tariff.
- Finance : Report to the deputy director, administration and conduct accounting and financial management works including accounting, fixed asset management, and cost analysis. However, the present staff works only as bookkeeper.
- Planning : The deputy director, engineering assumes this job that is to plan expansion of the water supply network and facility improvement based

on the analysis of the water demand using demography and socioeconomic statistics. However, the present staff conducts only supervision of operations concerning maintenance of WTP and residential connections.

- Production : Manage safe and stable water production as well as quality control. However, the present staff performs only as head operator of water purification plant.
- Distribution : Manage the water distribution pipe network including stable water distribution, detection of leakage and stolen water. However, the present staff operates only the water supply pipelines.

MIME has a plan to corporatize the water supply system to establish the Cambodian National Water Supply System and the draft decree is discussing in the cabinet. However, if this decree is not accepted and issued as law of Cambodia, MIME has a plan to shift for establishment of the Siem Reap Water Supply Authority, autonomous authority manage the water supply system in Siem Reap. MIME will follow up the situation of this plan and will inform JICA of the progress as necessary.

2-4-2 Project Operation Plan

The F/S conducted in 2000 suggested an organization of 25 staffs composed of an administration department, customer service department, and engineering department. However, the Study Team proposes expanding to a 40 staff organization to operate the facility 24 hours a day with 3 shifts as shown in the following organization in Figure 2.22. This staff of 40 excludes board members and auditors. At the beginning of operation of new system in 2006, the organization will be started by 33 personnel and will be gradually increase to the 40 staff members as the water supply will be expanded from 4,000 m³/d in early 2006 to 8,000 m³/d in the target year 2008.

Table 2.33 shows a comparison of proposed organization in F/S and B/D. The F/S suggested increasing the number of staff gradually by 19 in 2006 and 25 in 2010. The Project targets to increase the water supply capacity to 8,000 m³/day, providing water to 4,570 household customers and hotel business customers in 2008. This means that business volume will be expanded sharply to around 8 times of the current capacity in terms of customer services. For this reason, the Study Team proposes recruiting the necessary number of staff and start business with a total of 33 staff members to ensure a high degree of quality operation and maintenance work, and provide high quality services to their customers. 33 staffs consist of a director, two staffs for administration and finance (one department manager, one section chief, others are held by manager/chief concurrently), seven staffs for customer services (one department manager, one section chief, three staffs for meter reading, two staffs for computer operation, and others are held by manager/chief concurrently), and 23 staffs for engineering department including shift worker for 24 hours operation of WTP. Additional 21 staffs with proper qualification should be recruited as referred to Appendix 6-4.

Therefore, MIME is highly recommended to set up sufficient budget that make sure of employment of the required number of staff for SRWSS as scheduled in May 2005. Likewise, MIME should coordinate with “The Project on Capacity Building for Water Supply System in Cambodia” being implemented from 2003 under a technical cooperation by GOJ and make the best use of the Project as well as the proposed soft component under this Project.

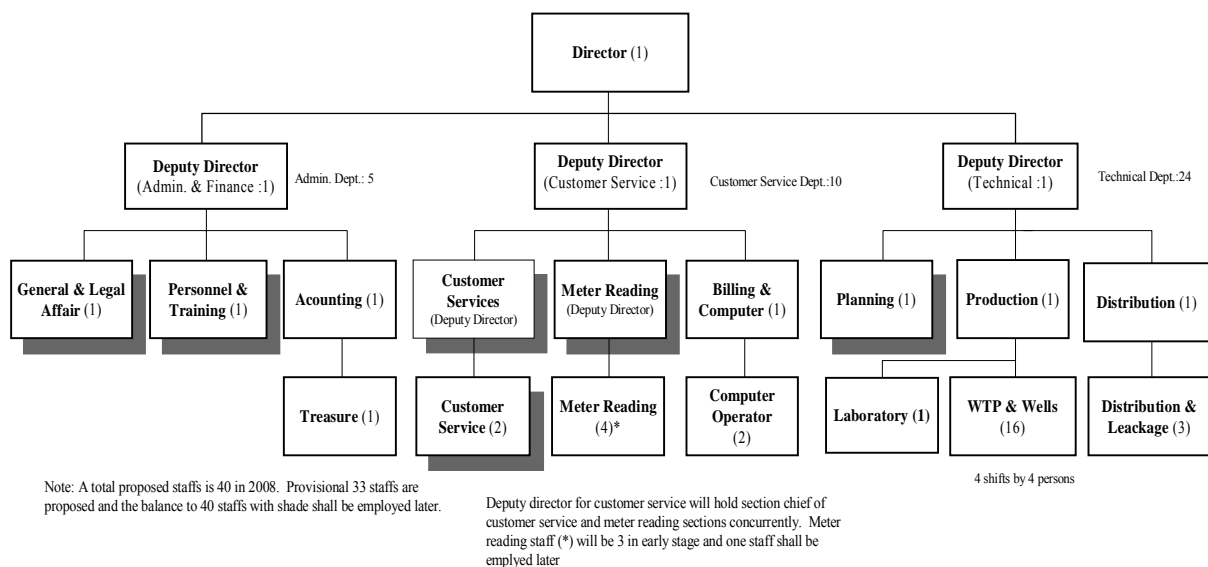


Figure 2.22 Proposed SRWSS Organization

Table 2.33 Proposed Organization

Job	F/S	B/D	Comments
Director	1	1	Same as F/S
Deputy Directors (Administration & finance, customer service, and technical managers)	3	3	Same as F/S. In early stage, deputy director as department manager for admin. and finance will hold the role of section chief of general/legal affairs and personnel management and training concurrently. Deputy director as department manager for customer services will hold the role of section chief for customer services and meter reading concurrently.
Accounting section chief and staff	1	1+(1)	It is necessary to separate accountants who conduct bookkeeping and accounting, and treasurers who handle cash for establishment of internal control system. In early stage, section chief will hold the role of staff concurrently. Another staff shall be employed later by 2008.
General & legal affairs section chief	0	(1)	In F/S one staff member to conduct both general affair/legal affair and human resources management. Separation of two roles is recommended because the both job is very important to do business as public corporation. In early stage, department manager will hold the role of section chief concurrently. Section chief shall be employed later by 2008.
Personnel & training section chief	1	(1)	SRWSS needs to develop the human resources rapidly in early stages of the new organization for strengthening the organizational capability and to sustain the business. This post will be held by the department manager concurrently in early stage.
Customer service, technical staff	1	0	This part will be moved to a distribution section for their character of the work similar with engineering work, rather than business administration work.
Customer services staff	0	(2)	F/S did not consider this position, however, it is important to set up this section to accept request for house connections, complaints, and request from customers. This post will be held by the department manager concurrently in early stage.
Billing and computer section chief and staff	0	3	F/S suggests doing this job by meter reader. However, it is not good to have the same person conducting meter reading, billing and collection by the standpoint from internal control. Also, the nature of job is rather business administration work using computer system. Thus, this section needs 3 personnel.
Meter reading staff	4	3+(1)	Same as F/S. In early stage, three personnel will manage the roles.
Planning section chief	1	(1)	Same as F/S. The department manager will hold the roles in early stage.
Production section chief	1	1	Same as F/S
Laboratory staff	1	1	Same as F/S

WTP & wells staff	8	16	F/S suggests operating WTP with only one staff. However, the purification plant has iron removal system that is not expected in F/S, and staff also needs to patrol and monitor deep wells and pumping stations. Considering the volume of work, 4 teams of 4 staffs members in a team is recommended to be set up and conduct operations 24 hours with 3 shifts, and one team can take holidays one by one after a night of working.
Distribution and leakage section chief	1	1	Same as F/S
Distribution & leakage section staff	2	3	Two staff is not enough for maintenance of water supply network, control of water distribution, find leakage, and repair as well as supervising house connections, civil work, and test water meter of houses.
Total	25	33 (7)	In early stage, organization will start by 33 staffs and will be gradually increased to 40 staffs by the target year 2008

Notes: The number in parenthesis shown the required number to be increased gradually by the target year 2008.

2-4-3 Operation and Maintenance Program

The proposed water supply system is composed of intake, water treatment, and transmission/distribution facilities. A typical operation and maintenance program for the proposed water supply system is outlined hereunder. All the activities are managed by the 24 personnel of technical department so that the water supply system should be kept in such good condition through proper operation and maintenance to maximize the functions of the equipment, extend its useful life and save on costly repairs in the future. Namely, objective of a regular operation and maintenance program is that it provides the people in the service area with an uninterrupted, equitably distributed, and adequate amount of safe water supply with a reasonable burden on the people.

(1) Raw Water Intake Facility

The proposed raw water intake facility consists of eight wells and eight intake pumps with appurtenances. The production section and laboratory section should monitor the intake amount and raw water quality, respectively to supply water to meet demand fluctuations and WHO guidelines.

(2) Water Treatment Facility

The production section will handle all of the proposed WTP which starts with pH adjustment and oxidization in the raw water receiving tank, which is chemical addition process to the raw water, and is immediately followed by oxidization tanks. These processes entail the conditioning of the raw water such that soluble iron can be oxidized and allow the precipitated particles to achieve filterable size in the oxidization tanks. Particles of precipitated iron which have not been removed by settling in the oxidization tanks will be removed by the following rapid sand filtration process.

The filtration flow rate is to be maintained and distributed hydraulically into each of the three filters by an influent weir installed at the inlet to each filter from the distribution channel, which receives flow from the oxidization tanks. The highest filtration level at which washing will start will be controlled automatically by means of the water level in each filter and surface/backwashing will then run for a pre-set time period. Thus the head of water above the sand level of the filter will increase during the filtration cycle until washing is required. Therefore, the production unit should firmly set the dosage of chemicals in the receiving well and monitor the operation conditions of oxidation tanks and filter units. The settled iron in the oxidation tanks should be manually discharged regularly.

To achieve optimal water treatment, it is vital to analyze the quality of raw water and effluent from the filter units after chlorinated in reference to the WHO guidelines for drinking water quality. Typical water quality parameters to be analyzed daily are pH, iron, manganese, temperature, turbidity, and residual chlorine. These water quality control should be conducted by laboratory staff in cooperate with the production unit.

The clear water pump station includes two backwashing pumps and two clear water lifting pumps to the elevated water tank. One unit each is standby. Each pump system comprises a suction valve, check valve and electrically operated discharge valve. Chemical feed pipelines and tanks for lime should be flushed regularly to avoid clogging of impurities in the chemicals and retain the designed hydraulic performance. Those equipment should be maintained periodically to secure uninterrupted operation by the production unit.

O&M items mainly focus on overhaul of mechanical/electrical facilities including electrical power receiving facilities. The operation and maintenance manuals for equipment/facility provided by the Contractor should be fully understood by the engineering department.

The major issues of the operations and maintenance areas are centered in and around the maintenance of equipment/facilities, and logistics of maintenance resources such as materials, spare parts, tools and equipment. Thus planning and coordination among operations, maintenance, material control, and procurement activities should be well coordinated by the deputy director who serves concurrently as a manager of engineering, resulting in sufficient repair and maintenance works.

(3) Transmission and Distribution Facilities

The Project includes expansion of transmission and distribution pipes and replacement of the existing deteriorated pipes. To isolate and drain the pipeline sections for testing, inspection, cleaning, and repairs; a number of appurtenances or auxiliaries are to be installed in the line. All sizes and types must be inspected for leakage or loss of pressure – outward signs of failure. The pipelines including consumer flow meters to be procured should be expanded according to a well coordinated expansion plan by the distribution unit supervised by the deputy director for engineering.