

Republic of Sierra Leone

FY2016 Ex-Post Evaluation of Japanese Grant Aid Project

“The Project for Establishment of Rural Water Supply System in Kambia Town”

External Evaluator: Yasuo Sumita, Global Link Management, Inc.

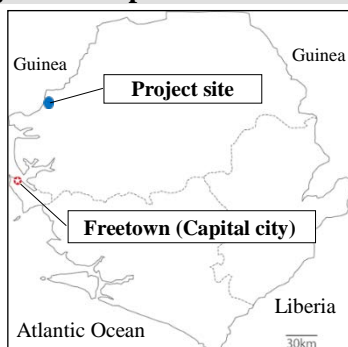
0. Summary

The project was implemented for the purpose of contributing to the improvement of the living environment and hygiene of the residents by providing a stable supply of safe drinking water by rehabilitating and improving water supply facilities in the target areas in Kambia Town.

The project was consistent with the development policies of Sierra Leone and the priority areas of the Japan’s ODA policy for Sierra Leone. The development needs of Sierra Leone was high. Therefore, its relevance is high. Although the project cost was within the plan, the project period was slightly longer than planned. Therefore, the efficiency is judged as fair. Treated water, which was safer than the previous water source, was supplied throughout the year by the project, but the water supply for each area was provided during a limited timespan every other day. The population served at the time of ex-post evaluation was slightly lower than the target population, but it improved significantly with the project implementation. In addition, although it did not reach the target value for water supply per person per day, it was not much lower than the target value for water supply volume if it was limited to users of public water taps. The public water taps were operating in 96 out of all the installed 100 locations. Positive impacts such as the reduction of water-borne diseases and reduction of water fetching labor, among others, were realized due to improved hygiene conditions and better water quality. Although the project’s implementation had an effect to a certain degree, the effectiveness and impact are fair because the water supply for each area was provided during a limited timespan every other day. There are no major problems concerning technical aspects of operation and maintenance, but the sustainability of the institutional and financial conditions is fair. The operation and maintenance status of facilities and equipment has some problems. Accordingly, the sustainability of the project is fair.

In light of the above, the project is evaluated to be partially satisfactory.

1. Project Description



Project Location



Constructed water treatment plant

1.1 Background

Due to the civil war¹ that lasted ten years from 1991, much of Sierra Leone's social infrastructure was devastatingly destroyed and sufficient services were not provided. In the water sector, water supply facilities equipped with a rapid sand filtration system were built and operated in provincial towns under the cooperation of the World Bank, France, Japan, and others during the 1970s and 1980s, but those water supply facilities in every town were destroyed by the civil war and did not function at the time of project planning and the water supply rate of the country was at a low level. In the target area of the project, Kambia Town², the provincial capital of Kambia Province, 60% of the residents were using dug wells and wells with hand pumps. Dug wells became dry during the dry season, and the quality of the water has a problem by infiltration of such as sewage from daily life. This caused water-borne diseases. In addition, the remaining 40% of the residents were using unhygienic river and stream water.³

JICA implemented the technical cooperation project "Establishment of Water Supply Management System in Kambia District" (December 2006-December 2008 at Rokupr in the province. Water supply facilities were restored with the construction of a water treatment facility using the slow sand filtration system⁴, and the project also supported the strengthening of their operation capacity through the establishment of a water supply and sanitation board. These activities aimed at establishing models related to water supply projects in provincial towns in line with the decentralization and independent management of the Sierra Leone government's water and sanitation policy after the civil war in principle. The Government of Sierra Leone expressed its intention to disseminate the model above nationwide as a method for improving water supply facilities in provincial towns, and requested implementation of the project with Grant Aid for the improvement of water supply facilities in Kambia Town.

1.2 Project Outline

The objective of the project is to ensure stable supply of safe drinking water by rehabilitating and improving water supply facilities, thereby contributing to improvements in the living standards and hygiene of the residents in the target area, Kambia Town in Kambia Province, Sierra Leone.

¹ The civil war ended on March 1, 2002.

² Kambia Town consists of three areas, namely Kambia 1, 2 and 3, and the target area of the project consists of two areas, Kambia 1 (Old Town) and Kambia 2 (New Town). According to the project consultant, Kambia 3, which is outside of the target area, was made up of 10 households at the time of project planning. However, at the time of ex-post evaluation, the population of Kambia 3 had increased to about 1,000 people. The residents used rivers, streams and traditional wells as water sources, and safe water supply was required in Kambia 3.

³ *JICA Preparatory Survey Report*

⁴ This is a water treatment method in which raw water is slowly passed through filter layers made up of sand with a naturally-generated biological filter of micro-organisms and gravel. Although it is not as quick or efficient as rapid sand filtration, which uses large amounts of chemicals, it is less costly and is easy to operate and maintain. This makes it an appropriate water treatment method for developing countries suffering from a shortage of both technology and financial resources if the conditions such as raw water quality and water quantity are satisfied. (Source: JICA Multimedia-based Learning Material "*Slow sand filtration: creating clean, safe water*")

G/A Grant Amount / Actual Grant Amount	805 million yen / 703 million yen
Exchange of Notes Date /Grant Agreement Date	January 2011 / January 2011
Executing Agency	Ministry of Water Resources ⁵
Project Completion	January 2013
Main Contractor	Dai Nippon Construction
Main Consultant	Eight-Japan Engineering Consultants Inc.
Preparatory Survey	April 2010 to January 2011
Related Projects	Dispatch of Expert ⁶ - Dispatch of Expert on Water Supply Management for Rural Towns (February 2012-March 2013) Technical Cooperation Project - Establishment of Water Supply Management System in Kambia District (December 2006 - December 2008)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuo Sumita, Global Link Management, Inc.

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule:

Duration of the Study: July 2016 to February 2018

Duration of the Field Study: November 5 to 19, 2016 and March 11 to 21, 2017

3. Results of the Evaluation (Overall Rating: C⁷)

3.1 Relevance (Rating: ③⁸)

3.1.1 Consistency with the Development Plan of Sierra Leone

At the time of project planning, the First (2005) and Second (2008) *Poverty Reduction Strategy Paper*, the development policy of the government of Sierra Leone, identified "construction of safe water supply and sanitation facilities for poor communities in rural and urban areas", "restoration

⁵ At the time of project planning, it was the Water Supply Division of the Ministry of Energy and Water Resources, but it became the Ministry of Water Resources when the Government ministries were reorganized from January 2013.

⁶ It was necessary to newly establish the Kambia Water Supply Sanitation Board in Kambia province, which is an organization for the operation and maintenance of water supply facilities. The Kambia Water Supply Sanitation Board was required to strengthen its technical and operational capacity, and it was also necessary to supervise and monitor operations and maintenance for a while after the start of operations at the water supply facility. Thus, an expert was dispatched under a technical cooperation scheme. The purpose of dispatching experts is "An appropriate management system at the Kambia Water Supply and Sanitation Board is established, and an institutional condition for sustainable water supply is established". The activities include supporting for establishment of Kambia Water Supply and Sanitation Board and education of staff, public awareness to residents by the water supply project and the necessity of water user fee payment, and awareness of hygiene, etc.

⁷ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁸ ③: High, ②: Fair, ①: Low

and reconstruction of existing water supply facilities damaged by the civil war" and "hygiene improvement and sensitization about fetching-water and storage of drinking water. *The Poverty Reduction Strategy Paper* (2013-2018) at the time of ex-post evaluation states, "Expansion of piped water supply and improvement of access to safe drinking water".

The National Water and Sanitation Policy (2008), the policy for the water sector that was formulated at the time of project planning, recommended piped water supply rather than water supply by a point source such as wells with hand pumps. This policy laid out strategies through 2015, but as of the ex-post evaluation, the results of these strategies were being evaluated and had not been updated.

In Sierra Leone, *The National Ebola Recovery Strategy for Sierra Leone* was formulated at the time of the Ebola outbreak⁹ in West Africa from 2014. The first phase was implemented as *The 6-9 months Recovery Programme* (July 2015-March 2016), and at the time of ex-post evaluation, *The 10-24 months Recovery Programme* (April 2016-June 2017) as the second phase was underway. These programs note that providing safe water to 700,000 in provincial areas by June 2017 is a policy goal of the regional water supply sector.

As seen above, the project is consistent with the development policy of the Sierra Leone government at the time of planning and ex-post evaluation.

3.1.2 Consistency with the Development Needs of Sierra Leone

In Sierra Leone, water supply facilities were destroyed during the civil war and most of them remained unrestored, so many people were unable to access safe water and were forced to live with this obstacle. At the time the project was planned, the target area of the project, Kambia Town, had a water supply facility constructed in the 1970s, but it was inoperable. For this reason, 84% of residents used either traditional wells (44%) that were dug out using unsanitary methods or river and stream water (40%) as their source of water supply. Only 16% of residents were able to use deep wells with hand pumps, which are considered to be relatively hygienic.¹⁰

At the time of ex-post evaluation, water treatment was carried out by the water supply facility constructed in the area, replacing the unhygienic water supply available before the project with a water supply that is comparatively safe. However, the water supply has been provided every other day in each area. In addition, the area where water supply facilities are needed has expanded due to the population increase in recent years, which means that further increases in water supply volume and construction of water supply facilities would be required. From the time of planning, the water supply rate in rural areas was lower than in urban areas, and improving the water supply

⁹ The declaration of the end of the epidemic in Sierra Leone by the WHO (World Health Organization: WHO) was November 7, 2015. However, after that, a new infected person was confirmed and the WHO issued a second declaration of the end of the epidemic of Sierra Leone on March 17, 2016.

¹⁰ *JICA Preparatory Survey Report*

rate was a problem even at the time of ex-post evaluation.¹¹

In light of the above, the need to expand and improve water supply services in the area was high both at the time of planning and ex-post evaluation; therefore, the consistency of the project is high.

3.1.3 Consistency with Japan's ODA Policy

Among the Rural Development in Kambia District Program¹², the project was positioned as a Rural Development Project, a priority development subject for support of Sierra Leone at the time of project planning. This contributed to the improvement of the living environment in the area. In addition, the project was strongly related to the achievement targets in the field of "Water and Sanitation" in *The Yokohama Action Plan*¹³ adopted at the 4th Tokyo International Conference on African Development (TICAD IV) in 2008, as well as the achievement of the *Millennium Development Goals* (MDGs)¹⁴, which Japan prioritizes.

In light of the above, implementation of the project has been relevant to the development policies and development needs of Sierra Leone as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

In the project, water facilities were constructed and installed¹⁵ to supply water to the residents of the target area through public taps, where raw water taken in was treated at the water treatment facility and transferred from the elevated tank through a transmission pipe and distribution pipe. Two facilities from two sources, a river and a swamp¹⁶, were constructed as water intake facilities which can be selected depending on seasonal water volume and water quality (turbidity). The slow sand filtration system was adopted for water treatment as it allows for easy operation and maintenance at low cost. 100 public water taps having three faucets each were installed to supply water to residents, and private connections were provided to three public facilities, Kambia Hospital, Kambia District Council and Resource Centre¹⁷. The water supply plug connection to

¹¹ Urban area is from 47% (2008) to 85% (2015). Rural area is 32% (2008) to 49% (2015). (Source: Ministry of Water Resources)

¹² *JICA Ex-ante Project Evaluation Sheet*

¹³ May 2008 *Yokohama Action Plan*, Tokyo International Conference on African Development (TICAD) IV

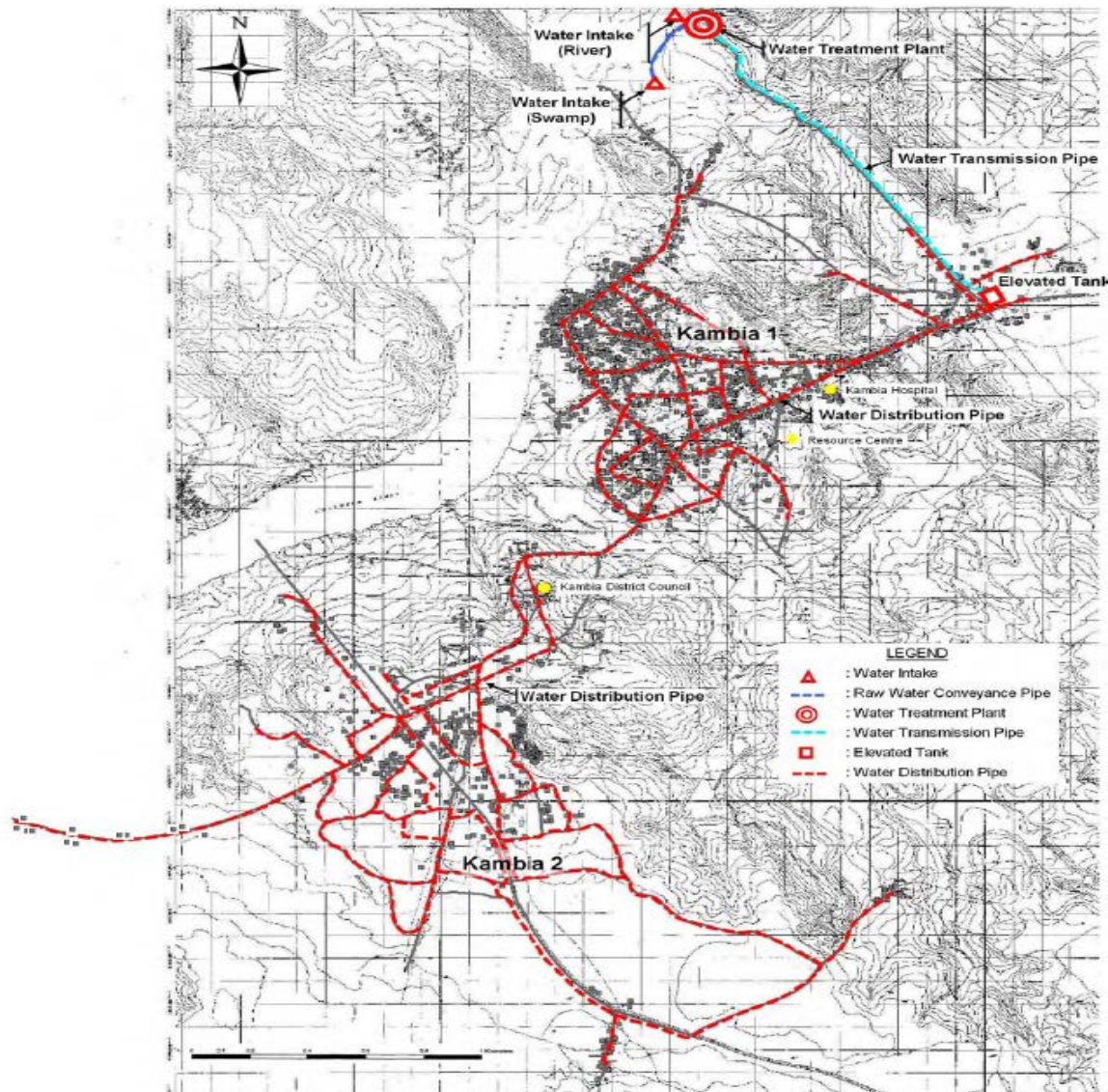
¹⁴ Target 7C: Cut in half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015.

¹⁵ Existing facilities (water intake facility, water treatment facility, elevated tank, transmission pipe, distribution pipe, public taps, etc.) were destroyed during the civil war and left without being or maintained for a long time, so deterioration was marked and only a few facilities were renovated and utilized, such as raw water conveyance channels, ancillary facilities for water tanks, basic foundation of operator's dormitory and warehouse, and others.

¹⁶ The swamp that was taken as a water intake site in the project is a wetland located in a low geographical position, and it is turbid in the dry season and there is little flow, but there is clear and abundant groundwater runoff in the rainy season.

¹⁷ Community center that is used for training of community residents, community activities, events, etc.

houses and other facilities, carried out after the completion of the project, was done by Sierra Leone. In addition, support was provided, including some equipment for the operator's dormitory at the water treatment plant and for water supply taps for private connections after starting the project.



Source: JICA Preparatory Survey Report

Figure 1 Target area and outputs of the project

[Japan side]

The outputs of the Japan side are as shown in Table 1. All were carried out as planned.

Table 1 Plan and actual outputs of Japan side

Planned Items	Contents	Actual
1. Water intake facility	Intake pump : 0.84 m ³ /min × 14.8m × 3.7KW × 2sets (River) Intake pump : 0.84 m ³ /min × 17.5m × 3.7KW × 2sets (Swamp)	As planned
2. Raw water conveyance facility	Conveyance pipe: DCIP φ 150mm × 100m (Rive to Waterworks) Conveyance pipe : DCIP φ 150mm × 400m (Swamp to Waterworks)	As planned
3. Water treatment facility	Capacity : 1,200 m ³ /day Receiving well : 22 m ³ × 1 basin Sedimentation basin : 400 m ³ × 2 basins Slow sand filter : 60 m ² × 4 basins Clear water reservoir : 150 m ³ Sand wash and dry : 84 m ³ × 1 no. Sand washer : 1 set Chlorination device : 2 sets Sludge & drainage basin : 9 m ³ × 1 basin Generator : 60KVA × 3 sets Lighting device : 1 Ls. (outdoor (mercury lump) and indoor)	As planned
4. Water transmission facility	Transmission pump : 0.42 m ³ /min × 60.9m × 11KW × 3 sets Transmission pipe : DCIP φ 200mm × 1,715m (Waterworks to Elevated tank)	As planned
5. Water distribution facility	Elevated tank : 400 m ³ × 1 no. Distribution pipe : PVC φ 250mm to 75mm × 29km Public water tap : 100 places (3-faucet type) Private connection : 3 places (Kambia Hospital, Kambia District Council and Resource Centre)	As planned
6. Buildings	Pump house : 2 buildings (3.0m × 5.0m) Generator room : 1 building (10.0m × 7.0m) Store : 1 building (12.0m × 6.0m) Staff quarter 1 : 1 building (18.0m × 7.5m) Staff quarter 2 : 1 building (22.0m × 8.2m)	As planned
7. Equipment	Water meter : φ 40mm × 30 sets Piping material : Ls. (for the plumbing work of the above water meters) Tools : 1 set (for plumbing work) 1 set (for electrical work) 1 set (for mechanical work)	As planned

Source: Document provided by JICA, Answers for the questionnaire from SALWACO and interviews of the project consultant

[Sierra Leone side]

The items to be borne by the Sierra Leone side are as shown in Table 2 All were carried out as planned.

Table 2 Plan and actual costs for Sierra Leone side

Plan	Actual
1. Providing temporary sites (approx. 5,000m ²) for materials, storage, etc.	As planned
2. Securing construction base for water supply facilities • Water intake facility/Water treatment facility/Elevated tank/Public water taps	As planned
3. Removal of existing water treatment facilities (high speed sedimentation pond, pressure type filtration tank, water treatment tank, elevated tank) and four existing buildings (only walls excluding the foundation) in the water treatment plant	As planned
4. Removal of existing elevated tank (steel gantry and tank part)	As planned
5. Prompt custom clearance and tax exemption to import construction materials for the Project and support the inland transport	As planned
6. The following costs required for implementation of the project that are not covered by grant aid. • Project management costs of the Ministry of Energy and Water Resources • Project management costs of the Kambia District Council • Initial working capital for the operation and maintenance of Kambia Water Supply and Sanitation Board	As planned
7. Exemption from customs duties, domestic taxes and other charges imposed on Sierra Leone domestic procurement of contractual equipment and services	As planned
8. Entry permission and residence permit of Japanese who do business based on contract	As planned
9. Appropriate operation and maintenance, and effective use for the Project facilities	As planned
10. Coverage of notice fee and payment fee for authorization certificate (A/P) to be paid to Japanese banks for banking business based on interbank agreement (B/A)	As planned

Source: Document provided by JICA, Answers for the questionnaire from SALWACO and interviews of the project consultant

3.2.2 Project Inputs

3.2.2.1 Project Cost

As shown in Table 3, the project costs on the Japan side fell within the plan (86% of the plan). This is due to the influence of the appreciation of the yen¹⁸, and there has not been any decline in the quality control and quality of construction and facilities. Although the total project costs borne by the Sierra Leone side are unknown, the items deemed to be the responsibility of the Sierra Leone side and the accompanying expenses were covered as planned.

Table 3 Plan and actual project costs

	Plan	Actual	Ratio to the plan
Japan	805 million yen	703 million yen	86%
Sierra Leone	16 million yen	N/A	—
Total	821 million yen	N/A	—

Source: Document provided by JICA, Answers for the questionnaire from the Executing Agency and interviews with the project consultant

¹⁸ At the time of the basic design, 1 US dollar = 92.13 Japanese yen, and at the time the design was implemented, it was calculated as 1 US dollar = 83.53 Japanese yen.

3.2.2.2 Project Period

The project period lasted 23 months¹⁹, one month longer than the planned 22 months²⁰ and a slight 5% over the original plan. Although the design period was as planned, the construction period was extended. The reason for the delay in the construction is that when the national road was built in the target area, Sierra Leone promised to carry out the preliminary installation of the pipeline under the road so that the water distribution pipe would cross the national road, but did not do so. Thus, a period of time was needed to renegotiate the road excavation and obtain permission for installation, and the construction period for installing the water distribution pipe was longer than planned.

As noted above, project costs were within the plan, but the project period was longer than planned. Therefore, efficiency of the project is fair.

3.3 Effectiveness²¹ (Rating: ②)

3.3.1 Quantitative Effects

The population served set at the time of project planning and the water supply volume per person per day are used as main indicators.²²

3.3.1.1 Population Served²³

The project aimed for a population served (population that can access safe water) of 30,000 people (three years after project completion). This figure is the estimated population²⁴ as the baseline based on the growth rate at the time of project planning with 5,000 people added to represent the non-permanent residents (short-term residents²⁵) in the target area.

In Sierra Leone, a census was carried out in December 2015. Kambia Town has a population

¹⁹ 23 months from March 14, 2011 (consultant contract date) to January 21, 2013 (completion date). According to the process chart described in the *JICA Preparatory Survey Report*, the project period at the time of the project planning is 3.5 months for the design period and 18.0 months for the construction period (including 2.0 months for the bidding work) for a total of 21.5 months. It is calculated as 22.0 months from the contract month to the completion month. In the JICA Ex-ante Project Evaluation, the implementation period is 21 months, and the actual project period will be 24 months (109% of the plan) in case the starting month is the grant agreement month (January 2011).

²⁰ In this evaluation, the starting date of the project was adjusted at the start of detailed design.

²¹ Sub-rating for Effectiveness takes Impact into account.

²² In the *JICA Ex-ante Project Evaluation*, only the population served is set as an indicator, but the *JICA Preparatory Survey Report* sets the population served and the water supply volume per person per day as the main indicators.

²³ According to the executing agency, all residents of the target areas Kambia 1 and Kambia 2 are beneficiaries (population served). A village outside Kambia Town is also covered by the project, but there are only four households.

²⁴ According to the project application form from Sierra Leone, the 2007 population was 20,000 people, but the population in 2007 was 12,503 people (estimates from the census conducted in 2004), according to the Statistics Sierra Leone at the time of the ex-post evaluation. Considering the results of the census conducted in 2015 (21,027 people), the evaluator thinks that the population of 20,000 people listed in the project application form is higher than the actual population and that the population figure from the Statistics Sierra Leone (12,503 people) is too low.

²⁵ According to the Ministry of Water Resources, the Kambia District has the border with neighboring Guinea and there are short-term residents in Kambia Town such as merchants, shipping companies and concerned people who travel to and from Sierra Leone and Guinea. The Ministry estimated this population to 5,000 people / year, and they indicated that there were no figures associated with the calculation basis of the population and it was an estimate calculated also based on the scale of the planned facility.

of 21,027 people²⁶, according to the Statistics Sierra Leone. The estimated population of the target area (Kambia 1 and Kambia 2) based on the population growth rate is 20,721 people in 2016, which does not include the population of Kambia 3 (approximately 1,000 people). The actual figure at the time of ex-post evaluation is estimated to be 25,721 people (86% of the original plan), which is the Ministry of Water Resources' estimate of 20,721 people and an additional 5,000 people²⁷ that are non-permanent residents.

Table 4 Population served of target area

Unit: Number of people

	Baseline	Target	Estimated	
	2010	2016	2013	2016
	Baseline Year	3 years after project completion	Project Completion	3 years after project completion
Population served (Kambia 1 and Kambia 2)	3,400 (People using wells with hand pumps)	30,000	23,507	25,721

Source: Calculated from the figure (2015 census) provided by the Statistics Sierra Leone

3.3.1.2 Volume of Safe Treated Water Per Person Per Day

At the time of planning, the project set the water supply volume to 36 liters²⁸ per day three years after the project completion (2016).

At the time of ex-post evaluation, for financial reasons, water was supplied every other day to Kambia 1 and Kambia 2, the target area in Kambia Town, and the water supply volume was 450 m³/day (450,000 liters/day). Since the estimated population of Kambia 1 and Kambia 2 is 25,721 people and water is supplied every other day, the volume of water supplied per person per day is estimated to be 15.8 liters²⁹ (44% of the planned volume).

²⁶ According to the Statistics Sierra Leone, the population is the sum of Kambia 1 to 3 which make up Kambia Town. Also, according to the Statistics Sierra Leone (Kambia District Branch), the estimated population of Kambia 3 in 2016 is approximately 1,000 people. The population growth rate is 3.3% (Northern Province including Kambia District).

²⁷ Since the target volume includes 5,000 non-permanent residents, 5,000 was also added to the figures at the time of the ex-post evaluation.

²⁸ The water supply volume for the public tap is calculated as 20 liters/person/day, and the water supply volume of private connection (house) is calculated as 60 liters/person/day. Based on that, 60:40, the desired ratio of public taps and individual connections in local cities as set by the Ministry of Water Resources, is applied, and 36 liters/person/day was calculated using the equation $20 \text{ liters/person/day} \times 60\% + 60 \text{ liters/person/day} \times 40\%$.

²⁹ According to confirmation by the Statistic Sierra Leone, the population ratio of Kambia 1 and Kambia 2 was "almost the same", and the ratio could not be specified. Therefore, the population of Kambia 1 and Kambia 2 was calculated as having the same ratio. The water supply volume $450,000 \times 0.9$ (leakage rate 10%) \div target population $(25,721 \div 2) = 31.5$ liters/person/day. However, since it was supplied every other day, it amounts to $31.5 \div 2 = 15.8$ liters per day. Since the leakage rate could not be confirmed during the ex-post evaluation, the rate set at the time of the project plan was used.

Table 5 Water supply volume per person per day for safe treated water

	Baseline	Target	Estimated
	2010	2016	2016
	Baseline Year	3 years after project completion	3 years after project completion
Water supply volume per person per day	0 liter	36 liters	15.8 liters

Source: Estimated by the answers to the questionnaire from the Executing Agency

It should be noted that calculations for the target water supply per person per day was based on the national water sanitation policy. This was calculated at 20 liters/person/day for public water tap users, and at 60 liters/person/day for private connection users. Assuming that private connection users used 60 liters of water per person/day, it is estimated that public water tap user, which account for 99% of water users, were using 15.4 liters/person/day.³⁰ In other words, if it is limited to public water tap users, we can presume that supply is not far below the target water supply designated in the project.

3.3.1.3 Facility Capacity (Water Supply Volume)

The project constructed a water supply facility with a capacity of 1,200 m³/day. At the time of ex-post evaluation, the volume of water supplied per day was 450 m³/day, and the water supply time was about four hours in the morning.³¹ The facility capacity was calculated³² and designed based on the target population served and the target water supply volume per person per day. The required water supply volume was approximately 580 m³/day, as calculated from the population at the time of ex-post evaluation and the ratio of public water taps to private connections. Therefore, the volume of water supplied per day at the time of ex-post evaluation was about 78% of the required water supply volume.³³ The main reason that the required water supply volume has not been reached is that the water supply time was limited due to a shortage

³⁰ Of the population of 25,721 at the time of ex-post evaluation, there were 192 private connection users (32 houses x 6 persons per households [according to the Statistics Sierra Leone]) and 25,529 public water tap users (450,000 liters x 0.9 (leakage rate 10%) - (192 x 60 liters)) ÷ 25, 529 = 15.4 liters). However, it should be noted that this does not take into account private connection users other than houses (offices, schools, etc.) because data on the water supply volume could not be confirmed.

³¹ Water is supplied from the water treatment facility to the elevated tank from 6:00 am to 10:00 am, but water can be fetched even after 10:00 am on the public water tap that supplies water through the distribution pipe from the elevated tank. The time when water cannot be fetched (water stoppage) depends on the location of the public water tap (the height), but at around 1:00 pm, the water stops at almost all public water taps.

³² 30,000 people (target population served) × 36 liters/person/day = 1,080,000 liters/day (planned water supply volume); 1,080,000 liters/day ÷ 0.9 (leakage rate 10%) = 1,200,000 liters/day (1,200 m³/day)

³³ The necessary water supply volume is (192 (users of private connections) × 60 liters/person/day + 25,529 (users of public tap water) × 20 liters/person/day) ÷ 0.9 (leakage rate 10%) = 580,111 liters. Therefore, the actual water supply volume (450,000 liters) is estimated to be about 78% of the required water supply (580,000 liters). However, because it was not possible to confirm data on the water supply volume for private connections other than houses (offices, schools, etc.), the required water supply volume could be more than 580,111 liters.

of funds for the fuel³⁴ purchases necessary for facility operation.

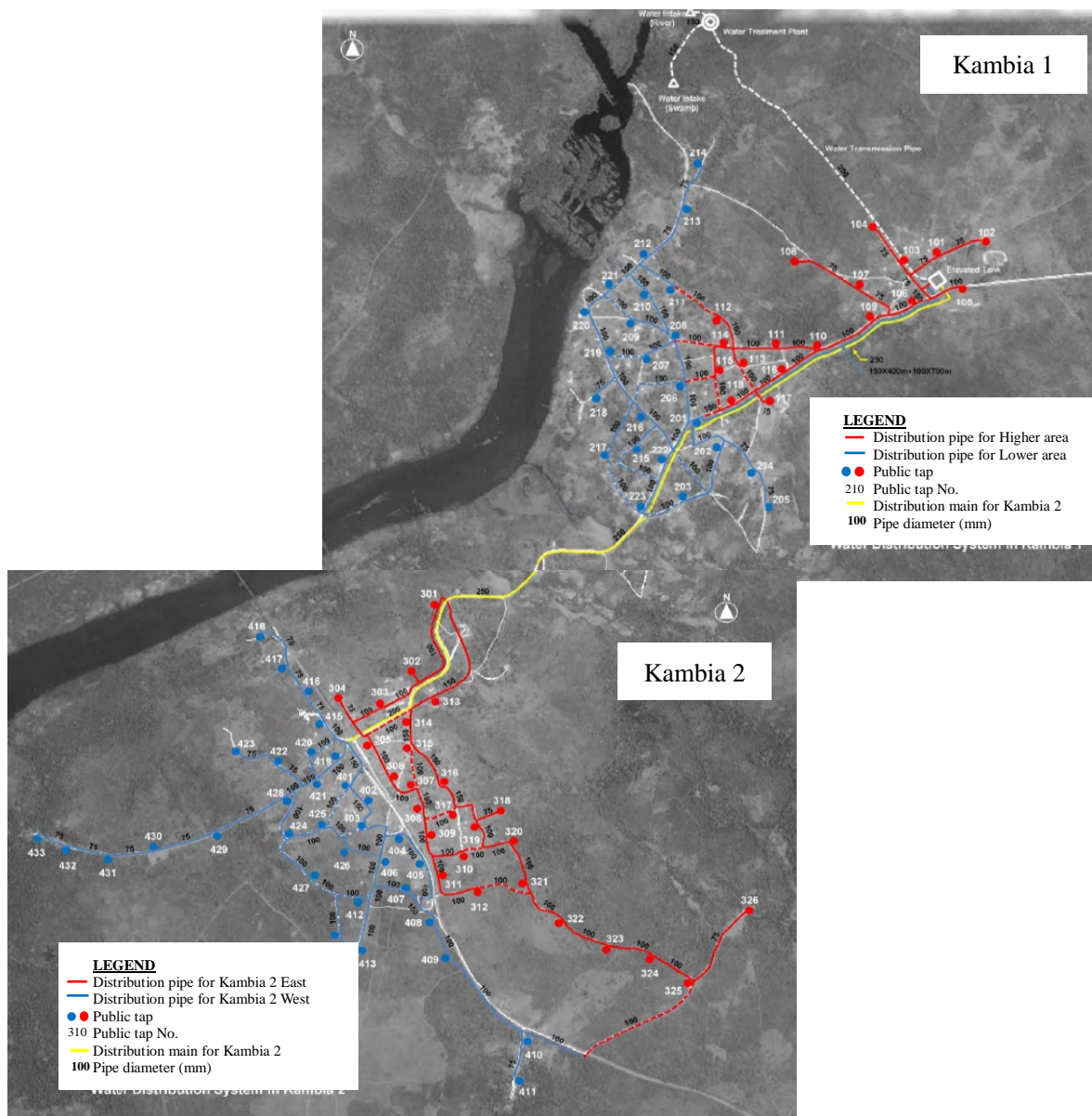
3.3.1.4 Operating Status of Taps

In the project, 100 public water taps were installed to provide the residents with water supply, and only three public district facilities—namely, Kambia Hospital, the Kambia District Council and the Resource Centre—had private connections. Sierra Leone was responsible for the private connections of houses and other facilities. The operation status is described below.

Public water taps

As shown in Figure 2, since there was an altitude difference in Kambia 1, a total of 41 public water taps were installed with the distribution section divided into "High block" and "Low block" in consideration of the stability of water supply. On the other hand, since the water distribution of Kambia 2 is divided into two by the main road, the water distribution area was divided into "East Block" and "West Block" by the main road, and a total of 59 public water taps were installed for supplying water by block.

³⁴ Commercial electricity is not being supplied to Kambia Town, and fuel (diesel) is required to operate the generator at the water treatment plant.



Source: JICA Preparatory Survey Report

Figure 2 Locations of public water taps in Kambia 1 and Kambia 2

At the time of ex-post evaluation, 96 out of 100 locations of the installed public water taps by the project were operating normally. (There was no water leakage from anything other than the faucet and it was supplied without problems.) As shown in Table 6, all public water taps were in operation in Kambia 1, and four in Kambia 2 were non-operational. There were no public water taps that were out of order. Taps were non-operational because there were few users at those three locations, and the water supply was stopped for one location as a pump attendant³⁵

³⁵ Pump attendants are selected based on recommendations from the community, with one person assigned to each public water tap.

was not assigned to that location.

Table 6 Number of public water taps in operation

		Total		Operation		Non-operation	
Kambia 1	High block	18	41	18	41	0	0
	Low Block	23		23		0	
Kambia 2	East Block	33	59	31	55	2	4
	West Block	26		24		2	
Total		100		96		4	

Source: Results of interviewing with the Executing Agency and field survey

Private Connection

At the time of ex-post evaluation, it was confirmed that the water faucets at the three places (Kambia Hospital, Kambia District Council and Resource Centre) connected by the project were supplying water normally. (However, since the Resource Centre is not always used, it is operated only at the time of facility use.) Also, as of ex-post evaluation, as shown in Table 7, new private connections had been installed and water supplied, in addition to the three aforementioned places.

Table 7 Private connection status

Class ³⁶	Private connections	Number
Class A	Drinking water sales companies	2
Class B	Hotels	1
Class C	Offices, Guest houses (Including public facilities such as Kambia Hospital, Kambia District Council Resource Centre, etc.)	24
Class D	Schools	2
—	Houses	32

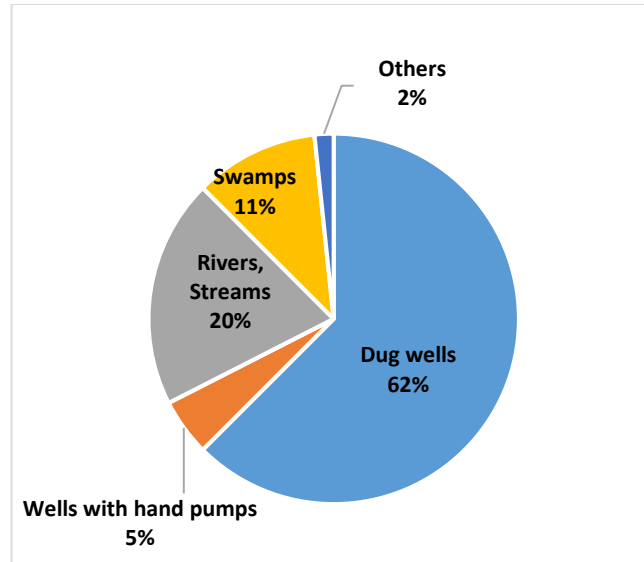
Source: Interview results with the Executing Agency

3.3.2 Qualitative Effects (Other effects)

3.3.2.1 Improvement of Water Quality

³⁶ The facilities of each private connection are classified according to the amount of water user fees collected (fixed price system). The class is not set for houses because it is a water user fee collection system with a meter.

The beneficiary survey³⁷ (public water tap users) on the quality of the public tap water showed that 100% of the respondents answered that the water quality improved compared to the previous water source. The water sources previously used by respondents are shown in Figure 3.



Source: Beneficially Survey

Figure 3 Water sources previously used by residents (public water tap users), who said that the water quality improved

Interviews with public water tap users in the field study showed that the water quality of public water taps installed by the project has not changed from the start of service to the time of ex-post evaluation. In addition, some respondents answered that water quality remained an improvement compared to the previous water source.

According to the field study at the time of ex-post evaluation and interviews with the executing agency, the water treatment facility was being sterilized by chlorine and "safe water compared with the previous water source" has been supplied, but regular water quality tests have not been carried out at the water treatment facility and public water taps.

Also, as of the ex-post evaluation, water was supplied every other day for each town. Therefore, in the beneficiary survey, 64% (77 people) answered that "they are also using other water sources",

³⁷ The beneficiary survey was conducted from November 14 to 18, 2016 in Kambia Town taking into account the ratio of public water taps installed in each area by the project. A total of 120 people (49 people in Kambia 1, 71 people in Kambia 2) who came to fetch water from public water taps and 25 people with private connections were sampled and investigators carried out individual interviews with them. In regard to public water users, the number of valid response was 1-2 persons per site and 120 in total. In regard to private connection users, the number of valid response was one person per house and 25 in total. For public water tap users, the ages of respondents were as follows: 10.8% between the age of 10 and 19, 42.5% between the age of 20 and 29, 21.7% between the age of 30 and 39, 14.2% between the age of 40 and 49, 9.2% between the age of 50 and 59, 0.8% between age 60 and 69, and 0.8% at age 70 and older. Of the respondents, 36.7% were men and 63.3% were women. For private connection users (houses), the ages of respondents were as follows: 8.0% between the age of 10 and 19, 32.0% between the age of 20 and 29, 16.0% between the age of 30 and 39, 12.0% between the age of 40 and 49, 20.0% between the age of 50 and 59, 8.0% between age 60 and 69, and 4.0% at age 70 and older. Of the respondents, 36.0% were men and 64.0% were women.

which means that about two thirds were using other water sources as well. The most common reason for using other water sources was "to wash clothes," at 49% (38 people).



Residents who use a public water tap



Residents washing clothes at a stream

3.3.2.2 Supply Water Volume and Stable Supply Situation

Before the project implementation, the water supply facilities were limited to wells, rivers, swamps, etc. in Kambia Town, and they became dry during the dry season. As a result, their supply was unstable and the water supply volume was inconstant. In the project, intake sites were selected based on the amount of water and the turbidity³⁸ from two intake sites, and water supply can be provided throughout the year regardless of the season. With the exception of one respondent in the beneficiary survey (public faucet user), 99% answered that "the volume of water used is increasing compared to the previous water source used ". Although many residents use both the public water tap installed by the project and the previous water sources, the volume of water used by the residents has increased and the supply situation has improved as compared with the period before the project.

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Distance to Water Source

In the project, one public water tap was installed about every 200 meters. Even in the beneficiary survey (public water tap users), 79% of the respondents answered that the distance to the water source was less than 100m, as shown in Table 8. In addition, 93% (111 people) of all the respondents answered that "the distance has shrunk compared to the previous water source". We speculate that the project was effective in shortening the distance to the water source.

³⁸ The turbidity of the raw water being drawn must be low when adopting the slow sand filtration system. However, when the turbidity of the river used for water intake is high and cannot be used, we assumed that the water volume of the swamp is not sufficient and cannot be used. Therefore, a sedimentation basin, which has been shown to be effective in lowering the turbidity of the raw water to a turbidity suitable for the slow sand filtration system, was installed as a treatment facility for the slow sand filter so that it always had a low turbidity. (Source: *JICA Preparatory Survey Report* and interviews with the project consultant)

Table 8 Distance to public water taps

	less than 50m	50 to less than 100m	100 to less than 200m	More than 200m
No. of responses	57	37	15	11
%	48	31	13	9

Source: Beneficiary Survey

Note: The percentage (%) is rounded, so it is 101% in total. The respondents included nine respondents who answered that there was no change in the distance, and two respondents who answered that the distance had increased.

3.4.1.2 Water Fetching Time

In the beneficiary survey (public water tap users), all respondents answered that "the time has decreased" for water fetching. The time required to fetch water is shown in Table 9, with 75% answering that it takes less than 20 minutes. In the survey conducted at the time of project planning, 67% answered that the water fetching time was less than 20 minutes. Although we should be careful in interpreting the result because different areas and residents were targeted in this beneficiary survey, it is presumed that the project was effective in decreasing water fetching time.

Table 9 Water fetching time

	Less than 10min.	10 to less than 20min.	20 to less than 30min.	More than 30min.
No. of responses	37	53	24	6
%	31	44	20	5

Source: Beneficiary Survey

Note: Time to fetch water per day

3.4.1.3 Reduction of Water Fetching Labor and Utilization of Surplus Time

We were able to confirm that the distance to the water source and the time to fetch water had decreased, and interviews with residents in the field study also showed that water fetching labor had been reduced. Although the free time due to the shorter water fetching time is not very long, respondents who reported shorter water fetching time in the beneficiary survey answered (multiple answers) that the surplus time has been used for housework (84%), rest (84%), non-agricultural income activity³⁹ (63%), and agricultural work (27%).

3.4.1.4 Impact on Life of Children

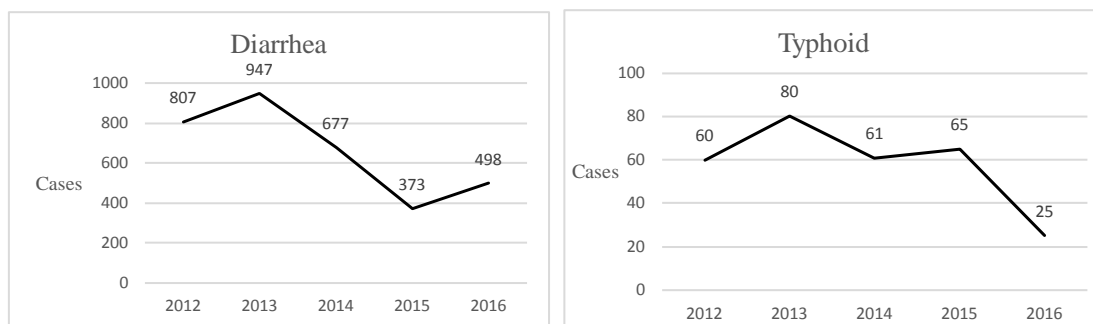
The most frequent answers (multiple answers) by respondents who answered that there was an impact on the lives of their children in the beneficiary survey (public water tap users) were "an increase in time spent at school" (97.5%) and "increase in study time" (95.8%). Even in interviews

³⁹ Some interviewees answered that they wanted to increase the time they spend selling in the market and time spent working in the store even a little.

at the time of the field study, residents answered that they make their children study as children did not need to help water fetching now that water fetching labor had been reduced with the installation of public water taps. However, it could not be confirmed how much surplus time children now had, and how much time was spent at school and how much study time had increased.

3.4.1.5 Reduction of Water-borne Diseases

According to the beneficiary survey and interviews to public water tap users, some residents were using the previous water source for laundry because use of the facility installed by the project requires payment of a water user fee, but water for drinking and cooking was mainly from public water taps (91%). In the beneficiary survey (public water tap users), 93% of respondents answered that waterborne diseases were "definitely reduced" after the project implementation. (7% answered "I do not know".) At the time of ex-post evaluation, the occurrence of water-borne diseases⁴⁰ in Kambia Town was confirmed with the District Health Management Team (hereinafter referred to as "DHMT"), shown in Figure 4. This confirmed that the occurrence of water-borne diseases was reduced in Kambia Town compared to before the project (2012).



Source: DHMT

Figure 4 Occurrence of water-borne diseases (Diarrhea, Typhoid)

3.4.2 Other Positive and Negative Impacts

3.4.2.1 Impacts on the National Environment

An environmental permit was issued for the project by the Sierra Leone Environment Protection Authority (SLEPA) in November 2011. There were no negative impacts on the environment, nor were there complaints from affected residents about "depletion of water sources" and "ground subsidence around the site" as a result of the project.⁴¹

⁴⁰ According to DHMT, cholera has not occurred in Kambia town since 2012, before the project started.

⁴¹ Regarding the impact on the national environment, we were unable to confirm the environmental impact monitoring form for before and after construction. Instead, interviews were conducted with the project consultant and executing agency to confirm the impact between the period of the project plan and the completion of the project. For the period between the completion of the project and ex-post evaluation, impact was confirmed through interviews with the Kambia Water Supply and Sanitation Board, which is responsible for operation and maintenance, in addition to the field study.

3.4.2.2 Resettlement and Land Acquisition

No new land acquisition and resettlement occurred because the water treatment facility and elevated tank, the main facilities for the project, were constructed by removing existing facilities.

3.4.2.3 Consideration of Residents

When a water distribution pipe was constructed on an unpaved road in the target area, countermeasures were taken with the residents, such as preliminarily spraying water on the road and suppressing the generation of dust.

Regarding effectiveness, the population served at the time of ex-post evaluation, which was set at the time of planning, was slightly lower than the target population, but it can be said that the population served greatly improved as a result of the project implementation. The water supply per person per day was about 79% of the target value for users of public water taps. Of the 100 locations in which public water taps were installed by the project, 96 locations were in operation. Regarding access to safe water, the project has been supplying treated water that is safer than the previous water source, and it has been supplied throughout the year. However, the water was supplied every other day for each town at a limited time.

As for impact, although there are residents who are using the previous water sources in parallel because the water supply did not reach the target volume, there is an increase in the amount of water used compared to before the project. Reduction of water-borne diseases by improvement of water quality and improvement of awareness concerning hygiene, reduction of water fetching labor, and other factors have a positive impact on living standards. There were no reports of any negative impact due to the project such as harm to the natural environment, resettlement of residents or acquisition of land.

In light of the above, the implementation of the project has had effects to some degree. Therefore, the effectiveness and impact of the project are fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

The responsible ministry of the project is the Ministry of Water Resources. At the time of planning, it was the Ministry of Energy and Water Resources, but it had become the Ministry of Water Resources (since January 2013) by the time of ex-post evaluation. The Water Supply Division of the Ministry of Energy and Water Resources has become the Ministry of Water Resources, including the personnel involved in the project. This reorganization of the ministries had no influence on the project.⁴²

⁴² Based on an interview with the project consultant and Ministry of Water Resources.

Because of the decentralization⁴³, the responsibility for operating and maintaining the water supply services of Kambia Town related to the project was transferred from the central government to the Kambia District Council. Based on the bye-law, the Kambia District Council established the Kambia Water Supply and Sanitation Board⁴⁴ (hereinafter referred to as "KWSSB") in April 2012 as an operation and maintenance organization. At the time of ex-post evaluation, KWSSB had overall management responsibilities related to the project, and also devises the fee collecting method, collects fees, manages accounting and other similar tasks. In order to support the KWSSB both technically and financially, staff from the Sierra Leone Water Supply Company (SALWACO), a state-owned water company under the umbrella of the Ministry of Water Resources with a proven track record in local water supply services, are stationed at the water treatment plant of the project. Furthermore, there is an office of the Kambia District of the Ministry of Water Resources in Kambia Town, which manages water supply projects in the Kambia District (planning water supply projects, etc.).

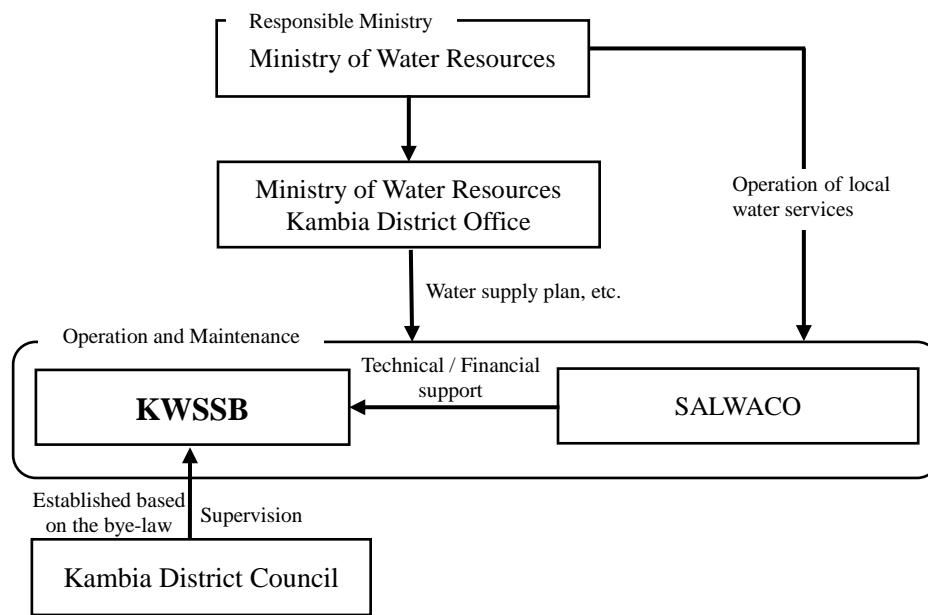
On May 23, 2017, a new law concerning water services, *The Sierra Leone Water Company Act, 2017* was passed⁴⁵ by the Parliament, giving SALWACO full management over municipal water service operations nationwide. Under this law, in the near future, the management of the water supply services of Kambia Town will be officially transferred⁴⁶ from the Kambia District Council to SALWACO.

⁴³ After the local autonomy law was established in 2004, local elections were carried out and the decentralization process began. Accordingly, the responsibility for the operation and maintenance of the water supply service in local cities over which the central government had previously had direct control was transferred to the local government.

⁴⁴ It was established in 2001. This was also meant to eliminate political interference in water supply services, and at the time of the project planning, SALWACO was responsible for the water supply services in six major regional cities, excluding the capital city Freetown. Although Kambia Town was not included in SALWACO's jurisdiction, it was able to support the operation and management of the water supply services owned by local governments. Also, amendment of laws and regulations concerning expansion of its jurisdiction (including Kambia Town) was underway.

⁴⁵ Available at <Parliament of Sierra Leone <http://www.parliament.gov.sl/dnn5/Home.aspx>> [Accessed at May 25, 2017]

⁴⁶ Formal transfer date is undecided. (As of June 2017)



Source: Created by the evaluator based on the study

Figure 5 KWSSB and related organizations responsible for operation and maintenance

Table 10 shows the staff of KWSSB at the time of planning and ex-post evaluation. Although procurement staff, residents service staff, electricians, and workers have not been added to meet the number set when the plan was devised, other staff complement the work. With regard to the staff structure of technical wing, technical support is also provided by SALWACO (staff dispatch) and no serious problems are seen. However, as of the ex-post evaluation, water quality inspections were not being carried out periodically, and the supervisory system and monitoring system related to safe water supply are weak.

Table 10 Staff list of KWSSB

Unit: Number of people

	Staff	Plan	At the time of ex-post evaluation
Board	Chair	1	1 (M)
	Board member	12 or less	12 (M11, F1)
Administrative section	Accountant	1	1 (M)
	Procurement	1	0
	Residents Service	0 to 1	0
	Water fee officer	1	3 (M)
	Water fee collector ⁴⁷	15 to 22	Pump attendant 88 (M26, F62)
Technical section	Pump operator	1	2 (M)
	Plumber	1	1 (M)
	Electrician	1	0
	Worker	2	0
	Assistant worker (for maintaining sand)	—	(Complemented by staff of Technical section) 0
	Security	—	4 (M)

Source: Answers for the questionnaire from KWSSB

Although there are weaknesses in the monitoring system for operation and maintenance, there are no major problems in the staff structure of KWSSB, and the support system of SALWACO is also in place. In addition, according to new laws, the operation and maintenance will be officially transferred to SALWACO in the near future. Based on the above factors, it is determined that the institutional aspects of operation and maintenance are fair.

3.5.2 Technical Aspects of Operation and Maintenance

The technical staff at KWSSB were given instructions on operations by the main contractor, with training also provided by the JICA expert.⁴⁸ At the time of ex-post evaluation, technical support and maintenance as well as financial support were provided mainly by SALWACO⁴⁹ at the

⁴⁷ At the time of planning, the water user fee was a flat rate system and water fee collectors collected the fixed fee from water users. At the time of ex-post evaluation, the water user fee had become a usage-based rate system, and a pump attendant was placed at each public tap water. The pump attendant is selected at the recommendation of the community, and one person is placed at each public tap. They collect water user fees from water users and maintain the taps (cleaning, etc.). There is no salary from the KWSSB, but 20% of the water user fees collected from the responsible public tap are given as an incentive. 96 locations out of all the installed 100 locations were in operation at the time of ex-post evaluation, but a flat rate system (monthly fee) is used at eight locations, so a pump attendant is not assigned, resulting in a total of 88 pump attendants.

⁴⁸ Interviews with the project consultant

⁴⁹ There is a total of five staff assigned by SALWACO to KWSSB. They are a manager of the water treatment plant, an engineer (supervising and coaching two pump operators at the KWSSB), a technician, a marketing officer, and a

request of the Kambia District Council. In the KWSSB office, a manager who has a master's degree in development studies in addition to a bachelor's degree in geography, as well as an accountant who has a bachelor's degree in accounting, are primarily responsible for operations. On the technical side, an employee dispatched from SALWACO (with a bachelor's degree in civil engineering and a master's degree in development studies) manage the technical side of the water supply facility. At the water treatment plant, an engineer who has a bachelor's degree in civil engineering and was dispatched from SALWACO is operating and maintaining the water treatment facility with two pump operators, who are technical staff of KWSSB. The two pump operators have not acquired degrees in civil engineering, waterworks or similar fields. However, they have operated and maintained the water treatment facility without any problems under the supervision and coaching of the engineer dispatched from SALWACO. The project's operation and maintenance manual is also shared and utilized by KWSSB and SALWACO.

As mentioned above, technical staff at KWSSB are given the necessary training and coaching, in addition to management/supervision and technical transfer/support by appropriately qualified staff. There are no major problems in terms of the technical aspects of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The water service of KWSSB is based on independent financing as a principle, and the water supply operated and maintained by using the collected water user fee.

The water user fee for public water taps is set by KWSSB. Although a flat rate system was used for public water taps until April 2016, the usage-based rate system has been adopted since May 2016. This system was adopted because the number of water users who are stuck with payment has increased and there were cases in which users fetched water without limits due to the flat rate system. Thus, users of the public water taps have been paying water user fees on a usage-based rate system to the pump attendant assigned to each public water tap. Thereafter, as fuel costs rose⁵⁰ in November 2016, the water user fee also rose⁵¹, but according to KWSSB, the mechanism of water fee collection by pump attendants has been functioning well and this usage-based rate system functions better than the flat rate system.⁵² Water fees are collected

driver. However, there is no urgent demand for the marketing officer and the driver and they are not stationed in the Kambia District.

⁵⁰ Prices were raised 60%, increasing the fee from 3,750 SLL/liter to 6,000 SLL / liter. In Sierra Leone, gasoline, diesel fuel and kerosene are all the same price.

⁵¹ It was 500 SLL for 0.066 m³ in May-November 2016 (equivalent to three jelly cans [plastic containers]). It was 500 SLL for 0.050 m³ (equivalent to 2 jelly cans [plastic containers]) from December 2016.

⁵² A flat rate system (monthly) is applied for the eight public water taps. The eight locations include five locations at the military barracks (700,000SLL/month/five locations), one location at the jail (200,000SLL/month), one location at the secondary school (100,000SLL/month) and one location at the limited four households (There are no other households around there.) (40,000SLL/month).

for private connections using a metered system for housing, and a flat rate system⁵³ for private companies, offices, etc.

Table 11 shows the annual revenue (2013-2016) of the KWSSB after starting the project.

Table 11 Annual revenue and expenditure of KWSSB Unit: SLL⁵⁴

	2013	2014	2015	2016
Revenue	41,479 ⁵⁵	62,632,000	76,690,000	138,502,000
Expenditure	79,353,000	74,328,000	68,907,000	135,637,000

Source: Answers for the questionnaire from KWSSB

Note: Expenditure includes KWSSB staff salary, fuel costs for operating water treatment plant, office maintenance costs, and other. However, the fuel costs supported by SALWACO (September 2013-April 2014 and February-December 2016), disinfectant costs, salaries of SALWACO staff, as well as the cost of the international aid organization's fuel (June 2014-January 2016) associated with the Ebola outbreak are not included in the expenditures.

Although expenditures exceeded revenue until 2014 after starting the project, revenue slightly exceeded expenditures from 2015. However, KWSSB has been supported by SALWACO (personnel, fuel costs, disinfectant costs) since September 2013, and received funding for fuel costs from June 2014 to January 2016 as support related to the Ebola outbreak from international aid organizations, so its financial system is not completely independent.

At the time of ex-post evaluation, SALWACO was helping to cover the cost of the fuel (half of monthly fuel costs) and disinfectant needed to operate the water treatment facility, and the fuel subsidies alone amounts to approximately 8 million SLL/month.⁵⁶ According to interviews of officials at the Ministry of Water Resources and SALWACO, this same level of support is expected to continue until the transfer, although the timing and details of the official transfer of water service operation and maintenance in Kambia Town to SALWACO has not yet been decided.

The annual revenue of KWSSB is increasing due to the change in the water user fee collecting system. However, annual expenditures are also increasing due to the rise in fuel costs and other expenses. It is difficult to operate and maintain the water services using only the water user fees that are collected. Given these circumstances, KWSSB has been receiving financial support from SALWACO, and the management of the water supply services will be officially transferred to SALWACO in the near future. Given this situation, we have determined that the sustainability

⁵³ Class A (Drinking Water Distribution Company) 700,000 SLL/month, Class B (Hotel) 600,000 SLL/month, Class C (offices and guest houses, and including public facilities such as hospitals, Kambia District Council and resource centre) 200,000 SLL/month, Class D (School) 100,000 SLL/month.

⁵⁴ Sierra Leonean Leone (SLL) is the currency of Sierra Leone. 1 SLL \approx 0.1 Japanese yen 7500SLL \approx 1US dollar (as of March 2017).

⁵⁵ After starting the project, in January 2013, the chairman of the Kambia District Council (Governor) declared on the local radio in March 2013 that water user fees would be eliminated, which made it impossible to collect the water fee from the water service users. As a result, the water supply was temporarily stopped. Later, from September 2013, SALWACO supported (from SALWACO's budget) the fuel and disinfectant necessary for operating and resumed the water supply. The water fee collection from water users resumed on February 1, 2014.

⁵⁶ Assuming that one month is 30 days. 6,000SLL (fuel/liter) x 88.9 liters/day x 15days = 8,000,000SLL.

of finances is fair.

3.5.4 Current Status of Operation and Maintenance

During the ex-post evaluation survey, field studies were conducted on the water intake facility, the water treatment facility, the elevated tank, all public water taps, and three private connections (Kambia Hospital, Kambia District Council, Resource Centre) supported by the project. The intake facility selectively takes in water from the river and the swamp, taking into account fluctuations in turbidity, and the area around the water source is being managed,⁵⁷ including cleaning of the intake port. Maintaining the sand for the slow sand filter is also carried out on a regular basis at the water treatment facility. However, at the time of ex-post evaluation, water quality inspections (control of residual chlorine concentration in supplied water) had not been done due to a missing analyzer, which SALWACO was planning to purchase. No leakage of the transmission pipe and the distribution pipe had been reported, but there was a water leak in the elevated tank, and leaked water was collected in the container. According to the project consultant for the project, there may have been problems with the assembly of the tank, which was assembled by a local agency that has a license to sell the elevated tank, and this may have been the cause of the water leakage.⁵⁸ SALWACO that manages the elevated tank, and KWSSB are studying ways of dealing with this leak. Also, water supply has been provided without problems at 96 out of 100 locations at which public water taps were installed by the project. At the time of ex-post evaluation, the pump attendant who is in charge of collecting water user fees was cleaning the public water taps and the facility was being kept clean, but regular water quality tests were not being carried out at the public water taps. As a result of the above, almost all of the constructed facilities have been operating properly, and serious problems such as water disruption due to facility failures have not occurred so far, but there is water leakage in the elevated tank and water quality inspections need to be carried out. As such, there are some problems with operation and maintenance at present.

⁵⁷ Based on the amount of water and the turbidity, intake from the swamp was carried out during the first field study (November 2016) and intake from the river was carried out during the second site field study (March 2017).

⁵⁸ The water leakage in the elevated tank had not occurred at the time of defect inspection (February 2014). Although visual confirmation at site is not made by the project consultant, the consultant assumed that it may be a problem in assembly especially bolt tightening, and mentioned that the water leakage may have occurred by the hasten aged deterioration of the rubber seal between the panels. According to the consultant, it will not cause problems with the operations and does not pose risks such as collapse as the tank is made of steel.



Maintaining sand in a slow sand filter basin



Cleaning public water taps by pump attendant

In light of the above, although there are no major technical issues concerning the operation and maintenance of the project, the structure and financial aspects are fair and there are some issues concerning the situation of operation and maintenance. Therefore, the sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project was implemented for the purpose of contributing to the improvement of the living environment and hygiene of the residents by providing a stable supply of safe drinking water by rehabilitating and improving water supply facilities in the target areas in Kambia Town.

The project was consistent with the development policies of Sierra Leone and the priority areas of the Japan's ODA policy for Sierra Leone. The development needs of Sierra Leone was high. Therefore, its relevance is high. Although the project cost was within the plan, the project period was slightly longer than planned. Therefore, the efficiency is judged as fair. Treated water, which was safer than the previous water source, was supplied throughout the year by the project, but the water supply for each area was provided during a limited timespan every other day. The population served at the time of ex-post evaluation was slightly lower than the target population, but it improved significantly with the project implementation. In addition, although it did not reach the target value for water supply per person per day, it was not much lower than the target value for water supply volume if it was limited to users of public water taps. The public water taps were operating in 96 out of all the installed 100 locations. Positive impacts such as the reduction of water-borne diseases and reduction of water fetching labor, among others, were realized due to improved hygiene conditions and better water quality. Although the project's implementation had an effect to a certain degree, the effectiveness and impact are fair because the water supply for each area was provided during a limited timespan every other day. There are no major problems concerning technical aspects of operation and maintenance, but the sustainability of the institutional and financial conditions is fair. The operation and maintenance status of facilities and equipment

has some problems. Accordingly, the sustainability of the project is fair.

In light of the above, the project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

[Ministry of Water Resources and KWSSB]

- Implementation of water quality test

Although the water supply is provided after disinfectant is added at the water treatment facility, proper planning and implementation of appropriate and periodic water quality inspections at the water treatment facility and at the public water taps is required. The inspection was not being carried out at the time of ex-post evaluation. The Kambia District office of the Ministry of Water Resources needs to discuss this with KWSSB as soon as possible to formulate the inspection plan, implementation procedure and budget plan (reagent fee, etc.) for water quality inspections. If necessary, a budget must then be requested to the ministry and allocated, or a cost-sharing method set up with the KWSSB. Water quality inspections need to be carried out properly, and "safe water" meeting Sierra Leone's standards should be supplied to residents.

4.2.2 Recommendations to JICA

- Inspection by technical experts on water leakage of the elevated tank

At the time of ex-post evaluation, water was leaking from the elevated tank. Although SALWACO and KWSSB are examining ways to deal with this leakage, the dispatch of experts to provide guidance on determining the causes and appropriate measures as necessary should be considered.

4.3 Lessons Learned

Appropriate fee system and collection method, and its associated support

When it comes to collecting fees for services, there are advantages and disadvantages both for the flat rate system and the usage-based rate system. The flat rate system has advantages, especially for the collector, such as reduction of labor for fee collections, the ability to anticipate a certain amount of revenue, and attractiveness for users. On the other hand, users find that rates are low for those who use a lot of water, they don't have to worry about rates when they use water, and it is easy to pay when using.

Initially, for the project, the flat rate system was adopted from the viewpoint of simplifying the system and reducing administrative costs, but it did not function well. The advantages for the side using the service were marked disadvantages for the collecting side, such as encouraging unrestricted water usage. Considering that facilities with limited funds are providing the water

supply, the usage-based rate system that charges according to the usage amount should be considered rather than the flat-rate system that has the potential to encourage unlimited use. The usage-based rate system has advantages such as suppressing usage of unrestricted water volume by users, appropriate fee collection according to the supply, and supply plans according to the volume of water used. Although a system that identifies the actual volume used and its inputs is needed, it was important to set limits on usage and time in the case of the flat rate system implemented in the project, and to consider measures for compliance. Also, prompt examination and response were required when problems occurred after implementation.

If the establishment of water fee collection system for public water taps is required, as in this project, from the stage of project formulation until after implementation, it is important to examine the capacity of the executing agency and consider providing the necessary technical assistance such as appropriate water usage fee setting, fee collecting system, personnel system, implementation procedure and monitoring system after implementation.

Establishment of water supply facilities suitable for actual conditions in target area

In the project, the water treatment facility of the slow sand filtration system was established in the targeted area of the local city. The slow sand filtration system cannot treat water in a short period of time as compared with the rapid sand filtration system, which uses a lot of chemicals and is complicated and expensive. However, it is a simple system and operation and maintenance can be done at a low cost if the conditions of the water source such as turbidity are suitable. Even in the project, there were limitations in terms of the budget and human resources, but there were no major technical problems with operation and maintenance and no serious problems such as water interruptions due to facility breakdowns. We believe that selecting an appropriate water facility with suitable filtration method based on the conditions in the target area and the capacity of the executing agency, such as human resources and finance, will contribute to the stable maintenance of the facility, as well as to the sustainable water supply.

End