Ex-Post Project Evaluation 2019:

Package I – 6 (Tanzania, Zambia)

September 2020

JAPAN INTERNATIONAL COOPERATION AGENCY

Ernst & Young ShinNihon LLC

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United Republic of Tanzania

FY2019 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Improvement of Rural Water Supply in Tabora Region"

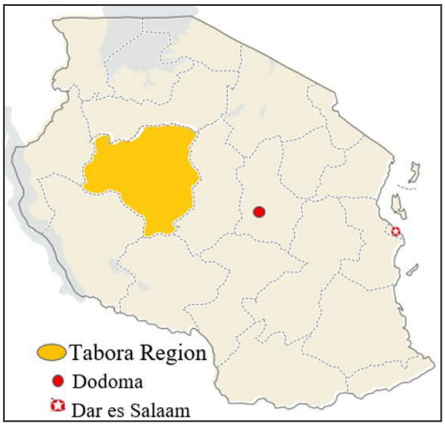
External Evaluator: Hisae Takahashi, Ernst & Young ShinNihon LLC

0. Summary

This Project was implemented to increase the population served of the water supply and the water supply coverage in the Tabora region of Tanzania by constructing water supply facilities and procuring equipment, thus helping improve the living environment of the target areas. Its purpose is in line with the development policy and sector plan of Tanzania, which emphasizes efforts to improve access to safe water in rural areas and the need to develop water supply facilities, in addition to Japanese aid policy. Accordingly, the relevance of the Project is high. Both the project cost and period were within the plan, thus the efficiency of the Project is also high. The water supply facilities constructed in this Project have significantly increased the population served of water supply and water supply coverage in the target areas, as well as reducing the cost to purchase water. The incidence of waterborne diseases has also declined due to the use of clean water. Reducing the time of fetching water has boosted the amount of agricultural activity women can do and helped improve their lives. In addition, despite some issues, the Community-Owned Water Supply Organizations (COWSOs) established through this Project are involved in community-based Operation and Maintenance (O&M) of water supply facilities and so on, so the effectiveness and impact of this Project are high. In terms of sustainability, however, some minor problems have been confirmed in institutional/organizational and financial aspects as well as maintenance status. The problems include a shortage of personnel to monitor water supply facilities and COWSOs, and the decreased involvement of COWSOs in O&M and water charge collection work. Accordingly, the sustainability of the Project effects is fair.

In light of the above, this Project is evaluated to be highly satisfactory.

1. Project Description



Project Location

Piped Water Supply Scheme (Uyui District)

1.1 Background

At the time of planning, the water supply coverage in rural Tanzania stagnated at 58.7% (2009) as a national average, with a figure of 49.1% (2009) for the Tabora region which lies in the central parts of Tanzania, the fourth-lowest in the country. Given the low annual rainfall in the region and the fact that the ground is mostly comprised of base rock, drilling boreholes in this area was regarded as very difficult from a technical perspective. Accordingly, there was a great lack of support to construct water supply facilities domestically and from abroad compared to elsewhere in Tanzania. In addition, the function of existing water supply facilities had deteriorated due to aging, forcing the villagers to use traditional water sources and the use of contaminated water was one of the reasons explaining why waterborne diseases among villagers comprised 32.6% of all diseases in the Tabora region.

Following this situation, the government of Tanzania requested support to evaluate the groundwater potentials and examine the feasibility of priority projects to develop water supply facilities in the Tabora region. In response, the government of Japan implemented a technical cooperation development project,, including the basic design survey for the grant aid project. This Project was implemented with a focus on activities identified as priority based on the survey result, in order to improve water supply coverage in the Tabora region.

1.2 Project Outline

The objective of this Project is to increase the water supply population and improve the water supply coverage in Tabora region by constructing water supply facilities and procuring equipment for groundwater development, thereby contributing to the improvement of the living environment in the target areas.

Grant Limit/Actual Grant Amount	7.6 million yen/7.6 million yen (Detailed design) 1,792 million yen/1,790 million yen (Civil works)
Exchange of Notes Date /Grant Agreement Date	March 2013/March 2013 (Detailed design) November 2013/November 2013 (Civil works)
Executing Agencies	Ministry of Water, Rural Water Supply and Sanitation Agency (Department of Rural Water Supply, Ministry of Water till 2019)
Project Completion	September 2016
Target Area	One city (Tabora municipality), 20 villages of five districts (Igunga, Nzega, Sikonge, Uyui, Urambo)
Main Contractor	Konoike Construction Co., Ltd.
Main Consultant	Earth System Science Co., Ltd.

Basic Design Survey	August 2009 – May 2011[1]
Related Projects	[Technical Cooperation] ・ The study on rural water supply in Tabora region in the united republic of Tanzania (2009 – 2011) ・ Rural Water Supply and Sanitation Capacity Development Phase 2 (2011 – 2014) [Other international organizations and aid agencies] ・ Basket fund supported by the African Development Bank and World Bank, *Water Sector Development Plan* (2007 – 2015)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisae Takahashi, Ernst & Young ShinNihon LLC

2.2 Duration of Evaluation Study

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

Duration of the Study: July 2019 – October 2020

Duration of the Field Study: October 17 – November 12, 2019

2.3 Constraints during the Evaluation Study

The second field survey of this evaluation survey was cancelled due to the COVID-19 pandemic. Thus, additional information, feedback on the evaluation summary with the executing agency and receiving of comments, all of which were scheduled for the second field survey, were conducted remotely with the support of local associates.

3. Results of the Evaluation (Overall Rating: A[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Consistency with the Development Plan of Tanzania

At the time of planning, *the Tanzania Development Vision 2025* (1999), the Tanzanian development policy, stated to aim at improving the quality of people's lives, achieving good governance based on law and realizing a competitive and strong economy. In the water sector, *the National Strategy for Growth and Poverty Reduction II* (2010/11 – 2014/15), formulated based on the above vision, clearly stated the target of improving the rural water supply coverage

[1] "The Study on Rural Water Supply in the Tabora Region" which was implemented from August 2009 to May 2011, was a technical cooperation development project including a basic design survey for grant aid project. The activities of the first year of this survey involved formulating "The Project for Improvement of Rural Water Supply in the Tabora Region" (This Project) and a request for the grant aid to implement this Project was submitted.

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ②: Fair, ①: Low

from 53 to 65%. *The Water Sector Development Plan (WSDP)* (2006 – 2025), a long-term sector plan formulated by the Ministry of Water at that time, also aimed to increase water supply coverage in the rural areas to 74% by 2015 and 90% by 2025 based on a sector-wide approach financed by the basket fund[4].

The second Five-year Development Plan (2016/17 – 2020/21)[5], the development policy as of the ex-post evaluation, includes "promoting human development and social reform" to meet the goals of *the Tanzania Development Vision 2025*. It indicates that access to safe water in rural areas would be improved to 85% by 2020/21, thus confirming that an improved water supply in rural areas remains a priority. *The WSDP II* (2014/15 – 2018/19)[6], which is a successor to *WSDP*, also aims to improve access to safe drinking water by enhancing water supply capacities in rural areas, strengthening water usage organizations and taking an integral approach on water supply and sanitation issues. In particular, it described to improve the water supply coverage for safe drinking water in rural areas from 51% to 80%. In 2019, *the Water Supply and Sanitation Act, 2019* was formulated and the Rural Water Supply and Sanitation Agency (RUWASA), which oversees local water supply operations, was established under the abovementioned Act. Accordingly, the O&M of water supply in rural areas was handed over from the Ministry of Water to a system run under the RUWASA[7].

As mentioned above, the development policy of Tanzania and the water sector plan have clearly aimed to improve water supply coverage in rural areas with specific target values from the time of planning to the time of the ex-post evaluation. It is thus consistent with the purpose of this Project which developed water supply facilities in the Tabora region with low water supply coverage in rural areas.

3.1.2 Consistency with the Development Needs of Tanzania

The water supply coverage in rural areas of Tanzania at the time of planning stagnated at a national average of 58.7% (2009) and the figure for the Tabora region was 49.1%, one of the lowest in terms of water supply. The average annual precipitation in the Tabora region was only 960 mm (2002), below the national average of 1,100 mm, so most of the water supplied was groundwater due to the limited surface water. Moreover, since the ground is mostly comprised of base rock in this area, it is difficult to identify the aquifer to develop groundwater and drill boreholes from a technical

Women collecting water from traditional water source

[4] Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*
[5] Source: *National Five-Year Development Plan* 2016/17 – 2020/21
[6] Source: *Water and Sanitation Development Plan* 2014/15 – 2018/19
[7] Based on the interviews to the Ministry of Water and RUWASA Tabora regional office

perspective. Moreover, existing water supply facilities had degraded 20 to 30 years after construction and their functions had declined. Accordingly, the water supply coverage, reflecting the utilization rate of water supply facilities, was even lower than the abovementioned coverage and forced villagers to use contaminated traditional water sources[8], raising concerns over health conditions[9].

At the time of the ex-post evaluation, water supply coverage was 68% (2018) in rural areas of the country and 52% in the Tabora region, figures which improved from the planning stage thanks to support from this Project. However, the low water supply coverage in rural areas remains unresolved. Moreover, unchanged topographical conditions mean people still rely on groundwater as a water source. However, since the operating rate of more than 1,500 water supply facilities in the Tabora region is about 50%[10], the need to develop water supply facilities to improve coverage in the region remains high.

3.1.3 Consistency with Japan's ODA Policy

The Country Assistance Policy for Tanzania (2012) identified infrastructure development supporting economic growth and poverty reduction as one of the priority areas. The Project, which developed water supply facilities in rural areas, corresponds to infrastructure improvement and also helped Yokohama Action Plan of the fifth Tokyo International Conference on African Development (TICAD IV) as well as contributing toward "improved access to safe drinking water" as one of the Millennium Development Goals, meaning that the Project was consistent with Japan's ODA policy.

In light of the above, the Project has been highly relevant to the Tanzania's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

(1) Japanese side

The main output of the Project comprised piped water supply schemes with public water points (Level 2) and deep wells with hand pumps (Level 1), procurement of geographical survey equipment to develop groundwater, capacity building support (soft component) for O&M of water supply facilities and hygiene plans and for improving the technical groundwater development survey capacity as well as consulting services. Tables 1 through 3 show the plan

[8] A traditional water source which was used from the past. The water is white and turbid and manure from domestic livestock flows alongside the rain water, making it extremely unclean. The photo is from the report of *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*.

[9] Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*

[10] Based on the questionnaire answer from the RUWASA Tabora regional office

and actual output of the Project.

Table 1 Planned and Actual Output (Construction of Water Supply Facilities)

(Unit: Number of Facility)

District/Municipality	Plan		Actual	
	Level 2	Level 1	Level 2	Level 1
Igunga district	0	12	0	11
Nzega district	1	23	1	65
Sikonge district	0	20	0	12
Uyui district	2	12	2	9
Tabora municipality	1	15	1	7
Urambo/Kaliua district	0	32	0	7
Total	**4**	**114**	**4**	**111**

Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*, document provided by JICA, questionnaire answer from the RUWASA Tabora regional office.

Note: The Urambo district was subdivided into the Urambo and Kaliua districts during the implementation of this Project.

Level 2 water supply facility
(Tabora municipality)

Level 1 water supply facility
(Sikonge district)

The Level 2 water supply facilities were installed as planned, and Level 1 water supply facilities were also installed almost as planned (97%) (see Table 1). The specifications and quantities of the piping/the ancillary of Level 2 water supply facilities[11], the villages where Level 1 water supply facilities were installed, drilling borehole locations, criteria for judging success/failure, installed locations and extension of piping, piping installation method, public water point positions and distribution route of water were changed. Since these are all minor changes, it was confirmed that there was no impact on the generation of the effects, the project cost and period due to the changes, which would affect the judgement of five evaluation criteria. Details of each change and the reasons behind them are as follows:

[11] The number of switches for the hydraulic valve box/piping diameter of the drain tanks were changed, the number of procured tool boxes for the O&M of the machine room and portable GPS were added and so on.

[Major changes of output (water supply facility) and reasons]

① Change of the target village for the Level 1 water supply facilities:
Uyui → Kalmuwa village in Tabora municipality

[Reason] Since Uyui village was confirmed as the target village of another project for developing water supply facilities planned by the Tanzanian side, the village was replaced by Kalmuwa village of the same Tabora municipality as an alternative village to avoid duplication. Kalmuwa was newly selected as the target village for the Project as it was rated as the highest priority among those villages excluded during the planning stage of this Project[12].

② Additional maintenance tools for the mechanical room

[Reason] The maintenance system was reviewed and it was considered necessary to supply maintenance tools for each district where the Level 2 water supply facility was installed.

③ Revised criteria for success/failure of boreholes for the Level 1 water supply facility[13]

<Changes of the water quality requirement>

- Manganese

Revised from 0.4 mg/litre, the water quality standard in line with World Health Organization (WHO) guidelines to 0.5mg/litre, the Tanzanian drinking water standard.

[Reason] The Tanzanian standard was applied, since this part was removed in the revision of the WHO guidelines on the grounds that it has no impact on human health.

- Nitrate

Revised from 50 mg/litre, the water quality standard in line with WHO guidelines, to 75 mg/litre, the Tanzanian drinking water standard.

[Reason] At the time of planning, the water quality standard, which was one of the factors for determining the success or failure of drilling boreholes, was mainly in line with WHO guidelines. Meanwhile, although some boreholes exceeded the values of the WHO guidelines, they remained within the Tanzanian water quality standard. The success rate of borehole drilling was also lower than planned and to supply clean and safe water to more people, the water quality requirement was revised, reflecting the opinion of the Ministry of Water and a consultant that this change would be less likely to affect the health of residents[14]. In case nitrates exceeded 50 mg/litre, this change was applied after confirming via guidance to villagers that this water could be considered drinkable but should not be given to infants[15].

[12] Based on the questionnaire answer from the RUWASA Tabora regional office and the interviews to the consultant

[13] At the time of planning, the success rate of drilling boreholes was estimated at 50.4%, however, the result was as low as 33.3% when 114 boreholes, the planned number, had been drilled. Subsequently, the success rate increased to 42.5% due to the changes in requirements and target villages.

[14] Documents provided by JICA and interview surveys with the Ministry of Water and the consultant. In addition, the WHO guidelines remain guidelines alone and each country is individually responsible for determining water quality standards.

[15] Nitrate ions bind to hemoglobin in the blood of bottle-fed infants (babies and infants raised on powdered milk) and

According to interviews with the RUWASA Tabora regional office and villagers during the site surveys, no harm to health had not been reported.

<Changes of yield (water volume)>

- Required yield: Revised from 6.7 to 3.0 litre/min

[Reason] Increased success rate due to easing the criterion allows the planned number of water supply facilities to be secured as well as ensuring further access to safe water in areas where the efforts to drill boreholes were unsuccessful and the required water yield could not be secured. It was assumed that this change would reduce the number of villagers accessing the water from 250 to 112 persons per borehole per day. Conversely, it has become easier for villagers who were otherwise forced to use contaminated traditional water sources to access safer water where it was not previously possible to secure sufficient water. Accordingly, as an exceptional measure, this change was allowed for only one borehole per village and a maximum of ten boreholes in this Project. It was confirmed that no cases of insufficient water in the villages covered were reported including the dry season in each RUWASA district office and the target villages by the time of the ex-post evaluation.

④ Relocated drilling boreholes

[Reason] The drilling boreholes, mainly at the Urambo and other districts, where success rates were low, were relocated to the villages of Nzega, Igunga and other districts, where obtaining more water was much likelier. According to the RUWASA Tabora regional office, despite the planned number for each district being revised, in this region, where it is difficult to identify aquifers and drill boreholes, the Ministry of Water prioritized efforts to ensure an increased water yield throughout the entire region, even if the points of drilling boreholes by districts were changed. Accordingly, boosting the success of boreholes drilled by relocating them to areas with higher drilling success rates was considered an appropriate decision.

Table 2 Planned and Actual Output (Procurement of Equipment)

Item	Plan	Actual
1. Electro magnetic survey equipment	1 set	As planned
2. Two-dimensional resistivity survey equipment	1 set	As planned
3. Global positioning system (GPS)	4 sets	5 sets

Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania* and documents provided by JICA

Electro magnetic survey equipment and two-dimensional resistivity survey equipment for groundwater development were procured as planned (See Table 2). The number of procured

may cause methemoglobin crystals, but do not otherwise harm human health.

Global Positioning Systems (GPS) was increased to add the number of GPS receivers required in line with the division of the target Urambo district. Since GPSs have been utilized effectively at each district office to capture location information for boreholes and water supply facilities, the appropriateness and need to procure GPSs for all the target districts can be considered high.

Table 3 Planned and Actual Output (Consulting Service, Soft Component/Training Sessions)

	Plan	Actual
Consulting service	Detailed design, Supervising civil works and procurement	As planned
Technical assistance: Capacity building for O&M	1) Establishing a community-based O&M mechanism 2) Enhancing the scope for Local Government Authorities (LGAs) to support local communities 3) Measuring the impact generated by the project 4) Organizing a system of health education concerning water and sanitation	・ As planned (summarized as follows): ・ 33 counterparts from target districts/municipalities and 7,505 villagers participated in the activities. 1) An explanation as to how COWSO was established, selected and approved the representative, the water rates set, members registered, an O&M plan prepared and support to implement technical and management training sessions on O&M, etc. 2) Trainings on COWSO management, responses to technical issues/troubles and so on for LGAs and OJT implementation 3) Participatory monitoring and evaluation and preparation of checklist 4) Explanation to the village representatives concerning the type and prevention of waterborne diseases, harm to health caused by fluorine in groundwater and maintenance of hygienic public water taps
Capacity building for groundwater development, including geographical survey methods	1) Formulating the well sitting survey in the target area 2) Boosting geophysical survey skills 3) Analysing the survey data and formulating the groundwater development plan	・ As planned (summary explained as follows:) ・ Four staff members participated from the Tabora Branch of the Lake Tanganyika Basin Office. 1) Study using existing well data and analytical training using GIS topographic data 2) On-site training to operate equipment, conduct effective line surveys, troubleshooting, etc. 3) Data analysis by comparing various aspects, reviewing the existing groundwater development plan for formulating a new plan

Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*, documents provided by JICA, questionnaire answer and the interview survey to RUWASA Tabora regional office

In this Project, formulating the COWSO mechanism for O&M of water supply facilities, support for LGAs monitoring COWSOs and training to use the equipment continuously were conducted as planned (See Table 3). The soft components were designed to ensure sustainability of the project effects generated and the expected effects are described in “3.4 Sustainability”.

(2) Obligations of Tanzanian side

The following five items were planned to be covered by the Tanzanian side.

1) Arranging a water use permit for water sources
2) Arranging permission, attending and inspection for the pipe-laying work traversing the railway and bearing the necessary cost
3) Arranging the necessary procedures to lay the pipeline under or alongside the main roads
4) Announcing to the villagers at target areas before starting to construct the water supply facility
5) Covering the cost of daily allowance and travel expenses for participants from the Tanzania side to technical support for geographical surveys and implementing soft components

It was confirmed that the abovementioned planned items were implemented as planned through the questionnaire answers from the Ministry of water and the RUWASA, and interview survey to the executing agency and the consultant.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The Japanese side covered a cost of 1,797 million yen against the Exchange of Notes (E/N) limit of 1,799 million yen, which was within the plan (99.9% of the plan). The planned project cost, including the burden of approximately 14 million yen on the Tanzanian side, was 1,804 million yen, but the total project cost could not be compared because the records of the expenditure on the Tanzanian side could not be ascertained. However, since Tanzania's burden was largely implemented as planned (see "3.2.1 Project Outputs"), it is considered that expenditures were made as planned.

3.2.2.2 Project Period

The project period[16] was planned to be 37 months, but actually it was 35 months from November 2013 to September 2016, which was within the plan (95% of the plan). The Project was completed within the planning period, while modifications such as relocating the drilling boreholes were made. The consultant explained that it can be attributed to the fact that all related parties, including the consultant, contractor, each regional/district office and the Ministry of Water, tried to communicate closely with each other and if any concerns arose, the information was shared, and solutions were discussed at an early stage. Zero accidents having occurred in the field was also considered as one of the contributing factors.

In the light of above, both the project cost and project period were within the plan. Therefore, efficiency of the Project is high.

[16] The project period is defined from the month of the start of DD to the end of completion of the construction.

3.3 Effectiveness and Impacts[17] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

(1) Population served with water and water supply coverage

The population served with water in 2019, at the time of the ex-post evaluation, was 45,464, which achieved the target (45,000) set during the planning for 2020, four years after project completion. Although the water supply coverage was below the target, since it exceeded 80% (44.4/53.5 = 83.0%) of the target (53.6%), the target is deemed as having been almost achieved.

Table 4 Population Served with Water and Coverage at Target Districts/Municipalities

	Baseline	Target	Actual		Achievement
	2009	2020	2016	2019	
		4 Years After Completion	Completion Year	3 Year After Completion	
Population served with water (person)	4,250	45,000	30,350	45,464	101%
Water supply coverage[Note 1] (%)	7.8	53.6	42.3	44.4	83.0%

Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*, documents provided by the RUWASA Tabora regional office and each district office

Note 1: Population served with water / population

(2) Safe and clean water volume and time for fetching water

Before implementing the Project, a certain volume of water was obtainable from traditional water sources during the rainy season. However, the quality was problematic and it was difficult to obtain safe and clean water (see the following section for the change of water quality). In addition, water sources dried up during the dry season and households who could obtain water sources within 30 minutes were only about 25% of the local population. After implementing the project, sufficient safe and clean water became available within target areas during both rainy and dry seasons by establishing water supply facilities.

[17] Sub-rating for Effectiveness is to be put with consideration of Impacts.

Table 5 Available Safe and Clean Water Volume per Day and Time when Fetching Water at the Target Districts/Municipalities

	Baseline	Target	Actual		Achievement
	2009	2020	2016	2019	
		4 Years After Completion	Completion Year	3 Year After Completion	
Daily available water volume	20 – 25 (little/person/day) Unsafe water	20 – 25 (little/person/day) Safe and clean water	20 – 25 (little/person/day) Safe and clean water		Achieved
Time for fetching water	Ratio of household who can fetch water within 30 minutes: Rainy season : 56.7% Dry season : 25.3%	Access to safe and clean water resource: Within about 400m and 30 minutes	Most of villagers have access to safe water resource within 400 m and 30 minutes		Achieved

Source: *The Study on Rural Water Supply in Tabora Region in the United Republic of Tanzania*, questionnaire answer from the RUWASA Tabora regional office

(3) Number of Community-Owned Water Supply Organizations (COWSOs)

In this Project, four Level 2 water supply facilities and 111 Level 1 water supply facilities (115 water supply facilities in total) were established in 33 villages in six districts and one municipality in the Tabora region. COWSO was planned to be formed in each village where water supply facilities were installed and actually established in all 33 villages where the water supply facilities were installed as planned. As described in "3.2.1 Output", the villagers learned the COWSO role and also obtained insights and experiences through training sessions for implementing the O&M of the installed water supply facilities. Accordingly, the COWSO-based O&M of the Level 2/1 water supply facilities has been carried out in principle.

Table 6 Number of Community-Owned Water Supply Organizations (COWSOs)

Baseline	Target	Actual		Achievement
2009	2020	2016	2019	
	4 Years After Completion	Completion Year	3 Year After Completion	
0[Note 1]	COWSOs are formed for 118 water supply facilities and carry out O&M	33 COWSOs have been formed for 115 water supply facilities and carry out O&M		Achieved

Source: *The Study on Rural Water Supply in Tabora region in the United Republic of Tanzania*, questionnaire answer from the RUWASA Tabora regional office

Note 1: As COWSOs were formed in conducting this Project, the baseline was regarded as 0.

3.3.1.2 Qualitative Effects (Other Effects)

(1) Improvement of drinking water quality

Before implementing this Project, most of the villagers relied on water points called traditional water sources and shallow wells for their livelihoods. Since livestock also used the

same sources, the water was too unhygienic for drinking. Their water source was shifted to deep wells, which paved the way to obtain safe and clean water by installing them as part of this Project. In the Tabora region, COWSO was to report to each district office of RUWASA, in case concerns over the colour or odour of water or impacts on physical condition emerged. However, no complaints about water quality were reported after project completion. In addition, the water quality was reportedly improved in all the villages visited in the course of interviews conducted during site surveys[18]. In some wells, it was explained that the water tasted very salty but would not harm health[19].

(Photo: Left)
Traditional water source

(Photo: Right)
Water from the water supply facility installed under this Project

(2) Cost reduction of obtaining water

Before implementing this Project, the villagers used to purchase water from water vendors during the dry season. The rate of water varied from year to year and based on the distance to deliver the water, but the average amount at the time was 100 to 300 Tanzanian Shillings[20] (Tsh)/20 litres, according to villagers. After the Project, the water from the Level 2 supply facility was priced at 50 Tsh/20 litres, reducing the cost of purchasing safe drinking water to between half and 1/6 of the original cost. In addition, at the Level 1 water supply facility, a water charge of approximately 500 to 2,000 Tsh per month is levied on each household[21]. If they purchase water from water vendors, it costs about 3,750 to 11,250 Tsh[22] per person per month. Accordingly, it can be said that this Project has greatly helped reduce the costs of obtaining water for users of a Level 1 water supply facility as well.

The monthly cost per person of obtaining water was reduced by approximately 1,875 to 9,375

[18] During the site visit, the evaluator visited 21 COWSOs out of the total 33 COWSOs formed in this Project. The key informant interviews with three COWSO members (representatives, secretaries and accountants) at seven sites and each representative at 12 sites were conducted. As for two sites, since the schedule of COWSO member could not be arranged, only work to confirm the facilities could be carried out. In addition, 30 of the total 115 water supply facilities were inspected, about three to five water users at each facility were interviewed on effectiveness, impact and sustainability.

[19] One facility confirmed that the well water was excessively salty, thus the well is used for livestock at the time of the ex-post evaluation.

[20] The exchange rate at the time of the ex-post evaluation (as of October 2019) was 1 Tsh = 0.05 yen.

[21] As described in "3.4 Sustainability", the water price is set by each COWSO and the price also differs.

[22] Estimation based on the volume of water required per person is 25 litres per day, as defined by the Ministry of Water.

Tsh[23] for users at the Level 2 water supply facility and by approximately 3,500 to 11,000 Tsh[24] at the Level 1 water supply facility, which corresponds to 0.4 to 2.5% of the average monthly income of Tanzania[25]. In the Tabora region, with the sixth-highest level of poverty among all 26 regions in the country[26], income levels are considered even lower. Accordingly, the contribution to reduce the cost of obtaining water by establishing water supply facilities under this Project is considered even higher in the Tabora region[27].

3.3.2 Impacts

3.3.2.1 Intended Impacts

(1) Decrease in incidence of waterborne diseases

In the target areas, drinking safe water has become possible due to changes in villagers' water sources. Despite the lack of data to show incidences of waterborne diseases in the target areas, the result of interviews with each RUWASA district office in the Tabora region and the COWSO members visited during the site surveys revealed a significant reduction in mainly abdominal pain and skin conditions after implementing this Project. Switching from hygienically unsafe water sources to using the deep wells installed in the Project has helped obtain higher quality water and eliminate abdominal pain and skin problems.

(2) Changes in women's working hours and children's learning time

Before implementing the Project, villagers - mainly women - mostly used to spend two to four hours[28] fetching water, especially during the dry season because the nearby water points used during the rainy season dried up. After the Project, the time required to fetch water was generally reduced to less than 30 minutes in the target areas, eliciting the following positive impacts, such as improved living, learning environment for children and so on.

・ Change in working hours for women and associated livelihood improvement

Time freed up for agricultural activities, which had been spent on fetching water, helped boost crop yields and incomes. Moreover, allowing more time for family and leisure brought home the perception of comforts in their life to those involved.

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[23] Comparison between the purchase of 25 litres of water from a water vendor and from water supply facilities in this Project

[24] Same as footnote 23

[25] Data stating the average monthly income of Tabora regions was not available, however, according to the Numbeo (http://www.numbeo.com/), a database recorded information on life in cities and countries worldwide, the average monthly income in 2020 was 442,204 Tsh (approximately 20,560 yen) in Tanzania.

[26] Source: National Bureau of Statistics (2019), *Key Indicators Report 2017-18 Household Budget Survey*

[27] In case reference is made to the "monthly average meal cost per adult" (41,473 Tsh), obtained as a variable from the Tabora region, the reduction in cost of purchasing water is equivalent to between 5 and 27% of the monthly average expense on meals and is thus expected to have a certain impact on cost reduction efforts for household expenses.

[28] Based on interview surveys with COWSO members and villagers using water facilities during site visits

・ Improved studying time and study environment for children

According to villagers in the target areas, children had more time to study thanks to the reduced time required to fetch water. It was also confirmed in some villages that villagers did not let children go and fetch water for safety reasons, since this often took them several hours during dry season before the Project. In such areas, although no changes in the working hours for children were reported, cases of mothers spending less time on fetching water and more time supporting their children with their studies were reported. In either case, it can be said that reducing the time required to fetch water helped improve the study environment for children.

(3) Fostering the ownership of villagers

Implementing this Project can be said to have helped establish a community-based O&M mechanism of the water supply facility, which had not existed before, by forming a COWSO in each village where the water supply facility was established. COWSO is responsible for collecting and managing water charges required for O&M, monitoring the condition of each water supply facility and reporting those conditions to the RUWASA district offices. The mechanism continued for a certain degree, even after the Project was completed. By way of explanation, forming COWSOs and providing training helped deepen the understanding to pay the maintenance cost of water supply facilities at their own cost and went a long way to helping sustain the mechanism. Though it is confirmed that some COWSOs do not collect water charges regularly and have changed the collection system to collect the necessary amount from villagers when damage occurs, the RUWASA district offices need to continue communicating with COWSOs and provide adequate advice on the best ways to collect water charges to ensure the sustainable operation of water supply facilities.

[BOX] Contribution of this Project from the perspective of the United Nations Sustainable Development Goals (SDGs)

This Project was implemented to improve access and water supply coverage to safe water by constructing deep wells, procuring groundwater development equipment and improving the capacity to conduct O&M of water supply facilities in the Tabora region with lower water supply coverage nationwide. This purpose is to contribute to the "Goal 6. Ensure availability and sustainable management of water and sanitation for all" of the SDGs adopted by the United Nations in 2015. In addition, installing wells in the neighbourhood have reduced the time required for women and children to fetch water, helping reduce the proportion of unpaid working hours and dovetails "Goal 5. Achieve gender equality". The following figure shows how the output and effects of this Project match those of the indicators specified by SDGs[Note], so improving the same indicator due to the implementation of this Project is considered to help achieve the SDGs goal in Tanzania.

Output		Effectiveness・Impact (Indicators)		SGDs (Indicators)
・ Construction of water supply facility ・ Procurement of groundwater development equipment	→	・ Increase in water population and water supply coverage ・ Increase of use of safe and clean water ・ Reduction of time for fetching water	=	・ Achieve universal and equitable access to safe and affordable drinking water (Goal 6.1, Indicator 6.1.1) ・ Proportion of time spent on unpaid domestic and care work (Goal 5.4 Indicator 5.4.1)
・ Training for establishing the O&M system	→	・ Sustainable O&M of facility by community based O&M of water supply facilities	=	・ Support and strengthen the participation of local communities in improving water and sanitation management (Goal 6.B, Indicator 6.B.1)

Figure Consistency of Logic between this Project and SDGs

Note: The SDGs comprise 169 targets for 17 goals to realize a sustainable world and 244 global indicators set to measure the progress.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the natural environment

At the time of planning, the Tabora Regional Secretariat conducted a Preliminary Environment Assessment on each of the planned facilities in accordance with the Environmental and Social Management Framework of the Ministry of Water. As a result, the impacts to be generated by this Project were deemed negligible. Through questionnaires and interviews with the executing agency, it was confirmed that there was actually no negative impact on the natural environment during the construction works as well as after the provision of the facilities.

(2) Resettlement and land acquisition

Temporary acquisition of some cropland during the construction period was planned for some sections of the distribution pipe when implementing this Project. However, it was expected that cultivation was carried out during the rainy season while the construction work was limited to only during the dry season, and the land was recovered for agricultural use after construction. Accordingly, the impact on harvesting and income is assumed to be negligible and no land acquisition would be required. In fact, in areas of temporarily affected cropland, the villages provided alternative land and no cases of resettlement and land acquisition were confirmed. Moreover, since water supply facilities were installed on national land, no resettlement or land acquisition was required when constructing the same.

As described above, this Project has mostly achieved its objectives. Therefore, effectiveness and impacts of the Project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

(1) Supervisory authority of the rural water supply

The organization overseeing water supply projects and O&M of rural water supply facilities shifted from LGAs to RUWASA following the enforcement of *the Water Supply and Sanitation Act, 2019* as described above. Most of the staff overseeing the rural water supply at LGAs (district/municipality) were transferred to the RUWASA Tabora regional or district offices. The reporting systems of the Ministry of Water, RUWASA regional offices and each village were generally adequate. However, as shown in the Table below, there is a shortage of personnel at each office and reportedly there are also some cases in which a timely response to support requests from the field is not always received. Accordingly, some concerns remain in terms of the institutional aspect of the O&M.

Table 7 Number of O&M staff of the RUWASA Regional and Each District Office

	Engineer		Technician	
	Set number	Placed number	Set number	Placed number
Tabora region	5	3	0	0
Igunga	4	3	10	4
Nzega	3	1	15	5
Sikonge	3	2	10	6
Tabora district/municipality	2	2	9	4
Urambo	4	2	6	3
Kaliua	6	1	12	4

Source: Questionnaire answer from RUWASA Tabora regional office

Note: While engineers are qualified, technicians have the necessary technical skills or have learned the required technology. In local authorities, although engineers had to be assigned to regional offices, this did not necessarily apply to technicians.

(2) O&M of Level 2/Level 1 water supply facility

The COWSO at each village oversees the O&M of the water supply facilities. Each COWSO comprises eight to 12 persons, including representatives, a secretary and accountant and must be replaced every three years. COWSOs understand the operational conditions of the facilities, water charges collected and the presence of problems, etc. and periodically (monthly, or quarterly, etc.) report to the RUWASA district offices via phone or on paper, whereupon district offices compile information and submit a monthly report to the RUWASA Tabora regional office. While most of the COWSOs oversee the O&M of water supply facilities on their own initiative until the time of the ex-post evaluation, RUWASA explained that the number of villages with less involvement in O&M of COWSO has gradually increased in recent years. This was attributable to less understanding on the part of new villagers having moved in and less motivation on the part of COWSO members who undertook such work unpaid. It was also confirmed that monitoring of the circumstances of the water supply facilities conducted by district offices was based on information reported from the field (COWSOs), rather than on-site inspections, due to shortages of staff and the necessary travel means for monitoring[29].

(3) O&M system of groundwater development equipment

The O&M of the equipment is conducted by the hydraulic geology department of the Tabora Branch of Lake Tanganyika Basin Office and has remained unchanged since the planning stages. The total number of office staff at the ex-post evaluation was nine, five of whom were engineers. A shortage of personnel to implement groundwater development surveys across the Tabora region was reported and is said to be a concern from an institutional perspective.

3.4.2 Technical Aspect of Operation and Maintenance

(1) O&M of the water supply facility: Technical capacity of COWSO

The COWSO members include technicians with basic knowledge who participated in O&M training while implementing this Project and could handle basic maintenance activities such as minor failure, replacement of consumables including packing, greasing of bearings, cleaning and so on. It was confirmed through the RUWASA district offices, interviews and the operational conditions of the facilities during site surveys that Level 1 water supply facilities could actually be maintained and managed. Conversely, when repairs which COWSOs cannot handle occur, such as failures of generators or equipment of the Level 2 water supply facility, breakage of pipes of Level 1 water supply facility, etc., COWSOs report to the RUWASA district offices, whereupon engineers from the district offices can follow up. Accordingly, no serious problems when conducting O&M of the water supply facility were confirmed.

[29] None of the RUWASA district offices in the Tabora region has any vehicles for monitoring, so monitoring takes place via motorbikes or bicycles.

(2) Monitoring and guidance to COWSO: RUWASA Tabor regional and each district offices

At the time of planning, the Department of the Rural Water Supply in the Ministry of Water, which was an executing agency, had the capacity to formulate water supply plans and design facilities and boosted this capacity through training opportunities supported by Japan and developing partners as well as technical support and guidance to LGAs. In addition, each district/municipality had water engineer offices where water engineers, equivalent to engineer level and technicians were assigned, then supported the O&M of water supply facility in the villages. As mentioned above, although RUWASA oversees the O&M of the water supply facility in rural areas at the time of the ex-post evaluation, staff members from the former water engineer offices have been transferred to the local RUWASA offices, so their knowledge and skills have been inherited. Therefore, there are no serious concerns over the capacity of local offices in RUWASA to provide the technical guidance and monitoring. Though scope to implement monitoring remains limited due to shortages of transportation means and personnel, in case the offices receive the reports on failures, etc. from COWSOs, they visit the site as much as possible, determine the circumstances and provide the necessary support[30].

(3) Maintenance of equipment: Technical capacity of the Tabora Branch of Lake Tanganyika Basin Office

The Tabora Branch of the Lake Tanganyika Basin Office was commissioned by the local governments and NGOs to conduct a geological survey. Since the number of survey cases was increasing at the time of planning, it was considered that they already had the required skills from those days. Furthermore, with regards to the newly procured equipment, there were no concerns over the technical aspects of O&M, since the staff members who participated in the Project training were in the office, except for one person retired and the procured equipment (resistivity, etc.) was effectively utilized. It was confirmed that the distributed O&M manuals were placed in the office and used as needed.

3.4.3 Financial Aspect of Operation and Maintenance

(1) O&M cost of the water supply facility

- Level 2 water supply facility

A system that charges 50 Tsh (about 2.3 yen) per 20 litres has been applied and the water charges have been collected without any problem. Conversely, the expense depends on whether commercial power or a diesel generator is used. In each COWSO of Mabama and Kakola, which uses diesel generators, the cost of fuel is high, which means only the minimum O&M cost can be covered and support has to be requested from the RUWASA district offices if large-scale

[30] Interview survey to the RUWASA Tabora Regional office, each district office and each COWSO members

repair needs and failures emerge. In addition, Kakola suffered from a vicious circle, in which COWSO failed collect the planned water charges due to leakage from public taps, and to secure the maintenance cost to conduct necessary repair works.

Table 8 Balance of COWSO with Level 2 Water Supply Facilities Installed

Target village	Status of balance for maintenance cost
Isanga	A commercial power supply is used and the O&M cost can be covered by collected water charges.
Mpumbli	The water supply was suspended till the previous month of conducting the ex-post evaluation, so no water charges were collected.
Mabama, Kakola	Diesel generators are used because the high-pressure power lines did not extend to the villages and only the minimum water charges for fuel and maintenance were collected. The amount of water charges collected did not reach the planned amount due to leakage from public water taps.

Source: Interview survey to members of each COWSO

- Level 1 water supply facility

At the Level 1 water supply facility, a system that charges a certain amount monthly per household (from about 500 to 2,000 Tsh (approximately 25 – 100 yen)) is applied. At the time of the ex-post evaluation, it was confirmed that no water charge was collected from just under 60% of COWSOs[31]. Since this number was about 30% at the time of the defect inspection survey conducted one year after project completion, it showed a tendency of increase. Although maintenance of the Level 1 water supply facility was not particularly costly, many COWSOs with the inability to collect water charges revised the water charge collection system to levying charges when repair was required rather than accumulating O&M funds monthly. This change means that if the accumulated O&M funds decline, it is impossible to perform repairs quickly when the water supply facilities malfunction, raising concerns over possible temporary operational stoppages of the water facilities, for which RUWASA must consider measures. The revision to the water charge collection system was deemed attributable to the fact that the agricultural activity as an only source of cash income was limited especially in dry season and payment was delayed, and that the collection work of COWSO members became a burden on the households. In addition, in a few cases, the way in which the collected funds were used was unclear, since the initial COWSO members did not fully understand the significance and importance of collecting water charges, meaning the collected money was improperly managed. Current members of COWSOs, in which such problems arose, questioned the quality of the initial members selected and emphasized the need for a careful selection process.

[31] 19 out of 33 COWSOs in villages with Level 1 water supply facilities installed in this Project. The situation differed between districts/municipalities. In villages within Sikonge, Tabora rural, Urambo, Kaliua and Tabora municipality, water charges were regularly collected by all COWSOs, except one COWSO in the Tabora municipality while the charges were collected when needed via COWSOs in each of Igunga and Nzega villages.

(2) Budget of RUWASA/LGAs

The water sector budget and expenditure for the past two years of LGAs overseeing the O&M of rural water supply and the budget of RUWASA in 2020 are shown in the Table below. The actual spending of each district was substantially lower than the planned budget, by about 20% on average. While the budget execution rate in Tanzania was generally low, the RUWASA staff cited a clear shortage of funding for proper O&M activities and monitoring, which was the main reason why sufficient transportation means could not be arranged, monitoring activities were not conducted regularly and so on.

Table 9 Budget and Expenditure of Water Sector in Districts/Municipalities where Water Supply Facilities were Installed

(million Tsh)

District/Municipality	LGAs				RUWASA
	2017/18		2018/19		2020
	Budget	Expenditure	Budget	Expenditure	Budget
Igunga	263	68	963	343	2,625
Nzega	648	101	3,257	306	3,565
Sikonge	983	425	1,810	85	2,623
Tabora rural	1,009	289	1,402	427	2,362
Tabora municipality	2,216	15	1,385	831	82
Urambo	465	9	1,361	2	2,230
Kaliua	1,049	347	1,521	6	2,433

Source: Documents provided by RUWASA Tabora Regional office

(3) O&M cost or equipment

Information on the budget of the Tabora Branch of the Lake Tanganyika Basin Office which is overseeing the O&M of the groundwater development equipment, could not be obtained during either the site surveys or the follow-up survey. Until 2019, the branch's budget was managed by the Kigoma office of the Ministry of Local Government of the President's Office, given the inability to access information from Dodoma, the capital, and Tabora region, the target area, which were visited during the ex-post evaluation. Conversely, it was reported that the equipment was not fully utilized at the time of the ex-post evaluation due to inability to secure sufficient funding to update the software required to use the two-dimensional resistivity survey equipment. Accordingly, it can be said that a lack of maintenance cost affected sustainability. According to the Ministry of Water, the RUWASA has already planned to dispatch IT experts since the management of the office shifted to RUWASA and proceed to respond with an upgrade of software, meaning specific action for future improvement was confirmed.

3.4.4 Status of Operation and Maintenance

In the Tabora region, water shortages in the dry season will seriously impact on the lives of villagers. Accordingly, they themselves are very aware of the importance of the water supply facility and the O&M of the facility is generally effectively maintained as follows:

(1) O&M status of water supply facility

- Level 2 water supply facility

The O&M status of each water supply facility is shown in the Table below. Among four villages where the Level 2 water supply facility was installed, no problems or defects affecting the function of water supply were identified in Isanga, Mabama and Kakola. In Mpumbli, generator faults were repaired three times thanks to support from the RUWASA district office, but the operation was stopped for one year due to the repeated subsequent failures. However, the repair had been completed and water was supplied without any problems at the time of the ex-post evaluation. In addition, leakages of public taps were confirmed at Kakola. Though the valves need to be replaced, funding the repairs was not possible, given the inability to collect the planned water charges due to the water leakage as described above. Accordingly, repair measures must be examined while requesting support from RUWASA.

Table 10 O&M Status of the Level 2 Facility

Isanga	Good condition. There have been no problems which affect water supply.
Mpumbli	Good condition. However, the operation was stopped till a month before the site survey was conducted during the ex-post evaluation because the water was improperly pumped due to a generator failure. The generator has already been fixed thanks to support from the district office. It was later confirmed that the facility was being utilized without issues in a follow-up survey conducted by the local associate.
Mabama	Good condition. There have been no problems affecting the water supply.
Kakola	The battery is aging and sometimes stops working, in which case water is supplied using the battery of the village. In addition, water leaks from all public taps cause a mismatch in revenue received compared to the amount of water supplied.

Source: Interviews to each COWSO members

- Level 1 water supply facility

The utilization rate of the Level 1 water supply facilities installed in this Project was good and about 95%. While water supply facilities were used in the dry season because the neighbouring water sources had dried up, villagers also used nearby traditional water sources during the rainy season. Thus, it was confirmed that the use of the facilities differed between dry and rainy seasons in some villages. This is due to the fact that the water charges were waived for those not using the water supply facility and that there was a widespread lack of hygiene awareness. Regarding the facilities inspected during site visits, two cases involving theft of pump heads and handles in the

Uyui district as well as some facilities where water could not be pumped due to wear of rubber were confirmed. In addition, the installation of a fence around the water supply facilities to keep livestock away and secure hygiene conditions was proposed at the defect inspection survey conducted one year after the project completion. However, at the site survey, it was confirmed that the fence had only been installed in a few facilities[32]. According to interview surveys with villagers and RUWASA district offices, although no damage from domestic animals was reported, the RUWASA Tabora regional office is thinking of reminding COWSOs to install fences to maintain hygienic conditions.

The major O&M of the Level 1 water supply facility comprised simple works such as replacing consumables due to wear and tear, inspection of sand clogging, cleaning and so on, most of which were done by COWSO members. Consumables and spare parts were also locally available. Support from the district offices was necessary to replace the pipes and respond to failures that could not otherwise be handled while there were concerns that the RUWASA district offices may be unable to respond quickly due to lack of manpower and transportation means.

(2) Equipment (electromagnetic survey equipment・resistivity survey equipment・GPS)

GPS is used frequently, but the resistivity survey equipment was used only about ten times a year. After being procured, the equipment was used more than 20 times a year until the time of the defect inspection. However, since the budget was insufficient to update the necessary software, old resistivity equipment (only alignment can be grasped in 1D), which was in operation before the new equipment was procured, was used. The resistivity equipment procured in this Project is capable of determining terrain in two dimensions (2D), which was impossible with the old model. Since the equipment provided by the Project is the only 2D-based equipment available in the country, an action must be taken as soon as possible.

(3) Effects generated by implementing a soft component: Contribution to sustainability

In this Project, technical assistance (soft component) on “O&M of water supply facilities” was carried out to ensure the effects of the Project could be sustained. Regarding the contribution and challenges involved in supporting the capacity to maintain and manage water supply facilities, COWSO members and staff of the RUWASA Tabora regional offices made the following comments:

- Contribution to the community-based O&M of water supply facilities

COWSOs were formed at all target villages through the activities of the soft component. After

[32] According to the RUWASA Tabora regional office, fences installed by COWSO after receiving the proposal at the defect inspection survey were made of wood and often subsequently rotted. In future, RUWASA is planning to remind COWSOs of the need to install fences.

water supply facilities were installed, collection and management of water charges which was not done before, the O&M such as necessary repairs and so on have been conducted mainly by COWSOs, which can be explained as effects of the soft component. However, three years after establishment, the number of COWSOs where the activities start to stagnate has been also increasing at the time of the ex-post evaluation. Therefore, it can be said that the follow up by RUWASA to implement continuous activities in the future is necessary.

- Improvement of community support mechanism by local authorities

Each RUWASA district office has staff members to communicate with COWSOs and handle sanitation. Many also have experience and have been involved in implementing trainings for COWSOs under this Project. Monitoring of the O&M status of water supply facilities and follow -up on COWSO activities were conducted by leveraging this experience. After completion of the project and also at the time of the ex-post evaluation, though the actual number of visits was limited due to a lack of transportation means and staff, routine communications were made via phone, etc. In case any serious issues or concerns occurred, the district offices staff members visited the sites and took appropriate measures.

- Improvement of a system for awareness of health and hygiene on “water and hygiene” within target communities

In interview surveys conducted at the site survey, the villagers answered that training under this Project helped deepen their understanding of the importance of using safe water and insights into its impact on health. According to each RUWASA district office, the villagers were unaware of all the types of waterborne diseases and prevention methods as well as the harm to health caused by groundwater fluorine. However, the villagers understood that using water from the water supply facilities installed in this Project would alleviate issues like abdominal pain, reflecting their understanding of the importance of using safe water as learned in training. Conversely, some villagers still reportedly used traditional water sources in rainy season as described above. According to staff from the RUWASA district office and COWSO members, the knowledge gained through awareness-raising activities could not be completely understood in one or two training sessions, and it is hoped that RUWASA will continue to conduct hygiene training at the required timing and frequency.

As described above, some minor problems have been observed in terms of the institutional/organizational and financial aspects as well as current status of O&M. Therefore, sustainability of the Project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This Project was implemented to increase the population served of the water supply and the water supply coverage in the Tabora region of Tanzania by constructing water supply facilities and procuring equipment, thus helping improve the living environment of the target areas. Its purpose is in line with the development policy and sector plan of Tanzania, which emphasizes efforts to improve access to safe water in rural areas and the need to develop water supply facilities, in addition to Japanese aid policy. Accordingly, the relevance of the Project is high. Both the project cost and period were within the plan, thus the efficiency of the Project is also high. The water supply facilities constructed in this Project have significantly increased the population served of water supply and water supply coverage in the target areas, as well as reducing the cost to purchase water. The incidence of waterborne diseases has also declined due to the use of clean water. Reducing the time of fetching water has boosted the amount of agricultural activity women can do and helped improve their lives. In addition, despite some issues, the COWSOs established through this Project are involved in community-based O&M of water supply facilities and so on, so the effectiveness and impact of this Project are high. In terms of sustainability, however, some minor problems have been confirmed in institutional/organizational and financial aspects as well as maintenance status. The problems include a shortage of personnel to monitor water supply facilities and COWSOs, and the decreased involvement of COWSOs in O&M and water charge collection work. Accordingly, the sustainability of the Project effects is fair.

In light of the above, this Project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Recommendation to RUWASA

・ Water tariff collection for Level 1 water supply facilities is declining and RUWASA says it is considering applying a pay-as-you-go system to Level 1 water supply facilities in future, like that applied for Level 2 water supply facilities. Conversely, villagers who remain reluctant to pay water charges at present, or who are not fully aware of the importance of accessing to clean water, may rely more frequently on traditional water sources. When considering changes to the collection system, RUWASA is considering setting rates and awareness-raising activities conducted under the soft component of this Project. Continued follow-up work is required to bring home to residents the importance of using sanitary water.

Recommendation to COWSO and RUWASA

・ More and more COWSOs have changed the system for collecting water charges for Level 1 water supply facilities from regular collection to collection on an as-required basis. There is

concern that the system of collecting fees when failure occurs and responding to them on a case-by-case basis is likely to take some time to repair and restart, and that villagers may not be able to obtain safe water during this period. Accordingly, it is desirable for COWSOs to set aside certain reserves so that they will always have a system in place to respond quickly in the event of a breakdown. RUWASA will need to take follow up actions such as explaining to COWSOs about the importance of reserve fund and a regular fee collection system to secure such a fund.

Recommendation to the Tabora Branch of Lake Tanganyika Basin Office

・ With regard to the procured resistivity survey equipment, despite the acknowledged needs, the software has not been fully updated and utilized due to lack of budget. The equipment provided by this Project is the only 2D-based survey equipment available in the country and is particularly urgently needed in Tabora region, where aquifer identification and borehole drilling are considered difficult. Although RUWASA is already in the process of arranging an IT person to verify the necessary information to secure the budget, the software will need to be regularly updated, not just this time. Therefore, it is advisable that the Tabora Branch of the Lake Tanganyika Basin Management Office confirm the frequency and amount of updates required as soon as possible and report back to RUWASA to receive the necessary budget allocations for continued use.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

・ Selection of core members of the community organization considering sustainability

In this Project, COWSOs overseeing the O&M of water supply facilities and the collection and management of water charges were formed and COWSO members comprising five to eight persons were selected at that time. Subsequently, a few cases in which COWSOs did not accumulate and deposit the collected money properly were confirmed. The villagers explained that COWSO members did not clarify the usage or manage the funds properly. It was also pointed that the selection process and criteria for members were not sufficiently clarified at the time of establishment, underlining the need for careful selection of members after properly explaining the significance of the proper organizational management when selecting members. In future, if there is a need to select members of community organization as part of the project, it will be preferable to select members by clarifying the selection criteria and adopting a fair and transparent selection process.

・ Flexible response considering the achievement of the output

Since the ground is mostly comprised of base rock in the Tabora region, it was regarded as a very difficult area to drill boreholes technically. In fact, the success rate of the initial stage of drilling boreholes under this Project was very low and there were concerns over whether the planned number of boreholes could be drilled within the assumed period. During this Project, however, it was possible to achieve the planned output within the period through a flexible approach by relocating the boreholes drilled and revising the success criteria (water quality/quantity), while taking the impacts on the whole target area and on the project stakeholders into consideration. In cases where the output was not expected to be achieved as planned, it is desirable for the related stakeholders to carefully examine the effects caused by the change of plans and respond with required changes swiftly and flexibly toward the realization of ultimate effects of the project.

The Republic of Zambia

FY2019 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Groundwater Development in Luapula Province (Phase 1, 2, 3)"

External Evaluator: Hideyuki Takagi, Ernst & Young ShinNihon LLC

0. Summary

The project was implemented in the rural area of Luapula Province, the Republic of Zambia, where the rate of access to safe water was especially low in the country. The objective of this project is to increase the water supply population by constructing water supply facilities centering on deep wells, thereby contributing to the improvement of water supply and sanitation in the target area.

The relevance of the project is high as the implementation of the project has been sufficiently consistent with the development plan and development needs of Zambia as well as with Japan's ODA policy. The outputs of the project, deep wells with hand pumps and piped water supply facilities, were almost as planned, and both the project costs and project period were within the plan. Therefore, efficiency of the project is high. In many communities in the target area of the project, the population with a safe water supply has increased, and as such the residents no longer suffer from waterborne diseases. In communities where it is now easier to fetch water, the noted effects have reduced danger and physical burden associated with transporting water and improved hygiene resulting from an increase in the amount of water used. As the project has achieved its objectives to some extent, the effectiveness and impacts of the project are fair. As for sustainability, there are some problems in terms of institutional and technical aspects in the operation and maintenance of this project. With regards to institutional aspects, a failure to sustain operation and maintenance (O&M) in the villages has caused deep wells with hand pumps to become inoperable. As for technical aspects, it has been difficult to secure spare parts in some districts in the project area, and there are problems with the O&M of chlorination in the piped water supply facilites. Some minor problems have been observed in terms of institutional/organizational and technical aspects. Therefore, the sustainability of the effects of the project is fair.

Considering all of the above points, this project is evaluated to be satisfactory.

1. Project Description

Figure 1. Project Locations

Photo 1. Many women and children gathering at a deep well in the morning to fetch water (Chabala Village, Mansa District)

1.1 Background

The rate of access to safe water in Luapula was the lowest of all nine provinces in Zambia. It was only 17% in 2007 when planning took place for the 1st phase of this project, and remained at 23% upon planning for the 3rd phase, which was still less than half of the national average for rural areas. Drinking unsanitary water caused high incidence of waterborne diseases, and fetching water was a heavy physical burden and time burden for women and children. Under these circumstances, providing a stable supply of safe water to local residents became an urgent issue in solving these problems.

The Zambian government aimed to improve access to safe water by positioning "water supply and sanitation" as a priority area in its *Fifth National Development Plan (2006-2010)* and its *Sixth National Development Plan (2011-2015)*. In its *National Rural Water Supply and Sanitation Program (2006-2015)*, the Ministry of Local Government and Housing (hereinafter referred to as the "MLGH") of Zambia set forth a program goal of raising the water supply rate in rural areas from 37% (national average as of 2006) to 75% by 2015.

Against this backdrop of government policy, the Zambian government requested Japan to provide a grant aid project for improving the rate of access to safe water in Luapula Province. After a basic design study in 2007, the 1st phase of this project was launched in 2008, under which water supply facilities were constructed in the rural area of Luapula Province, covering all seven districts of the province (Chienge, Nchelenge, Kawambwa, Mwense, Mansa, Samfya and Milenge). Starting from the 2nd phase, the project covered four districts (Nchelenge, Mwense, Mansa, and Milenge), with the three remaining districts excluded due to the African Development Bank providing support for local water supply to those districts. To further improve the rate of access to safe water, the project was implemented across three phases until its completion in August 2016.

1.2 Project Outline

The objective of this project was to increase the water supply population in the rural area of Luapula Province, Zambia, by constructing water supply facilities centering on deep wells, thereby contributing to the improvement of water supply and sanitation in the target area.

Grant Limit / Actual Grant Amount	1st phase: 641 million yen, 2nd phase: 712 million yen, 3rd phase: 858 million yen / 1st phase: 641 million yen, 2nd phase: 686 million yen, 3rd phase: 845 million yen
Exchange of Notes Date / Grant Agreement Date	1st phase: February 2008 (Detail planning and soft components), July 2008 (Construction and soft components), 2nd phase: June 2011, 3rd phase: September 2014 / 1st phase: N/A, 2nd phase: June 2011, 3rd phase: September 2014
Executing Agency	Ministry of Water Development, Sanitation and Environmental Protection (Ministry of Local Government and Housing prior to the central government reform in January 2017)
Project Completion	1st phase: August 2010, 2nd phase: May 2013, 3rd phase: August 2016
Target Areas	1st phase: all 7 districts in Luapula Province (Chienge, Nchelenge, Kawambwa, Mwense, Mansa, Samfya and Milenge), 2nd and 3rd phase: 4 districts (Nchelenge, Mwense, Mansa, and Milenge)
Main Contractor	1st - 3rd phases: Nissaku Co., Ltd.
Main Consultant	1st - 3rd phases: Japan Techno Co., Ltd.
Basic Design and Preparatory Survey	1st phase: November 2006 - August 2007 (Basic design study), 2nd phase: June 2010 - June 2011 (Preparatory survey), 3rd phase: December 2014 - September 2016 (Preparatory survey)
Related Projects	Technical assistance: The Sustainable Operation and Maintenance Project for Rural Water Supply (SOMAP) 1st phase (2005-2007), 2nd phase (SOMAP 2, 2007-2010), The Project for Support in National Roll-out of Sustainable Operation and maintenance Programme (SOMAP 3, 2011-2016) Plan International: Construction of deep wells and capacity development in Luapula Province (Grant aid, 2006-2011) African Development Bank: Construction of Water and Sewerage Infrastructure in Luapula Province (part of the Integrated Small Towns Water Supply and Sanitation Program in Western, Luapula, Muchinga and Northern Provinces) (Loan, 2007-2013) UNICEF: WASHE Support Programme (Grant aid, 2008-2010),

	Construction of deep wells in Luapula and Northern Provinces (Grant aid, 2012-2014)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hideyuki Takagi, Ernst & Young ShinNihon LLC

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted according to the following schedule.

Duration of the study: July 2019 - July 2020

Duration of the Field Study: October 15 - December 8, 2019, February 8 - 16, 2020

3. Results of the Evaluation (Overall Rating: B[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Consistency with the Development Plan of Zambia

3.1.1.1 Consistency with the National Development Plan

The National Development Plan of Zambia aims to improve access to safe water, positioning "water supply and sanitation" as a priority area at the time of both the ex-ante and the ex-post evaluation. At the time of the ex-ante evaluation of the 1st and 2nd phases of the project, the *Fifth National Development Plan (2006-2010)* indicated a plan for the "water supply and sanitation" sector, which set a goal of increasing access to sustainable water supply for all people by 2030 from 86% in urban areas and 37% in rural areas as of 2000. In addition, the plan for the "water supply and sanitation" sector in the *Sixth National Development Plan (2011-2015)* at the time of the ex-ante evaluation of the third project set a goal of increasing the safe water supply to 75% by 2015. At the time of the ex-post evaluation, the *Seventh National Development Plan (2017-2021)* continued to position "water supply and sanitation" as a priority area in the "human development" policy agenda. It included a strategy for improving inadequate water supply and sanitation that have caused waterborne diseases, emphasizing the importance of access to clean and safe water and sanitation facilities in both urban and rural areas.

3.1.1.2 Consistency with the Sector Development Plan

At the time of both the ex-ante evaluation and the ex-post evaluation, the executing agency's development plan promoted the improvement of water supply access in rural areas. At the time of the ex-ante evaluation, the MLGH set forth the goal of increasing the rural water supply rate from 37% (national average in 2006) to 55% by 2010 and 75% by mid-2015 as part of its *National Rural*

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[2] ③: High, ②: Fair, ①: Low

Water Supply and Sanitation Program (2006-2015). At the time of the ex-post evaluation, the Ministry of Water Development, Sanitation and Environmental Protection (hereinafter referred to as the "MWDSEP") set goals for access to drinking water for the rural population in its *2018-2021 Strategic Plan*, setting the targets of 70% with access to (clean and safe) basic drinking water[3] and 40% with access to safely managed drinking water[4] based on an understanding that the rate of access to improved drinking water in rural areas was 56% as of 2015.

In light of the above, the project has been highly relevant to the country's development plan both at the time of the ex-ante and the ex-post evaluation.

3.1.2 Consistency with the Development Needs of Zambia

In Luapula Province, the target area of the project, the rate of access to safe water was the lowest of all 10 provinces in Zambia. As it was less than half the national average for rural areas, there was a need to reduce waterborne disease and make it easier for women and children to fetch water.

3.1.2.1 Improvement of Access to Safe Water

At the time of the ex-ante evaluation, the rate of access to safe water in Luapula Province was 17% upon planning for the 1st phase (2007) and 23% upon planning for the 2nd phase (2010) and 3rd phase (2012) of the project. At the time of the ex-post evaluation, the rate of access to safe water was 56.9% (64% in urban areas and 54% in rural areas) according to the executing agency, indicating that it is necessary to continue to improve the access rate.

3.1.2.2 Reduction of Waterborne Disease

In Luapula Province, the rate of access to safe water was low, and people relied on surface water (rivers, lakes) and shallow wells in many villages despite such water not suitable for direct drinking. As such, there have been problems with waterborne diseases (such as diarrhea). The incidence of diarrhea in Luapula Province was 7.9% in 2009 (before the completion of the 1st phase), and 8.4% in 2018 according to the latest available data at the time of the ex-post evaluation, indicating that there was no improvement in the incidence of diarrhea. Therefore, there is still a need to improve the quality of drinking water. (Refer to "Quantitative Impact Indicators" for details)

3.1.2.3 Mitigating the Burden of Fetching Water

The task of fetching water from remote water sources such as rivers and lakes has mainly been

[3] Basic water supply by pipes, deep wells, protected shallow wells and/or springs, rainwater (improved water source). Less than 30 minutes for fetching water including round trip and waiting time.
[4] A well-managed water supply service with improved water sources, on-site, available when needed, free of fecal and priority chemical indicators.

the role of women and children. Because fetching water is a hard work, it presented a physical burden, and had negative impact on employment and attending school. As mentioned above, at the time of the ex-post evaluation, it was still necessary to improve the access rate to safe water in Luapula Province. It was also confirmed through interviews with residents during site inspections that there were many people who must travel long distances to fetch water from rivers and lakes. There is still a need to make it easier for these local residents to fetch water.

In light of the above, the project has been highly relevant to the country's development needs both at the time of the ex-ante and the ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

The project was consistent with Japan's ODA policy described below in the preliminary stages.

Country Assistance Policy: As part of its *Country Assistance Policy for Zambia (October 2002)*, the Japanese government planned to provide support in improving access to safe water as part of "enhancing cost-effective healthcare services," one of the priority areas and task-based assistance policies. Specifically, the policy stated that "Since safe water supply is indispensable for the prevention of cholera and other infectious diseases, water supply facilities should be developed and installed to improve the public health of the poor, with due consideration to the environment. Japan will consider ways to support the improvement of facility maintenance and management capacity through the participation of residents."

The project has been sufficiently consistent with the development plan and development needs of Zambia, as well as with Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The outputs of the project were the construction of deep wells with hand pumps and piped water supply facilities, procurement of hand pump maintenance tools, and consulting services and soft components. The actual outputs were almost as planned.

3.2.1.1 Construction and Procurement

3.2.1.1.1 Deep Wells with Hand Pumps

In the 1st phase of the project, 200 deep wells with hand pumps were planned and constructed and hand pump maintenance tools (81 sets) were planned and provided in rural areas of Luapula Province to cover all seven districts (Chienge, Nchelenge, Kawambwa, Mwense, Mansa, Samfya and Milenge). In the 2nd phase onwards, the project targeted four districts (Nchelenge, Mwense, Mansa, and Milenge), with the three remaining districts excluded due to the African Development Bank providing support for local water supply to those districts. In the 2nd phase, 216 deep wells were planned and constructed. In the 3rd phase, 200 deep wells were planned, and 176 deep wells

were actually constructed.

Table 1. The number of units and water supply population of deep wells with hand pumps

(Unit of the water supply population: Person)

	Plan		Actual		Difference	Target area
	The number of units	Water supply population	The number of units	Water supply population		
1st phase	200	50,000	200	50,000	-	7 districts
2nd phase	216	54,000	216	54,000	-	4 districts
3rd phase	200	50,000	176	44,000	- 6,000	
Total	616	154,000	592	148,000	- 6,000	

Source: Materials provided by JICA

Water supply population: Water supply populations were calculated using the Zambian government benchmark of 250 persons per deep well.

3.2.1.1.2 Piped Water Supply Facilities

In the 3rd phase of the project, piped water supply facilities were constructed in 5 areas in three districts (Nchelenge, Mwense and Milenge), in accordance with the request by the government of Zambia.

Table 2. The number of units and water supply population of piped water supply facilities

(Unit of the water supply population: Person)

	Plan		Actual		Difference	Target area
	The number of units	Water supply population	The number of units	Water supply population		
3rd phase	5	32,000	5	32,000	-	3 Districts

Source: Materials provided by JICA

Water supply population: The populations were calculated based on the projected population of each target village.

The main change in the construction and procurement was a decrease in the number of deep wells with hand pumps in the 3rd phase. The number of facilities was reduced by 24 from the plan due to exchange rate fluctuations during implementation. The effect of the decrease in the number of facilities (total for the three phases) was a decrease of 6,000 persons (3%) in the planned water supply population from approximately 186,000 to 180,000, which was within a range deemed to be insignificant. Despite this change, there were no plan modifications with the potential to affect the project effects.

3.2.1.2 Consulting Services and Soft Components

Consulting services for detailed design and construction supervision of deep wells with hand pumps and soft components for the development and strengthening of the independent operation and maintenance system for the water supply facilities by local residents were implemented almost as planned in all three phases. Support for strengthening the operation and maintenance system

was provided through soft components, including the establishment of the Village Water Sanitation, Health and Hygiene Education Committee (hereinafter referred to as "V-WASHE"), education on safe water use, accumulation and management of maintenance costs, and improvement of the capacity of Area Pump Minders (hereinafter referred to as "APM").

3.2.2 Project Inputs

3.2.2.1 Project Cost

The actual project cost was 2.2 billion yen (98% of the plan) for all three phases, which was within the planned cost. The efficiency of project cost was evaluated by comparing the planned and actual cooperation amounts on the Japanese side in consideration of the fact that the actual cost on the Zambian side could not be confirmed and that the planned amount was only 1% of the total project cost, which does not affect the comparison of the planned and actual project costs.

Table 3. Total planned project cost

(Unit: 100 million yen)

Phase	Japanese side	Zambian side	Total project cost
1st phase	6.41	0.11	6.52
2nd phase	7.12	0.06	7.18
3rd phase	8.58	0.05	8.63
Total	22.11	0.22	22.33
Percentage of total project cost (%)	**99%**	**1%**	**100%**

Source: Materials provided by JICA

Japanese side cost:

The actual project cost on the Japanese side was 98% of the planned amount.

Table 4. Comparison of planned and actual project cost on the Japanese side

(Unit: 100 million yen)

Phase	Plan	Actual	Difference	
			Amount	%
1st phase	6.41	6.41	0	100
2nd phase	7.12	6.86	-0.26	96
3rd phase	8.58	8.45	-0.13	98
Total	**22.11**	**21.72**	**-0.39**	**98**

Source: Materials provided by JICA

Zambian side cost:

Although the amount of the actual project cost on the Zambian side could not be confirmed by the executing agency, it is assumed that expenditures were made almost as planned since the project was implemented as planned. The project cost on the Zambian side was planned to include expenditures for the staff of the District Water Sanitation, Health and Hygiene Education Committees (hereinafter referred to as "D-WASHEs") for site surveys, construction supervision

and inspection, as well as soft component expenses and fee payments.

3.2.2.2 Project Period

The actual project period for the total of all three phases was 75 months (96% of the plan), which was within the planned period. The following tables are comparisons between the planned and actual project period by phase and process.

Table 5. Planned project period

Phase	Detailed design	Bidding / contract	Construction	The number of months
1st phase	4 months	4 months	24 months	32 months
2nd phase	6 months	3 months	15 months	24 months
3rd phase	6 months	3 months	13 months	22 months
Total				**78 months**

Source: Materials provided by JICA

Note: The project period starts from detailed design (consultant contract), and the definition of completion is the date that construction was concluded (i.e., the date of the completion of delivery).

Table 6. Actual project period

Phase	Detailed design	Bidding / contract	Construction	The number of months
1st phase	5 months (February - June 2008)	3 months (July - September 2008)	23 months (November 2008 – August 2010)	31 months
2nd phase	4 months (July - October 2011)	3 months (November 2011 – January 2012)	16 months (February 2012 - May 2013)	23 months
3rd phase	3 months (December 2014 – February 2015)	3 months (March - May 2015)	15 months (June 2015 - August 2016)	21 months
Total				**75 months**

Source: Materials provided by JICA

The outputs of the project were almost as planned, and both the project costs and project period were within the plan. Therefore, efficiency of the project is high.

3.3 Effectiveness and Impacts[5] (Rating: ②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

3.3.1.1.1 Operation Indicators

In conducting the ex-post evaluation, the following operation indicator “operating ratio of water

[5] Sub-rating for Effectiveness is assigned in consideration of Impacts.

supply facilities (%)" was set, in addition to the effect indicators set at the time of the ex-ante evaluation, to analyze the achievement of the project effects.

Operating Ratio of Water Supply Facilities (%): At the time of the ex-post evaluation, the operation ratio of the water supply facilities was 70% for deep wells with hand pumps (information was collected for 96% of the 592 units in total), and 100% for piped water supply facilities (all 5 locations are in operation). However, some of the water taps in the pipeline water supply facilities have not been used or use has been low due to competition with deep wells, both those installed as part of this project and otherwise, because of lower operation and maintenance expenses for users.

Table 7. Actual operating ratio of water supply facilities (deep wells with hand pumps)

Phase	Baseline	Actual			
	Planned No. of wells	Actual No. of wells	No. of wells for which information on operation status was obtained	2019	
				No. of operating wells	Operating ratio*1
1st phase	200	200	194	109	56%
2nd phase	216	216	204	152	75%
3rd phase	200	176	173	139	80%
Total	616	592	571	400	70%

Source: The actual No. of operating wells at the time of the ex-post evaluation was calculated by aggregating the information collected through direct confirmation upon site inspection or interviews with APMs or D-WASHE staff in charge of water supply.
*1 The No. of operating wells divided by the No. of wells for which information on operation status was obtained.

The breakdown of inactive deep wells with hand pumps for which information was collected in this study is 42% for India Mark II (71 units/171 units) and 58% for Afridev (100 units/171 units). The non-operation rate of deep wells by hand pump type are 63% for India Mark II (71 units/113 units)[6] and 21% for Afridev (100 units/474 units)[7]. Based on the site inspections and the understanding through interviews with community residents in the field study, the main reasons for the non-operation of the deep wells with hand pumps are considered as the following two factors: "Water quality of deep wells with India Mark II hand pumps (one of the hand pump types)" and "Organizational problems with V-WASHEs (due to lack of awareness of drinking and use of safe water by community residents)."

- Factor 1 "Water quality of deep wells with India Mark II hand pumps": In this project, there are two types of deep wells with hand pumps that were installed: India Mark II and Afridev. India Mark II hand pumps were installed when the depth to the groundwater source was more than a certain level and a lift was required, and Afridev hand pumps were installed when the

[6] Phase 1: 48 units/80 units (60%), Phase 2: 22 units/31 units (71%), Phase 3: 1 unit/2 units (50%)
[7] Phase 1: 37 units/118 units (31%), Phase 2: 30 units/182 units (16%), Phase 3: 33 units/174 units (19%)

depth to the groundwater source was less than the level. In Luapula, India Mark II have been widely used in the target area of the project, however, pumped water often contains excess iron as iron pipes and pump parts such as cylinders react with low pH (acidic) groundwater. In comparison, Afridev uses PVC pipes and stainless-steel pump parts, and the iron content in the pumped water is relatively low as it does not react with acidic groundwater. Considering the characteristics of groundwater quality in the target area, the project prioritized Afridev which is not subject to corrosion due to acidity, over India Mark II as the project progressed through the phases.

When the water pumped from deep wells with India Mark II hand pumps has an iron taste, community residents tend to be reluctant to pay for repairs, which is one of the causes of inactive deep wells. As a result, hand pumps are left unrepaired in many communities, even when only consumables need to be replaced or minor repairs are necessary.

- Factor 2 "Organizational problems with V-WASHEs": An issue that applies to both types of hand pumps is that the willingness of people to pay for operation and maintenance to ensure safe water from deep wells is relatively low in communities where shallow wells are highly convenient, where rivers and lakes are closer than deep wells, and where residents trust the quality of spring water that they have traditionally used. In these communities, there is a lack of consensus among the residents on the cost of repairs, which is a factor contributing to the suspended operation and maintenance activities of V-WASHEs. There are many cases in which hand pumps are left unrepaired and thus inoperable. Regarding the non-operation of deep wells with Afridev hand pumps for which there are no problems with water quality, the main factor for such non-operation is considered to be related to peoples' awareness about drinking and using safe water. In communities with low awareness about drinking and using safe water, V-WASHEs tend to not work, and as such broken hand pumps are not repaired. Although public awareness activities about drinking and using safe water was carried out through the soft components of the project, it is necessary to once again raise awareness about using safe water for hygienic purposes, especially in areas where there are conventional water sources near residential areas and thus no issues related to inconvenience in securing water as described above.

(Refer to the recommendations below for the factors contributing to non-operation and the measures for water quality of deep wells with India Mark II hand pumps)

3.3.1.1.2 Effect Indicators

In the summary of the ex-ante evaluation report, "water supply population (persons)" and "the rate of water supply (%)" were set as effect indicators. A comparison between the targets and actual results of these indicators is as follows. The baseline for the 2nd phase includes an increase in water supply population resulting from support from other donors. Therefore, in order to

comprehensively examine the project effects of all phases, only the increase resulting specifically from this project was used in the comparison, and the rate of achievement of the target was analyzed for both effect indicators.

Table 8. Comparison between targets and actual results for effect indicators

	Baseline	Target	Actual
	2007 - 2013	2020	2019
	At the planning of each phase	4 years after completion of 3rd phase	As of ex-post evaluation
Indicator 1 Increase in water supply population (persons)	N/A (See Table 9)	186,000	137,352
Indicator 2 Increase in the rate of water supply (%)	17	27	24

Source: Materials were provided by JICA for the baselines and targets, and the actual results were calculated based on the information collected through direct confirmation upon site inspection or interviews with APMs or D-WASHE staff in charge of water supply.

3.3.1.1.2.1 Increase in Water Supply Population (Persons)

The rate of achievement of the target of increasing the water supply population was 74% as a result of implementing all three phases of the project. The breakdown by phase is as follows.

Table 9. Comparison between the target and actual increase in water supply population (Breakdown by phase)

(Unit: Persons)

Phase	Plan			Actual	Achievement of target	
	Baseline	Target	Target increase	Actual*2		
	At the planning of each phase	Target year of each phase*1		As of ex-post evaluation	Persons	%
1st phase	162,300	212,300	50,000	40,609	-9,391	81%
2nd phase	247,876	301,876	54,000	48,351	-5,649	90%
3rd phase	302,000	384,000	82,000	48,392	-33,608	59%
Total of increase			**186,000**	**137,352**	-48,648	74%

Source: Materials were provided by JICA for the baselines and targets, and the actual results were calculated based on the information collected through direct confirmation upon site inspection or interviews with APMs or D-WASHE staff in charge of water supply.

*1 The target year for the 1st and 2nd phases of the project is the year of completion (2010 for the 1st phase and 2013 for the 2nd phase), four years after completion (2020) for the 3rd phase. The same applies hereinafter.

*2 The actual water supply population of the deep wells with hand pumps is the estimated total water supply population calculated based on the actual 96% of the installed deep wells for which information was collected. The actual figure for piped water supply facilities is based on the results of information collected at all five locations. The number of beneficiaries was calculated by multiplying the number of households confirmed through interviews by the average household size in rural areas (5.2 persons/household. Source: 2015 Living Conditions Monitoring Survey, Central Statistical Office of Zambia).

As for the breakdown of the rate of achievement by type of water supply facility, deep wells with hand pumps was 87% (indicating the achievement of the actual output of 592 units for the purpose of factor analysis)[8] and piped water supply facilities was 29%.

- Deep wells with hand pumps: Compared with the operating ratio of water supply facilities rate of 70%, the rate of increase in the water supply population is relatively high at 87%. Factors contributing to this relationship between these ratios are considered to be as follows: (1) There is a difference between the target set for water supply population and actual demand as the target was set using the Zambian government's benchmark (250 people / deep well) instead of the demand population in each target area (refer to the lessons learned below for the setting of target of water supply population), and (2) There are areas where the demand population is significantly higher than the benchmark (especially in Nchelenge District; see Table 10 below). In those areas where demand exceeds supply, many people still fetch water from traditional water sources (i.e., lakes and rivers) even after the project was implemented. Low utilization rates of deep wells with hand pumps (especially 27% in Samfya District) and difference in the size of the demand population are considered to be the factors for low rates of achievement for water supply population targets in certain districts.

Table 10. Breakdown of the increase in water supply population in target districts
(Deep wells with hand pumps)

(Unit: Persons)

District	Target	Actual	Achievement of target
Chienge	5,750	5,902	103%
Nchelenge	34,500	42,460	123%
Kawambwa	9,000	10,592	118%
Mwense*1	27,750	21,745	78%
Mansa	29,500	18,588	63%
Samfya	6,500	2,522	39%
Milenge	29,750	21,770	73%
Total	142,750	123,580	87%

Source: Materials were provided by JICA for the targets, and the actual results were calculated based on the information collected through direct confirmation upon site inspection or interviews with APMs or D-WASHE staff in charge of water supply. Both targets and actual figures are based on 96% of the installed deep wells for which information was collected. The basis of calculation is actual outputs, which does not include 24 units that did not achieve the plan in the 3rd phase.

*1 Information on the actual number of users could not be obtained for Mwense District and some of the project sites in other districts. For sites for which no information was obtained on the actual number of users, estimates were calculated using the Zambian government's benchmark of 250 users per deep well.

[8] Achievement based on the total 616 planned deep wells with hand pumps is estimated at 83%.

Table 11. Breakdown of deep wells with hand pumps used by over 200 households

(Unit: Households, Persons)

District	Project site	Approximate number of households	Approximate number of beneficiaries*1
Chienge	Yakobo Village	230	1,196
Nchelenge	Kaseka Village	200	1,040
	Kafutuma clinic	200	1,040
	Mutono Village (1)	200	1,040
	Seketeni Village	200	1,040
	Luswili Village	240	1,248
	Shimutambala Village	250	1,300
	Chofwe Mulenga Village	250	1,300
	Kapepele Village	250	1,300
	Mukanda Village	300	1,560
	Mfundawula	200	1,040
	Chula	200	1,040
	Sekeleti	200	1,040
Kawambwa	Kasawo	200	1,040
	Mbilima	215	1,118
	Munasha/Malitti	350	1,820
	Musungu Yambala	250	1,300
Mwense*2	Information was not obtained	-	-
Mansa	N/A	-	-
Samfya	N/A	-	-
Milenge	N/A	-	-

Source: Information collected through direct confirmation upon site inspection or interviews with APMs or D-WASHE staff in charge of water supply.

*1 Approximate numbers of beneficiaries were calculated by multiplying the number of households confirmed through interviews by the average number of households in rural areas (5.2 persons/household) as per the 2015 Living Conditions Monitoring Survey (Central Statistical Office of Zambia).

*2 For Mwense District, information on the actual number of users could not be obtained for many project sites.

- Piped water supply facilities: The situation varies by facility. It was confirmed that the actual water supply population in Nchelenge District is lower than the target due to the following reasons observed upon site inspection: there are unused public taps because the operation and maintenance costs are higher than that of nearby deep wells, and some households use alternative water sources during seasons in which there is low water volume from public taps. In the case of Mwense District, the population density assumption for the target area as of planning appears to be too high (especially for Musungu and Kapakala). In contrast, in Milenge District, the actual water supply population exceeds the target because the water supply facility was constructed at the densely populated center of the district.

Table 12. Breakdown of the increase in the water supply population by district
(Piped water supply facilities)

(Unit: Persons)

District / Project site	Target	Actual	Achievement of target
Nchelenge / Kabuta	3,267	2,154	66%
Mwense:	27,291	5,460	20%
Kapala	4,493	1,560	35%
Musangu	11,541	2,080	18%
Kapakala	11,257	1,820	16%
Milenge / Milenge	1,233	1,586	129%
Total	31,791	9,200	29%

Source: Information collected through direct confirmation upon site inspection or interviews with D-WASHE staff in charge of water supply.

3.3.1.1.2.2 Increase in the Rate of Water Supply (%)

By implementing all three phases of the project, 70% of the targeted increase in water supply rate in Luapula Province was achieved. The relationship between the project's contribution to increasing the water supply rate and the total population of the province are as follows.

Table 13. Comparison between target and actual water supply rate
(Contribution of the project)

(Unit: %, Persons)

Phase	Baseline	Target	Actual		Achievement of target
	Base year	Target year	As of ex-post evaluation	Increase	
Rate of water supply	**17.0%**	**27.2%**	**24.1%**	7.1%	70%*3
Basis of calculation:					
Water supply population	162,300	348,300	299,652*1	137,352	
Population in the province	954,706	1,279,587	1,245,682*2	290,976	

Source: Materials were provided by JICA for the baselines and targets, and the actual results were calculated based on the above water supply population.
*1 Calculated by adding the above-mentioned actual to the baseline (the impact of factors other than those related to the project on the water supply population were not considered).
*2 Population as of 2019 estimated by the Central Statistical Office of Zambia
*3 Calculated by dividing the actual increase of 7.1% by the target of increase of 10.2%

Reference: Overall water supply rate including the effects of other donor projects

The overall water supply rate in Luapula Province including the effects of other donor projects was around 60% as of the ex-post evaluation according to the executing agency's understanding of the situation. Compared to the time before the project, it means that the overall water supply rate has increased by 40%. Unlike the fact that the actual water supply rate of the "Contribution of the

project" above is based on the number of operating water supply facilities and the number of actual users at the time of this ex-post evaluation, the overall water supply rate indicates the figure based on the number of water supply facilities installed and the benchmark of 250 users per deep well. Therefore, it is assumed that the overall water supply rate would be lower in the case of lower operating ratio of water supply facilities installed by other donor projects.

Table 14. Comparison of targets and actual of water supply rate
(Including the effects of other donor projects)

(Unit: %, Persons)

Phase	Baseline	Target	Actual	Increase
	Base year	Target year	As of ex-post evaluation	
Rate of water supply	17.0%	30.0%	56.9%*1	40.0%
Basis of calculation:				
Water supply population:	162,300	383,876	708,793*2	546,493
Other than this project	162,300	35,576*3	571,468*2	409,168
This project	—	186,000	137,352	137,352
Population in the province	954,706	1,279,587	1,245,682*4	290,976

Source: Materials were provided by JICA for the baselines and targets, and the actuals were calculated based on the above-mentioned water supply population.
*1 The overall water supply rate in Luapula Province as of the ex-post evaluation according to the executing agency's understanding of the situation.
*2 Estimated water supply population is calculated based on the overall water supply rate, population and the contribution of the project to the water supply rate. (The total water supply population is the population in the province multiplied by the rate of water supply. The water supply population by other than this project is the figure obtained by subtracting the water supply population by this project from the total water supply population.)
*3 Difference between the target of Phase 1 and the baseline of Phase 2
*4 Population as of 2019 estimated by the Central Statistical Office of Zambia.

3.3.1.2 Qualitative Effects (Other Effects)

In the summary of the ex-ante evaluation report for each phase, qualitative effect indicators were set as follows: "decrease in cases of waterborne diseases" and "increase in employment opportunities for women and educational opportunities for children by making it easier to fetch water" in the 2nd phase, and "hygiene awareness," "convenience" and "adaptation to climate change" in the 3rd phase (there were no qualitative effect indicators set in the 1st phase). In conducting the ex-post evaluation, these indicators set at the time of planning were sorted into qualitative effect indicators and qualitative impact indicators from a logical standpoint of how the project effects were achieved. "Improvement in the quality of drinking water" and "increase in the volume of water used" were set as qualitative effect indicators and analyzed. The situation with regards to these indicators as of the ex-post evaluation was as follows.

3.3.1.2.1 Improvement in the Quality of Drinking Water

The beneficiaries corresponding to the actual water supply population (137,352 beneficiaries, 74% of the target) drink and use safe water from the water supply facilities constructed under this project. Conventional water sources used by most of the beneficiaries were shallow wells, rivers and lakes. According to interviews with residents during site inspections, people were infected with oral cholera, bacillary dysentery, typhoid fever, amoebic dysentery and hepatitis A as a result of drinking and using water from conventional water sources. There were also cases of schistosomiasis caused by bathing in rivers. Users of water from facilities said that improvements in the quality of drinking water have eliminated these waterborne infections.

- Deep wells with hand pumps: For 67% of deep wells for which information was collected (380 units out of the 571 units), which corresponds to 95% of active deep wells, drinking water from the deep wells no longer causes users to be infected with waterborne diseases. The breakdown of deep wells for which no improvement in the quality of drinking water was observed is as follows: out of 571 deep wells for which information was collected, 30% (171 units) are not in operation, 1% (8 units) do not provide drinkable for reasons such as iron etc., and no information on drinking water quality was collected in the survey for 2% (12 units).
- Piped water supply facilities: According to interviews with residents during site inspections, approximately 9,000 persons actually served by water supply facilities constructed under the project have been free from waterborne diseases as a result of drinking safe water.

The water quality examinations for the water supply facilities have been conducted as follows:

- Deep wells with hand pumps: At deep wells installed in health centers, water quality examinations are conducted (although not regularly) by health centers using test kits (no problems related to hydrogen sulfide are identified unless the reagents turn black). In the majority of deep wells other than them, water quality examinations (examination items: pH, color and coliforms) are conducted by environmental health technicians with the Ministry of Health when there is a danger of cholera or typhus epidemics.
- Piped water supply facilities: In Nchelenge and Mwenese Districts, the Luapula Water Supply and Sewerage Company (hereinafter referred to as “LpWSCO”) monitors water quality. It sends samples to a laboratory in Lusaka Capital City every week for water quality examination (examination items: pH, color, conductivity, total dissolved solids, turbidity, total coliforms and fecal coliforms.) On the other hand, the water supply facility in Milenge has not received technical support nor tested water quality since LpWSCO is not located in the district.

3.3.1.2.2 Increase in the Volume of Water Used

For almost half of the actual population of beneficiaries, the distance to water supply facilities is shorter than that for conventional water sources; therefore, it has become easier for these

beneficiaries to fetch water. On average, the distance to the water supply facility is less than 500 m and the time it takes to fetch water is less than 30 minutes. According to interviews with users of water supply facilities in these communities, the amount of water used by household has increased by a factor of two to three times (the extent of the increase depends on the degree to which it is easier to fetch water (reduction of distance)).

- Deep wells with hand pumps: In 45% (259 units) of communities for which information was gathered, it has become easier to fetch water (this percentage represents communities where the average distance to traditional water sources is greater than the average distance to water supply facilities). In 51% (289 units) of communities with deep wells, it has not become easier to fetch water as there are conventional water sources such as shallow wells near residential areas. For the remaining 4% (22 units), information on conventional water sources was not obtained during the survey.
- Piped water supply facilities: While the situation varies for each of the five facilities, there are generally conventional water sources near residential areas, except for Kapakala in Mwense District. Therefore, the project is deemed to have not had a major effect in making it easier to fetch water.

3.3.2 Impacts

3.3.2.1 Intended Impacts

3.3.2.1.1 Quantitative Impact Indicators

There were no quantitative impact indicators set in the project summary of the ex-ante evaluation report. Therefore, a quantitative impact indicator was set and analyzed in conducting the ex-post evaluation. The impact indicator of "reduction of waterborne diseases (%)" was set based on the fact that "decrease in cases of waterborne diseases" was set as a qualitative effect indicator in the summary of the ex-ante evaluation report for the 2nd phase of the project. Analysis was conducted with regards to data on the incidence of diarrhea that was obtained during the field study for the ex-post evaluation. The situation at the time of the ex-post evaluation was as follows.

Table 15. Comparison between baseline and actual results for the quantitative impact indicator

	Baseline	Target	Actual
	2009	2020	2018
	Before completion of the 1st phase	4 years after completion of the 3rd phase	As of ex-post evaluation
Reduction of waterborne diseases (%)	7.9	N/A	8.4

Source: The baseline was calculated based on the diarrhea incidence in 2009 by the Ministry of Health and population statistics as of 2010. The actual figure was calculated based on the incidence of diarrhea in 2018 according to the Ministry of Health and the population as of 2019 estimated by the Central Statistical Office of Zambia. (The data for the diarrhea incidence in 2019 was not obtained during the survey, which was conducted prior to the end of the year). See Table 16 for the incidence of diarrhea in each district in Luapula Province.

3.3.2.1.1.1 Reduction of Waterborne Diseases (%)

As noted with regards to the qualitative effect of "Improvement in the Quality of Drinking Water," the beneficiaries corresponding to the actual water supply population (estimated to be approximately 137,000 people) do not suffer from waterborne diseases as a result of drinking water from the water supply facilities constructed as part of the project. The number of beneficiaries is equivalent to around 11% of the population of Luapula Province at the time of the ex-post evaluation. The project has been effective against the incidence of waterborne diseases, and the rate of water supply has improved due to the increase in water supply facilities, including those constructed through support from other donors. On the other hand, the data on the rate of diarrhea incidence in Luapula Province indicate that the rate of infection has not changed (or has slightly worsened) from 7.9% in 2009 before the completion of the 1st phase to 8.4% at the time of the ex-post evaluation (2018 data). From the viewpoint of the executing agency, it is assumed that there are still many people who continue drinking unsafe water from conventional water sources despite the increase in the number of water supply facilities.

Table 16. Comparison between the incidence of diarrhea and the rate of water supply in Luapula Province (Reference)

(Unit: %)

District*1	Incidence of diarrhea			Water supply rate as of 2018	
	Baseline	Actual	Change	Urban	Rural
Chienge	5.2	5.6	0.4	-	34
Nchelenge	7.0	5.4	-1.6	65	38
Former Kawambwa:	8.7	8.6	-0.1	-	-
Kawambwa	7.0	9.7	2.6	50	49
Mwansabombwe	12.0	6.6	-5.5	-	76
Former Mwense:	7.8	9.9	2.1	-	-
Mwense	7.8	10.7	2.9	80	43
Chipili	7.9	8.0	0.1	-	55
Former Mansa:	8.6	11.0	2.4	-	-
Mansa	7.9	10.9	3.0	70	50
Chembe	14.4	12.1	-2.3	-	75
Former Samfya:	8.8	8.9	0.1	-	-
Samfya	5.1	5.5	0.5	80	88
Chifunaburi	-	-	-	-	50
Lunga	9.5	11.2	1.7	-	29
Milenge	9.6	7.7	-1.9	-	65
Total	**7.9**	**8.4**	0.5	69	54

Source: The source and calculation method of the data on the incidence of diarrhea before and after the project are the same as that for Table 15. The water supply rate is based on materials provided by the executing agency (2018 Annual Strategic Bulletin). "-" indicates that the data is not applicable or that there is no data.

*1 Administrative divisions were reorganized in 2016. Underlined districts have been newly established as a result of reorganization after the implementation of this project.

3.3.2.1.2 Qualitative Impact Indicators

The qualitative effect indicators were arranged from those in the summary of the ex-ante evaluation report of this project and set as follows for evaluation analysis: “increase in opportunities (or time) for education and employment (by making it easier to fetch water)” and “improvement in hygiene practices (due to an increase in the volume of water used).” The situation regarding these indicators at the time of the ex-post evaluation is as follows.

3.3.2.1.2.1 Increase in Opportunities (or time) for Education and Employment (by Making it Easier to Fetch Water)

As noted with regards to the qualitative effect of “increase in the volume of water used,” it has become easier to fetch water for roughly half of the actual population of beneficiaries. According to interviews with the beneficiaries, making it easier to fetch water has mainly resulted in the benefits of reducing danger and the physical burden of transporting water.

Regarding the increase in opportunities (or time) for education and employment, children in communities where it has become easier to fetch water are now able to go to school on time in the morning and study hours have increased. At Kafuula Community School in Mansa District (Photo 2), for example, students no longer need to fetch water (which takes approximately 1 hour to and from a river 1 km away from the school) before class in the morning; , class hours are longer than before as it starts about 30 minutes earlier.

Based on interviews at other schools, an environment was created where children have access to safe water at all times, sufficient water to wash their hands and clean toilets, and girls do not have to be absent during menstruation. This has had a positive effect on academic performance compared to areas where there are problems securing water.

In addition, Kaka Primary School in Kawambwa District was newly established after a deep well with a hand pump was constructed in the community as part of the project. The principal explained that the existence of a deep well was a major factor in selecting the site for construction of the school.

Photo 2. Deep wells with hand pumps installed at schools have contributed to improving learning opportunities and the study environment (Kafuula Community School, Mansa District)

In terms of women's employment, women now have more time to spend on other domestic tasks (childcare, cleaning, washing, etc.), agriculture (mostly self-sufficiency), and selling crops in markets. However, in communities with many user households, both deep wells and piped water supply facilities are often crowded during peak usage hours in the morning and evening. Since there are long wait times (e.g., more than one hour), the effect of shortening the time required to fetch water has not been achieved in many cases. Taking these aspects into account, the project is deemed to have not had a significant effect on increasing opportunities and time for employment for women since this effect was only achieved for less than half of the actual water supply population.

3.3.2.1.2.2 Improvement of Hygiene Practices (Due to an Increase in the Volume of Water Used)

As described in "Increase in the Volume of Water Used," it is assumed that there has been an increase in the volume of water used by the beneficiaries accounting for half of the actual water supply population for whom it is now easier to fetch water. According to interviews with users of water supply facilities, the volume of water used after the increase is about two to three times more than prior to the project, and the volume of water has increased especially for bathing. With regards to healthcare facilities, an interview was conducted at the Musaila Rural Health Center in Mansa District, where a deep well with a hand pump was constructed as part of this project. For healthcare centers, clean water is indispensable and important for medical treatment, and large quantity of clean water is used especially for childbirth. Clean water is used also for hand washing, cleaning medical instruments, and cleaning and treating wounds. However, before the installation of the water facility, it was difficult for this healthcare center to secure the required amount of water, resulting in hygiene issues in providing medical services. After installation, a necessary and sufficient amount of water has been secured and the amount of water used has increased. Therefore, it was confirmed that an increase in the volume of water used in medical institutions has greatly contributed to improving sanitation.

3.3.2.2 Other Positive and Negative Impacts

3.3.2.2.1 Impact on the Natural Environment

At the time of the ex-ante evaluation, it was concluded that undesirable effects on the environment by the project would be minimal in accordance with JICA's Guidelines for Environmental and Social Considerations (promulgated in April 2010). At the time of the ex-post evaluation, no impact on the natural environment was observed during site inspection and interviews.

3.3.2.2.2 Resettlement and/or Land Acquisitions

At the time of the ex-ante evaluation, there were no problems identified with land acquisition and resettlement. The proposed sites for the construction of the facilities were selected by the Water Management Committee formed by the inhabitants of the target sites in consultation with the Regional Development Committee and reported to the district for agreement. At the time of the ex-post evaluation, it was confirmed during site inspections and interviews that the installation of the water supply facilities was being carried out on communal land; therefore, no acquisition of private land or resettlement has occurred.

3.3.2.2.3 Other Impacts

Other Positive Impacts: According to interviews with beneficiaries, making it easier to fetch water has mainly resulted in the benefits of reducing danger and the physical burden of transporting water. Before the construction of water supply facilities, there was a high risk of encountering dangerous animals (such as poisonous snakes) on the riverside, falling, traffic accidents, and robbery. There were many injuries. The heavy labor of transporting water often resulted in neck pain and injury from falling down. In addition, women could not fetch water during pregnancy, which made their lives inconvenient (See the column below for the details of the impact of making it easier to fetch water).

This project has achieved its objectives to some extent. Therefore, the effectiveness and impacts of the project are fair.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspects of Operation and Maintenance

3.4.1.1 Institutional/Organizational Aspects of the Executing Agency

The role of the executing agency in this project was succeeded from the MLGH to the MWDSEP following central government reform in January 2017. At the time of the ex-post evaluation, there were no major changes in the executing agency's policies and plans for local water supply in Luapula Province. It continues to manage and supervise WASHE officials at the provincial and district levels. In addition, there have been no major changes in local water supply policies and plans of the provincial office of the executing agency, but there have been changes in persons in charge of local water supply due to organizational changes.

A system of monitoring the status of operation and maintenance of deep wells (periodic reporting from all V-WASHEs to D-WASHEs using a fixed form) was established through the soft components of this project. Although monitoring was conducted immediately after the completion of the project, monitoring was limited at the time of the ex-post evaluation. The resources available to D-WASHEs, such as the staff and budget for transportation expenses (such as vehicle fuel costs), have been limited. Given this situation, it has been difficult for D-WASHEs to monitor and provide

support by visiting villages that spread out widely across each district. At present, D-WASHEs provide monitoring and support based on the results of such monitoring for a limited number of communities, which have favorable transportation and favorable V-WASHE management.

3.4.1.2 Operation and Maintenance (O&M) Organizations

The operation and maintenance of the water supply facilities constructed as part of the project was planned to be carried out in such a way that each community forms a Water Sanitation Committee (WASHE) and users pay for the operation. Deep wells with hand pumps are maintained by V-WASHEs, and piped water supply facilities are maintained by Scheme-WASHEs.

- Deep wells with hand pumps: At the time of the ex-post evaluation, nearly 40% of V-WASHEs, the organizations responsible for the operation and maintenance system for deep wells with hand pumps, have not been in operation. This situation is one of main factors of non-operating deep wells, and it has been affected by limited monitoring, and support based on such monitoring, of water supply facilities by D-WASHEs. V-WASHEs are active for 54% (310 units) of deep wells with hand pumps for which information was gathered. These active V-WASHEs continue operation and maintenance activities including collection and management of reserves for repair costs (performed by cash managers), daily management such as locking up deep wells, maintenance such as replacement of consumables, contacting APM in cases of failure, and securing spare parts. On the other hand, for 39% (221 units) of deep wells with hand pumps, V-WASHEs have not continued these operation and maintenance activities. For 7% (40 units) of deep wells with hand pumps, water supply facilities are managed by public facilities (schools, healthcare centers, etc.) or information was not obtained regarding the continuance of the V-WASHEs for reasons such as absence of the committee member. The factors contributing to the inactivity of V-WASHEs, as described in the “Operating Ratio of Water Supply Facilities (%)” section, include problems with the water quality of India Mark II hand pumps (community residents are not willing to continue carrying out maintenance and operation of facilities after failure of hand pumps as pumped water tastes iron) and low awareness amongst community residents regarding drinking and using safe water. Although public awareness activities about drinking and using safe water was carried out through the soft components of the project from the viewpoint of hygiene, there are many communities where awareness about using safe water had declined upon the ex-post evaluation. As for the system for repairing deep wells with hand pumps, APMs are placed in each ward, and a V-WASHE staff member contacts an APM in the case of failure.
- Piped water supply facilities: Scheme-WASHEs continue to be active at all five locations, carrying out the operation and maintenance of water supply facilities (collection and management of reserves for repair costs (performed by cash managers), operating and maintaining pumps and chlorinators (performed by operators), and contacting the agency in

the event of failure, etc.). Scheme-WASHEs in Nchelenge District (one location) and Mwense District (three locations) receive technical support from LpWSCO for the operation and maintenance of piped water supply facilities, in addition to the monitoring by D-WASHEs. On the other hand, the Scheme-WASHE in Milenge District is not receiving such support as LpWSCO is not located in the district.

3.4.2 Technical Aspects of Operation and Maintenance

In the case of failure of a deep well with a hand pump, APMs repair it at the request of the nearby community. As for piped water supply facilities, the pumps and chlorinators are operated by residents serving as operators who received technical training through the soft components of the project.

- Deep wells with hand pumps: There are no technical issues with the APMs placed in each ward[9] as they received technical training through the soft components of the project and JICA's SOMAP 3[10] technical cooperation project. However, if V-WASHEs do not continue their activities, in many cases communities do not make a request with an APM to repair inoperable hand pumps. Especially in areas where conventional water sources such as shallow wells are located near residential areas thereby securing water is not difficult even though the water is unsafe, community residents are not willing to repair failed hand pumps due to the related financial burden. In such areas, APMs are less likely to be involved in the repair of pumps; instead, they rely heavily on means of sustenance other than pump repair, such as agriculture and fishing. For this reason, some APMs appear to have not maintained their repair abilities.

  In some districts, there are challenges in securing spare parts for hand pumps. During the field study, respondents indicated that securing spare parts has been difficult especially in districts where there are no spare parts shops (Kawambwa District and Mwansabombwe District (formerly part of Kawanbwa District), Chipili County (formerly part of Mwense Distirct), Chembe District (formerly part of Mansa District), and Chifunaburi District (formerly part of Samfya District), which were newly established out of the division of administrative districts beginning in 2016.

  In Nchelenge District as well spare parts are in short supply compared to the number of wells. The district relies on the stock of a spare parts shop which was constructed through the

[9] During site inspections for the ex-post evaluation, skilled APMs in each District provided the evaluation team with guidance to deep wells and information gathering support (information on the location of deep wells, types of pumps, number of user households, presence/absence of water quality tests, conventional water sources, etc.). The evaluation team observed that the technical level of APMs has been maintained: during site inspections, APMs evaluated pump condition and provided advice to the residents.

[10] SOMAP 1 established the SOMAP O&M Model, which combines activities such as clarifying the role of each stakeholder in O&M for water supply facilities, education activities, and activities aimed at improving abilities. It was elaborated and disseminated in the 2nd phase of the project. The SOMAP O&M model was implemented in four districts in Luapula Province (Nchelenge, Mwense, Mansa and Milenge) in SOMAP 3.

SOMAP 3 technical cooperation project. In the Mwense, Mansa and Milenge districts, spare parts can be procured from companies in Lusaka City (mainly SARO and AJAY). (Refer to the recommendations below for information regarding securing spare parts)

Photo 3. Spare parts shop constructed through the SOMAP 3 technical cooperation project

- Piped water supply facilities: Operators operate the facilities, including pumps and chlorinators. At the time of the ex-post evaluation, chlorinators for all five facilities were out of order, which was most likely due to low awareness amongst operators about safety with regards to chlorination. It appears that operators believe that the facilities can be operated manually without use of a chlorinator, or that chlorination does not have to be performed because the water source is the same groundwater as that from deep wells. For this reason, no countermeasures have been taken in response to malfunctions or failures of the equipment. LpWSCO has been following up to repair chlorinators at the three facilities in Mwense District. (Refer to the recommendations below for information regarding improvements in chlorination at the piped water supply facilities)

3.4.3 Financial Aspects of Operation and Maintenance

In nearly 40% of the total target communities, contributions for the operation and maintenance of deep wells with hand pumps have not been collected or managed because V-WASHEs are inactive. The operation and maintenance costs of piped water supply facilities are collected and managed at all five locations.

- Deep wells with hand pumps: Of the 96% of the project sites for which information was obtained, operation and maintenance costs (2-5 ZMK per household/month; about 15-40 yen) are basically not collected in 39% (221 units) of the communities because V-WASHEs are inactive. In most of the 30% of the community(171 units) of the communities where deep wells are not in operation, costs are not secured even for repairing minor failures and replacing consumables due to a lack of funds. The financial problems regarding operation and maintenance facing inactive V-WASHEs have been attributed to the organizational aspect of sustainability as a negative factor in this evaluation; therefore, such problems are not treated

as a negative factor in terms of the financial aspect of sustainability.

In most of the communities where V-WASHEs are continuing their activities, operation and maintenance costs are collected and managed. Many positive examples have also been observed through site inspections. For example, there are communities where mutual assistance is provided for poor households, such as providing payment extensions or payment in kind when payment is difficult.

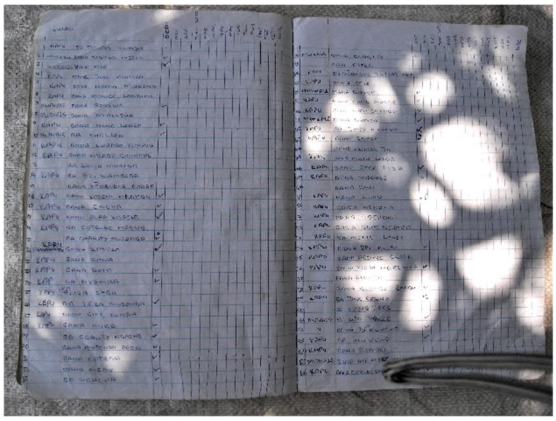

Photo 4. At V-WASHEs, a cashier collects money and records it in a cash book

- Piped water supply facilities: At all five facilities, operation and maintenance costs (5-10 ZMK / month per household; about 40-80 yen) are collected, and cash books have been kept to manage income and expenditures at each project site. The collected funds are used for pump power fees, payment of labor costs to operators, and purchase of consumables such as chlorine.

3.4.4 Status of Operation and Maintenance

As described above, the status of operation and maintenance at the time of the ex-post evaluation was that 30% of the deep wells with hand pumps were out of service, and the chlorinators at all five piped water supply facilities were out of order.

- Deep wells with hand pumps: In communities where V-WASHEs are not active or deep wells with India Mark Ⅱ hand pumps of which the pumped water taste iron because it contains excess iron, hand pumps tend to not be repaired even if they fail, and people are even reluctant to exchange consumables in some communities. Regarding the deep wells installed with India Mark II, there were many places where they were replaced to Afridev by UNICEF support or district government budget (out of 165 initial installations of India Mark II, 51 units (about 31%) have been exchanged for Afridev, which exclude 10 units which were replaced to Afridev during SOMAP 3).
- Piped water supply facilities: Chlorination has not been performed properly, mainly due to the low awareness amongst operators about safety regarding chlorination.

Additional water supply pipes have been connected to the piped water supply facilities in Musangu in Mwense District and Milenge in Milenge District. Construction of some of the additional connections observed is inappropriate. Therefore, there is concern that the water supply pipes may be damaged, or that water may leak from the connection. In addition, since around August 2019, there has been leakage from the inflow pipe to the water reservoir tank at the piped water supply facility in Milenge District (according to the person in charge of the

D-WASHE, there is also a leakage from the lower part of the tank which is located underground). The JICA Zambia office understands the situation and is considering countermeasures.

Some minor problems have been observed in terms of institutional/organizational and technical aspects. Therefore, the sustainability of the effects of the project is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project was implemented in the rural area of Luapula Province, Zambia, where the rate of access to safe water was especially low in the country. The objective of this project is to increase the water supply population by constructing water supply facilities centering on deep wells, thereby contributing to the improvement of water supply and sanitation in the target area.

The relevance of the project is high as the implementation of the project has been sufficiently consistent with the development plan and development needs of Zambia as well as with Japan's ODA policy. The outputs of the project, deep wells with hand pumps and piped water supply facilities, were almost as planned, and both the project costs and project period were within the plan. Therefore, efficiency of the project is high. In many communities in the target area of the project, the population with a safe water supply has increased, and as such the residents no longer suffer from waterborne diseases. In communities where it is now easier to fetch water, the noted effects have reduced danger and physical burden associated with transporting water and improved hygiene resulting from an increase in the amount of water used. As the project has achieved its objectives to some extent, the effectiveness and impacts of the project are fair. As for sustainability, there are some problems in terms of institutional and technical aspects in the operation and maintenance of this project. With regards to institutional aspects, a failure to sustain operation and maintenance (O&M) in the villages has caused deep wells with hand pumps to become inoperable. As for technical aspects, it has been difficult to secure spare parts in some districts in the project area, and there are problems with the O&M of chlorination in the piped water supply facilities. Some minor problems have been observed in terms of institutional/organizational and technical aspects. Therefore, the sustainability of the effects of the project is fair.

Considering all of the above points, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Recommendations to the D-WASHEs in the project area:

- Education for community residents on use of safe water: One of the main reasons that the

O&M function of some of the V-WASHEs has not continued is the low awareness amongst community residents about drinking and using safe water. Operation and maintenance of deep wells with hand pumps has not been carried out, mainly in areas where people can secure water from traditional water sources, and the community residents tend to not agree with the idea of sharing the costs of repair. Given this situation, it is desirable to provide administrative support to the community residents in accordance with the government policy of "improvement of sanitation through the improvement of access to safe water." For V-WASHEs with inactive O&M functions, the following methods of support are considered, including raising awareness amongst community residents about drinking and using safe water:

1. Considering the constraints on the resources of D-WASHE, the staff in charge of water supply at each D-WASHE first establish mutual and consistent telephone communication with V-WASHEs in communities where deep wells are not operating. If there is no telephone number list for the persons in charge at V-WASHEs, such list should be prepared in cooperation with the APM in each area.
2. Consider the support menu based on the situation in each community confirmed through telephone communication.
3. D-WASHEs provide support to communities for which awareness must be raised about drinking and using of safe water. Staff in charge of water supply, together with health and safety staff and education staff, explain the importance of using water supply facilities to residents and discuss countermeasures such as securing repair costs.
4. Communities that are willing to repair broken hand pumps are provided with support for such repair through technical cooperation with APMs.

- Securing spare parts for deep wells with hand pumps: The availability of spare parts for deep wells with hand pumps varies across Luapula Province. No spare parts shops have been established in Kawambwa District. Also, it is difficult to secure spare parts in Nchelenge District (which is far from the Lusaka Capital City). On the other hand, spare parts are secured in the Mwense, Mansa and Milenge Districts from handling companies in Lusaka City (these districts were covered by SOMAP 3 and received technical assistance). One of the causes of the inoperability of deep wells with hand pumps is the difficulty of securing spare parts in those districts. One possible measure in response to this issue is to share information about spare parts inventory between districts so that the inventories are shared between districts where parts can be secured to some extent and districts where parts cannot be secured. Further, joint procurement by nearby districts would lower transportation costs. One possible method for sharing information about inventories is to set up a database cataloging spare parts inventories (using Excel software, etc.) and periodically (e.g., monthly) share the database by e-mail.

Recommendations to the Scheme-WASHEs in the project area:

- Improvement of chlorination of the piped water supply facilities: The chlorinators for piped water supply facilities have failed in all five locations; therefore, chlorination has not been performed automatically, and instead the operators perform chlorine injection manually. For this reason, situations have been observed in which the frequency of chlorination is low or almost never conducted at the time of the ex-post evaluation. A common underlying problem is insufficient awareness amongst operators and community members about water quality safety rather than the difficulty or cost of repairing machinery. Therefore, it is necessary for community members to reconsider how to improve the operation of chlorinators, including receiving technical guidance from LpWSCO.
- Careful handling of additional water supply connections to piped water supply facilities: Additional water supply pipes have been connected to water supply facilities at Musangu in Mwense District and Milenge in Milenge District. Some of these additional connections have been constructed by operators of piped water supply facilities. If the construction of pipe works is not performed properly by a specialist, it may cause water leakages such as those due to pipes breaking. In addition, it appears that a map of the water supply pipe network has not been prepared. Therefore, it would be difficult to make repairs if an underground water leakage occurs. In sum, when additional water supply pipes are connected, it is necessary to take careful measures based on the risk of water leakage such as ensuring construction quality and creating a map of the water supply pipe network.

4.2.2 Recommendations to JICA

- Continuous consideration on technical applicability of India Mark II hand pumps: Among the deep wells with India Mark II hand pump which were installed in the target area of this project, there seems a situation that the pumped water has a taste of iron as it contains excessive iron, which has become one of factors that deep wells are not operated. In addition, there is a possibility that the deep wells in operation may be left without any repair or other maintenance when consumables need to be replaced or are broken. The cause of this seems to be the reaction of acidic groundwater with iron components (pipes and cylinders of India Mark II hand pumps). In case a deep well goes out of service, residents would once again fetch water from traditional water sources, causing the recurrence of waterborne diseases and the dangers and health hazards caused by the labor of fetching water. To improve the situation and to achieve the project purpose of improving the access to safe water, it is recommended for JICA to consider technical validity, such as replacing India Mark II hand pumps with those of which material does not readily react with acidic ground water (e.g. Arfidev).

4.3 Lessons Learned

- Setting a water supply population target based on the actual conditions of the target area: The target water supply population was set based on 250 beneficiaries per deep well, a benchmark for the number of users in Zambia. Conditions related to demand for deep wells, such as the population density of communities and the types of and distances to the existing water sources vary by project target area. The actual water supply population was confirmed through a field study that was part of the ex-post evaluation. As a result, there were many project sites with the number of users significantly exceeding the benchmark of 250 users, while at some other project sites this number was below the benchmark. Calculating the population served by using a common benchmark in this way results in deviations from the beneficiary population of each project site and is thus considered to be problematic in terms of accurately measuring the project effects. Therefore, the target water supply population should have been set based on confirmation of the beneficiary population in each target community at the time of the preliminary survey.

Column: Analysis based on the theory of change regarding the improvement of beneficiaries' convenience

At the project planning phase, the direct benefits for the beneficiaries were assumed to be the supply of safe drinking water and making it easier to fetch water (Figure 1).

Regarding the supply of safe drinking water, most community residents for whom water supply facilities were constructed are no longer susceptible to waterborne diseases because they no longer drink unsafe water from traditional water sources. Regarding making it easier to fetch water, it was assumed that construction of new water supply facilities, mainly deep wells with hand pumps, would result in a change in behavior whereby women and children would no longer fetch water from traditional water sources far away from their place of residence. As a result, it was assumed that it would be easier to fetch water, thereby increasing working hours for women and school hours for children.

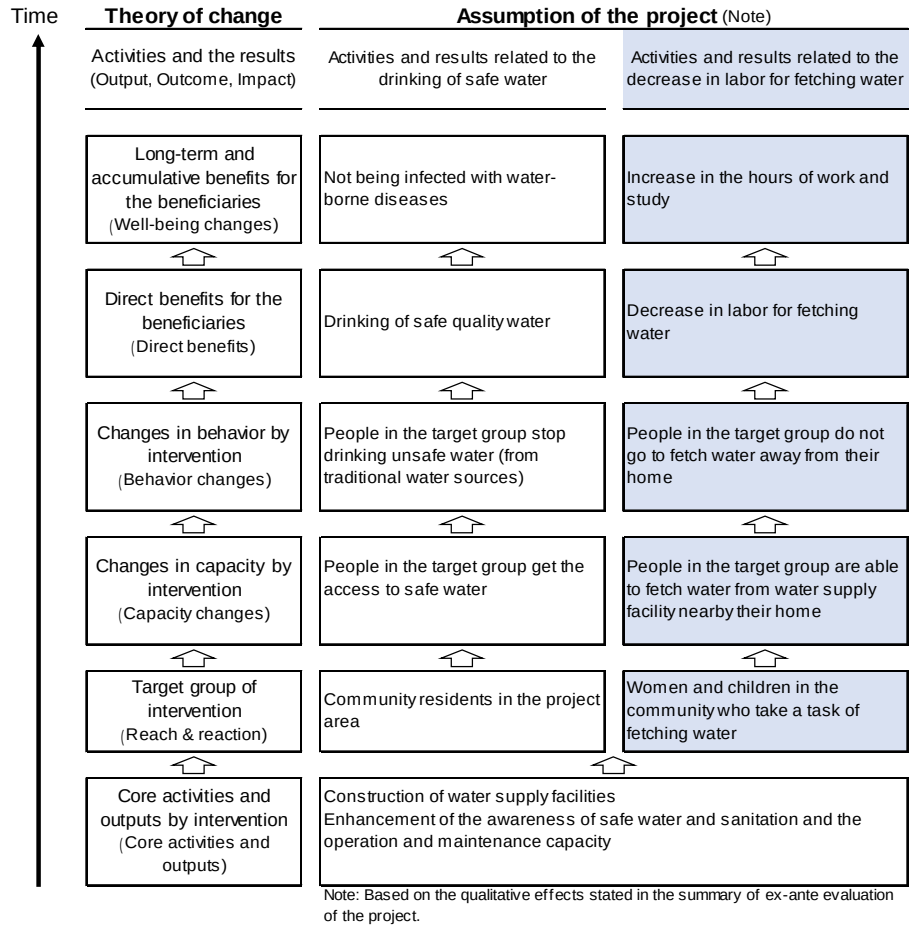

Figure 1. Summary of the activities and the expected results of the project

This column discusses the benefits resulting from making it easier to fetch water, as shown in Figure 2. These benefits are the result of the closer locations from which water is drawn in many communities (estimated to be more than half of the total) where water supply facilities were established through this project. However, there appears to be no benefit from making it easier to fetch water in communities where there has been no change in the distance for fetching water as there are traditional water sources such as shallow wells near residential areas.

A common effect that has been confirmed through interviews in many communities where it has become easier to fetch water is an increase in the amount of water used for bathing, washing and cleaning at home, thus resulting in better hygiene for the residents. For example, in areas where residents live far away from rivers or lakes, children might not bathe for extended periods of time as they were not taken to bathing places. However, children can be bathed at home after the project, and they can be kept clean. An external factor contributing to these changes is the recommendation from the Ministry of Health's hygiene improvement program to drink safe water to prevent

waterborne diseases such as cholera.

Although not true for all communities, the effect most recognized in interviews with residents in communities near rivers and lakes (e.g., the Luapula River and Lake Mweru), which are some of the main areas of this project, was that making it easier to fetch water has contributed to the reduction of risks for women and children. Before the construction of water supply facilities, there was a high risk of encountering dangerous animals such as snakes while fetching water as well as falling and traffic accidents during transportation. Together with the heavy labor of transporting water, there had been significant negative effects on people's health. After the construction of water facilities through the project, the danger posed to community residents has been reduced or even eliminated. At the project planning phase, these aspects of benefit from the project were not emphasized as an impact. However, it is considered that from the viewpoint of the problems facing residents in the target area and improvements in such problems, the reduction of risks for women and children has been the greatest impact related to making it easier to fetch water.

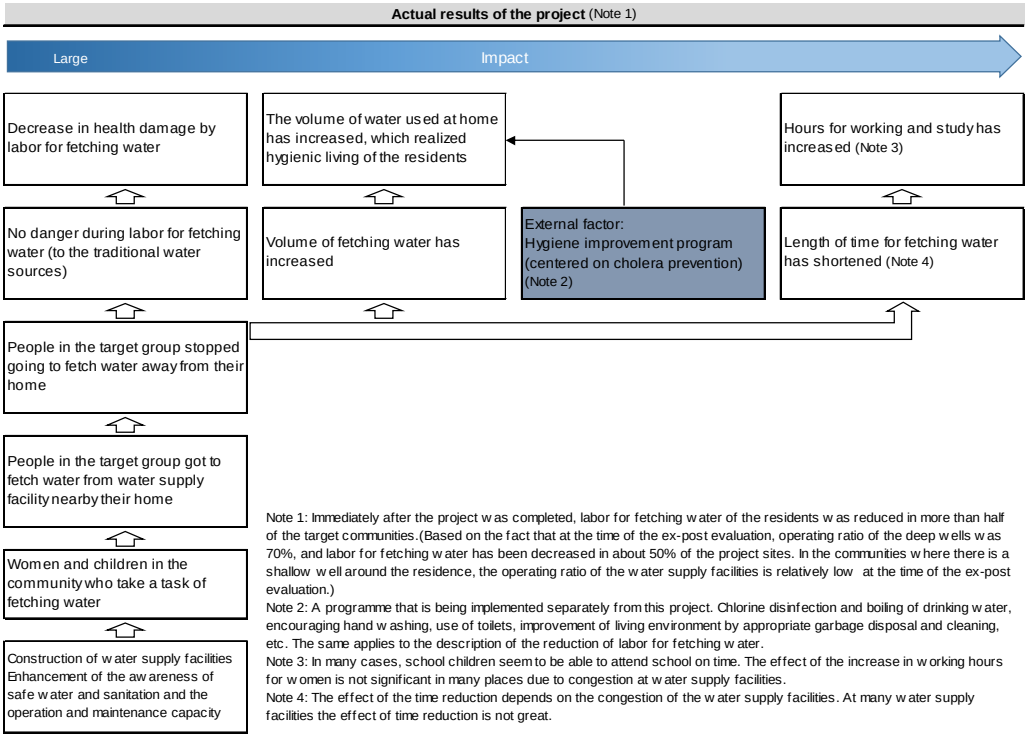

Figure 2. Actual results of project activities

However, although the effects of increasing working hours for women and school hours for children were assumed at the time of planning, the actual impacts on this aspect have not been as great as that for the two impacts mentioned above since it takes a long time to fetch water from the installed water supply facilities in many communities due to crowding. In addition, interviews with women in target areas indicate that even in cases where the time required to fetch water has been reduced, not many women have spent more time on economic activities (many residents responded that the time they have gained as a result of the greater ease of fetching water has been used for housework and childcare. Most of the economic activities in the target areas are self-sufficient agriculture and the sale of agricultural products at markets, for which there is a cycle between a busy season and an idle season. Therefore, people do not need to spend much time on such activities on a regular basis.) Regarding the increase in school time for children, children in many communities have been able to avoid being tardy and thus arrive at school on time in the morning. In schools with improved water supplies, the availability of water at sanitation facilities has led to significant improvements in the learning environment, especially for girls (no longer need to be absent for nearly a week during menstruation as was the case before).

End

Simplified Ex-Post Evaluation for Grant Aid Project

External Evaluator: Hideyuki Takagi, Ernst & Young ShinNihon LLC (July 2020)

Country Name	**<Project Name>** The Project for Upgrading Lusaka Health Centers to District Hospitals
Republic of Zambia	

I. Project Outline

Background	A high mortality rate of under 5 years of age and a high maternal mortality rate have been challenges in the health sector in Zambia, which needed to be further improved. Meanwhile, there have been difficulties in meeting the health service demands of Lusaka citizens as there were no hospitals categorized at the first or second level in the capital city Lusaka. Further, the University Teaching Hospital of Zambia (UTH), which is responsible for third-level medical services, was seriously and chronically congested since approximately 25% of patients accepted by UTH were referred from health centers (basic health service facilities). Under these circumstances, the project commenced in 2013 with the aim of improving access to health services for Lusaka citizens by strengthening the functions of two small health centers so that they can provide the same functions as a primary hospital.			
Objectives of the Project	The objective of the project is to strengthen the functions of two urban health centers (Matero and Chilenje), which are responsible for regional medical care in Lusaka, Zambia, by improving the facilities and equipment of these health centers, thereby contributing to improved access by Lusaka citizens to first-level medical services, as well as to third-level medical services by reducing congestion at UTH.			
Project Details	1. Project Site: Lusaka 2. Japanese side: Construction and procurement: Renovation and construction of additional facilities for the target health centers (additional facilities include an outpatient ward and central clinic, surgery and pediatric wards and related facilities), and procurement of medical equipment Consulting services and technical assistance: Training for improving the medical environment and the operation and maintenance of medical equipment through 5S/KAIZEN/TQM activities 3. Zambian side: Construction-related activities: Demolition of existing facilities, creation and leveling of planned construction sites, relocation of existing infrastructure offsite, maintenance of infrastructure, relocation costs for new facilities, etc. Other fees for various administrative procedures: Procedures related to construction permits, tax exemptions, operation and maintenance budget for facilities and equipment, contracts and contributions related to utility expenses, etc.			
Project Period	E/N Date	July 17, 2013 (Revised E/N: January 28, 2014)	Completion Date	July 26, 2016 (Completion)
	G/A Date	July 17, 2013 (Revised G/A: January 28, 2014)		
Project Cost	E/N Grant Limit / G/A Grant Limit: 1,908 million yen (Revised Grant Limit: 1,999 million yen)		Actual Grant Amount: 1,996 million yen	
Executing Agency	Ministry of Health (MOH)			
Contracted Agencies	Main Contractors: Construction: Shimizu Corporation, Procurement: Sirius Corporation Main Consultants: Nihon Sekkei, Inc./Fujita Planning Co., Ltd. (JV) Agent: N/A			

II. Result of the Evaluation

<Constraints on Evaluation>

- None

<Special Perspectives Considered in the Ex-Post Evaluation>

- The information collected on the qualitative effect indicators is compiled separately in the attached column "Summary of qualitative survey results."

1 Relevance

<Consistency with the Development Policy of Zambia at the Time of Ex-Ante Evaluation>

The *Fifth National Development Plan (2006-2010)* states that the vision for the health sector is "to achieve fair access to quality, cost-effective health care by 2030," together with the need to repair and renew deteriorated medical facilities and equipment to allow the health system to function effectively, which is one of the major challenges in the health sector. In addition, upgrading existing health centers to first-level hospitals was one of the priority strategies in the MOH's *Fifth National Health Strategy (2011-2015)*. In its 2008 plan, the MOH set out to strengthen and expand the facilities of designated health centers in five areas in Lusaka, thereby enabling these health centers to provide the required first-level medical services.

Therefore, the project is deemed to be relevant to the development policy of Zambia.

<Consistency with the Development Needs of Zambia at the Time of Ex-Ante Evaluation >

The development needs of the project are as described in Background in I. Project Outline. It was necessary to reduce congestion in UTH by strengthening the first and second level hospitals. In relation to the development needs, the sole second-level hospital in Lusaka, Levi Mwanawasa General Hospital,[1] was opened in 2011 at the planning stage of the project. The hospital is located in the eastern part of

[1] The hospital was upgraded from a clinic with the support of the Chinese government. The hospital was upgraded to a Level 4 hospital through further

Lusaka, slightly away from the center of Lusaka. Since it was not well known at the time of its opening as a second-level hospital, the number of outpatients was small. Comparatively, the target health centers of the project were both located in the center of Lusaka, similar to UTH. Therefore, many patients had been referred from the target hospitals to UTH.

In light of the above, the project is deemed to be consistent with the development needs of Zambia.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

One of the priority policies and issues stated in *Japan's Country Assistance Policy for Zambia (October 2002)* is "enhancing cost-effective healthcare services." This policy for Zambia stated that "Japan considers ways to expand primary health care and cooperate in the area of reproductive health to achieve results that are highly effective at relatively low costs and that directly benefit the people, especially the poor. These circumstances are currently exacerbated by a high cost structure characterized by urbanization of healthcare service facilities and an emphasis on treatment services provided by higher-order hospitals." The project was implemented based on this policy; therefore, it was consistent with Japan's ODA policy at the time of the ex-ante evaluation.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impacts

<Effectiveness>

After the project was implemented, both target health centers were upgraded to level 1 hospitals in April 2017.

Quantitative effect indicators of "the number of cesarean sections" and "the number of inpatients in the adult surgery ward" were set for the project in the summary report of the ex-ante evaluation. The targets for indicator 1 "the number of cesarean sections" were achieved. Before the project was implemented, there were no doctors or facilities available at the target health centers; therefore, patients requiring surgery were referred to UTH. After the project was implemented, as level 1 hospitals with improved facilities, medical equipment, and doctor/nurse labor force, the target health centers were capable of accepting patients, handling surgeries, as well as hospitalization. Indicator 2 "the number of inpatients in the adult surgery ward," which verifies the number of inpatients in the newly constructed adult surgery ward at Matero Hospital, has also been achieved by far exceeding the target. A qualitative effect indicator of "improvement in medical services to local residents (by enhancing the medical system)" was set in the summary report of the ex-ante evaluation. As of the ex-post evaluation, both target hospitals had well-organized medical systems that enabled local residents to receive most common medical services at a high standard without relying on referrals to UTH or visiting private hospitals. Therefore, the qualitative effect of the project has been achieved. (Refer to the column "Summary of Qualitative Survey Results" for details on the qualitative effect.)

<Impact>

A qualitative impact indicator of "relieving congestion at UTH and thereby improving medical services at UTH" was set for the project based on the assumption that the project would result in the medical referral system in Lusaka becoming multi-layered and recover functionality to allow for the provision of efficient medical services according to the disease and severity thereof. Improvements in medical systems at both target hospitals contributed to a reduction in the number of patients referred to UTH, thereby significantly alleviating congestion at UTH by the time of the ex-post evaluation. As a result, UTH can now concentrate on advanced medical treatment including heart surgery and is approaching a normal operating state in accordance with its intended purpose. Therefore, the qualitative impact of the project has been achieved. (Refer to the column "Summary of Qualitative Survey Results" for details on the qualitative impact.) To supplement the qualitative impact indicator, additional quantitative indicators were set in conducting the ex-post evaluation. The actual results for both indicator 3 "decrease in the number of referral patients to UTH" and 4 "decrease in the ratio of referral patients to UTH" were below the baseline as of the ex-post evaluation, indicating that the expected impact has been achieved.

In addition to the project, other donors have been supporting improvements in the medical system in Lusaka. This assistance is considered to have also contributed to the medical referral system in Lusaka becoming multi-layered and recovering functionality. In particular, the enhancement of functions at Levi Mwanawasa General Hospital has in turn contributed to the functionality of UTH mainly by allowing the hospital to accept referral patients from health centers in the eastern part of Lusaka.

As for the other impacts, there has been a gender impact associated with the decrease in referrals for cesarean sections, which has reduced the physical and economic burden on female healthcare users. There have been no negative impacts on the natural environment or on society.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is high.

Quantitative Effects

Indicators	Baseline 2012 Baseline Year	Target 2018 3 Years after Completion	Actual 2017 1 Year after Completion	Actual 2018 2 Years after Completion	Actual 2019[2] 3 Years after Completion
Indicator 1 The number of caesarean sections at Matero Hospital	0	377	207	203	475
The number of caesarean sections at Chilenje Hospital	0	357	219	384	921

support and was accepting referral patients at the time of the ex-post evaluation.

[2] In the plan of the project, the target year was 2018, which is three years after the completion of the project. Since the completion of the project was delayed by around one year, the comparison between the target and actual is based on the actual results for 2019.

Indicators	Baseline 2012 Baseline Year	Target 2018 3 Years after Completion	Actual 2017 1 Year after Completion	Actual 2018 2 Years after Completion	Actual 2019 3 Years after Completion
Indicator 2 The number of inpatients in the new adult surgery ward at Matero hospital	0	968	Data not obtained	1,670	1,757
Indicator 3 (Additional indicator) Decrease in the number of referral patients to UTH *1	65,219	No target (additional indicator for evaluation)	39,856	26,056	23,979
Indicator 4 (Additional indicator) Decrease in the ratio of referral patients to UTH (%) *2	24.7	No target (same as above)	16.6	13.0	15.9

Source: Materials were provided by JICA for the baseline and target, and by the target hospitals for the actual results.

*1 Total number of referral patients including patients accepted from medical institutions other than target hospitals of the project (Matero and Chilenje)

*2 Ratio of referral patients from other medical institutions to the total number of patients at UTH

3 Efficiency

The actual outputs of the project were mostly as planned (the plan is described in Project Details under I. Project Outline). Although there were changes from the plan such as the layout of the facilities, those changes did not affect the effects of the Project.

The total planned project cost was 2,019 million yen (1,999 million yen for the Japanese side and 20 million yen for the Zambian side). The actual Japanese side cost was as planned: the actual cost was 1,996 million yen whereas the planned cost was 1,999 million yen (nearly 100% of the planned cost). The planned cost for the Zambian side was 20 million yen; however, the actual cost could not be confirmed. Therefore, the evaluation of the project's cost efficiency was based on a comparison between the planned and actual cost on the Japanese side considering that the planned cost for the Zambian side was only 1% of the total and would thus not affect the comparison between plan and actual.

The actual project period was 37 months, exceeding the planned project period of 22 months (168% of the planned period). The main reasons for the actual project period exceeding the planned period were a delay in the start of bidding and construction as a result of the grant limit being revised reflecting additional grant due to exchange rate fluctuations, a delay in construction due to a delay in procurement of materials and labor, delays in the construction schedule resulting from a planned power outage (installation of additional generators) and the excavation and removal of underground rock.

<Evaluation Result>

Although the project cost was as planned, the project period exceeded the plan. Therefore, the efficiency of the project is fair.

4 Sustainability

<Institutional Aspects>

Under the operation and maintenance (O&M) system of the target health centers at the time of the ex-ante evaluation, there were no maintenance staff for the facilities and equipment in the health centers; instead, the district health office maintenance staff had been responsible for the maintenance of multiple health centers. Therefore, O&M at each health center was not deemed to be conducted in an appropriate manner. Based on the situation and in order to establish a maintenance department after upgrading to level 1 hospitals, technical assistance was planned as part of the project. Technical assistance was implemented for (1) establishment of a maintenance system for facilities and equipment including cooperation between the maintenance department and the consumables/replacement parts warehouse, and (2) establishment of medical waste collection/treatment system at the hospitals.

Under the O&M system of both target hospitals at the time of the ex-post evaluation, a maintenance department and a system for medical waste collection and treatment were established and sustained; however, the assumed cooperation between these and the consumables and replacement parts warehouse had not been established.

As for the staffing of the maintenance departments at the target hospitals, two new staff members (a department chief/person responsible for machinery and a person responsible for electricity) have been allocated to each hospital, compared to three new staff members at each hospital (a department chief, a person responsible for machinery and a person responsible for electricity) requested by the study team at the time of planning. However, in the area covered by Matero Hospital, there are a total of 9 clinics and health posts, for which maintenance of medical equipment is handled by 2 maintenance staff members and 4 student volunteers stationed at Matero Hospital. Similarly, there are a total of 11 clinics and health posts in the area covered by the Chilenje Hospital, for which maintenance of medical equipment is handled by 2 maintenance staff members and 3 student volunteers stationed at Chilenje Hospital. According to maintenance staff at both target hospitals, the number of staff members is insufficient because maintenance work must be performed at multiple clinics in the area covered by each hospital. (Refer to "Recommendations for the Executing Agency.") The management of medical waste is handled by one person at each of the target hospitals, and the number of staff members is sufficient.

The number of medical workers was increased to the level assumed necessary at the time of planning. However, interviews with the target hospitals revealed that it is necessary to further increase the number of doctors and midwives as the number of patients has continued to increase (in particular, doctors in the surgical ward of Matero Hospital and midwives in both hospitals need to be increased).

Comparison between the number of medical workers before and after the project

Classification	As of ex-ante evaluation			As of ex-post evaluation			Difference
	Matero health center	Chilenje health center	Additional workers needed (total for both health centers)	Matero Level 1 Hospital	Chilenje Level 1 Hospital	Actual increase in workers (total for both health centers)	
Doctor	2	3	4	15	18	28	+24
Physician assistant	9	8	14	16	9	8	-6

Classification	As of ex-ante evaluation			As of ex-post evaluation			Difference
	Matero health center	Chilenje health center	Additional workers needed (total for both health centers)	Matero Level 1 Hospital	Chilenje Level 1 Hospital	Actual increase in workers (total for both health centers)	
Nurse	38	41	74	167	204	292	+218
Midwife	16	21	19	21	15	-1	-20
Other	75	70	22	384	271	510	+488
Total	140	143	133	603	517	837	+704

Source: Materials were provided by JICA for the data as of the ex-ante evaluation, and by the executing agency and the target hospitals for the data as of the ex-post evaluation.

<Technical Aspects>

Regarding the technical aspects of O&M at the time of the ex-ante evaluation, there were concerns that medical services would deteriorate due to failure of facilities and medical equipment because the target health centers had no staff with skills related to operation and maintenance. There were also concerns about the deterioration of the surrounding environment and an increased risk of infection in the hospitals because the treatment methods for medical wastewater and medical waste were not appropriate. Based on these circumstances, the following technical assistance was planned for the project: (1) strengthening the capacity of the staff of the maintenance department, which will be set up as a result of upgrading to a level 1 hospital (allowing for proper use and operation of facilities, improving measures for failures, and making periodic inspections), and (2) raising awareness about appropriate waste disposal in each department (ensuring separate collection of infectious waste) and correct operation of incinerators.

As for the technical level of O&M at the time of the ex-post evaluation, there were no problems since both of the target hospitals are staffed with personnel trained through the technical assistance of the project and personnel with electrician backgrounds. The O&M staff maintain the facilities and equipment according to the O&M plan (monthly and annual periodic checklist), which was prepared with the support of the technical assistance provided as part of the project and approved by the Ministry of Health. The manuals for each type of medical equipment are stored in a cabinet in the operation and maintenance department, and O&M staff members refer to these manuals as necessary in the course of their work. Regarding the management of medical waste, separate collection of waste has generally been maintained, with such collection being strengthened through the technical assistance of the project. However, since incinerators malfunctioned at both target hospitals, medical waste has been transported to other hospitals where incinerators are operational.[3] It is necessary to deal with issues involving failure to immediately incinerate infectious medical waste. (Refer to "Recommendations for both Target Hospitals.") Since this is a financial issue stemming from budget constraints on repair and renewal, it is deemed to not be a negative technical factor.[4]

<Financial Aspects>

Regarding the financial aspects of O&M at the time of the ex-ante evaluation, the operating costs of health centers were managed by the district health office, and the budget allocated to the target health centers from the revenue of the district health office was calculated based on the health services provided by the health centers. Of the district health office's revenue, nearly 60% was from the budget allocated by the central government, 10% was from medical treatment revenue, and over 30% was from other sources (various program budgets). The annual budget allocation to the target health centers in 2009 was 539 million Zambian Kwacha (ZMK) for the Matero Health Center and 520 million ZMK for the Chilenje Health Center. In addition, the annual maintenance budget (facilities and equipment) for the target health center was 36 million ZMK for the Matero Health Center and 35 million ZMK for the Chilenje Center. In contrast, the financial outlook of the target health centers after completion of the project was prepared assuming a significant increase in the revenue of each health center, including revenue from budget allocated by the district health office, government grants, and referral income. The annual O&M cost was estimated to be 710 million ZMK for the Matero Health Center and 737 million ZMK for the Chilenje Health Center.

At the time of the ex-post evaluation, the allocation of government subsidies to both target hospitals was less than the budget requirement (less than half of the budget requirement), resulting in insufficient revenue to these hospitals. Therefore, although the hospitals remain in operation, the budget for O&M of medical equipment is insufficient (particularly the cost of purchasing test reagents and spare parts as well as repair costs) according to the persons in charge of finance at the target hospitals. (Refer to "Recommendations for the Executing Agency.")

Comparison between forecasted and actual revenue and expense

(Unit: ZMK)

Revenue and expense items	Matero Level 1 Hospital			Chilenje Level 1 Hospital		
	As of ex-ante evaluation (Actual in 2009)	Forecast at the time of planning (As of 2015)	As of ex-post evaluation (Actual in 2018)	As of ex-ante evaluation (Actual in 2009)	Forecast at the time of planning (As of 2015)	As of ex-post evaluation (Actual in 2018)
Revenue:						
Government subsidies	-	8,000,000	1,211,578	-	8,000,000	1,322,151
Budget allocated by district health office	539,000	4,520,000		520,000	4,490,000	
Referral income from urban health centers	-	1,288,000	N/A	-	1,932,000	N/A
Medical treatment revenue	-	400,000	1,245,344	-	400,000	1,041,685

[3] The incinerators have been out of order since March 2018 at Matero Hospital and since around April 2019 at Chilenje Hospital.

[4] The incinerators were not procured through the project; rather, they were installed at the health centers prior to project implementation. For this reason, this issue is not separately described under Financial Aspects in the Sustainability section.

Revenue and expense items	Matero Level 1 Hospital			Chilenje Level 1 Hospital		
	As of ex-ante evaluation (Actual in 2009)	Forecast at the time of planning (As of 2015)	As of ex-post evaluation (Actual in 2018)	As of ex-ante evaluation (Actual in 2009)	Forecast at the time of planning (As of 2015)	As of ex-post evaluation (Actual in 2018)
Total revenue	**539,000**	**14,208,000**	**2,456,922**	**520,000**	**14,741,000**	**2,363,836**
Operating costs	No info	No info	1,695,287	No info	No info	2,140,470
Maintenance costs	36,000	710,000	641,635	35,000	737,000	112,656
Surplus	No info	No info	**120**	No info	No info	**110,709**

Source: Materials were provided by JICA for the data as of the ex-ante evaluation (including the assumption at the time of planning), and by the executing agency and the target hospitals for the data as of the ex-post evaluation.

Note: Since the currency of Zambia was devalued (1,000 ZMK → 1 ZMK) in 2013 (denomination), figures in the above table for the actual in 2009 and the forecast in 2015 represent the amounts after denomination conversion for the purpose of comparing amounts before and after the project. Actual budget allocations from the government and the district health office as of the ex-post evaluation are not separately recorded. Medical treatment revenue is based on the standard remuneration rates of public hospitals.

<Current Status of Operation and Maintenance>

With regard to the condition of the procured equipment, some of the equipment has not been in operation for nearly one year. There have been difficulties in obtaining test reagents for test devices used in laboratories and spare parts for medical equipment mainly due to budget shortages. In addition, the agency has not appropriately responded to the situation, and the markup is too high for the necessary items to be acquired at reasonable prices. For equipment that cannot be operated for these reasons, hospitals are relying on equipment provided by donors. (Refer to "Recommendations for the Executing Agency," "Recommendations for both Target Hospitals and Chilenje Hospital" and "Lessons Learned by JICA.")

<Evaluation Result>

Some minor issues were observed with regards to the institutional and financial aspects. Therefore, the sustainability of the project effect is fair.

5 Summary of the Evaluation

The relevance of the project is high as the implementation of the project is sufficiently consistent with the development policy and development needs of Zambia as well as with Japan's ODA policy. The number of patients referred to UTH has been reduced since cesarean sections are now being performed at both target hospitals and since medical services are improving at other outpatient clinics. As a result, congestion at UTH has been greatly reduced, and it is now possible for UTH to concentrate on its primary purpose, advanced medical care. Therefore, the effectiveness/impact of the project is high. Although the outputs of the project and the project period were mostly in line with plans, the project period exceeded the plan. Therefore, the efficiency of the project is fair.

Regarding sustainability, some minor issues were observed with regards to the institutional and financial aspects. Both target hospitals have established and maintained a maintenance department and a medical waste collection and treatment system as planned; however, the number of maintenance staff is insufficient, and the budget for maintenance of medical equipment is inadequate. Therefore, the sustainability of the project effect is fair.

Considering all of the above points, the project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for the Executing Agency:

- Budget allocation for the cost of spare parts for medical equipment (e.g., probes for ultrasonic diagnostic equipment) and consumable parts (e.g., reagents for biochemical analyzers): Medical treatment at the target hospitals has been impeded by the inoperability of ultrasonic diagnostic equipment and electrocardiographic diagnostic equipment (ECG). Under such situation, it is desirable that the Ministry of Health allocate a budget to each target hospital for the operation and maintenance of medical equipment in the order of priority, including costs for purchasing spare parts and repair costs.
- Budget allocation for ensuring a sufficient number of maintenance staff: At both of the target hospitals, the current number of staff members is insufficient given that maintenance staff must perform maintenance work at multiple clinics in the area covered by each hospital (they are able to perform regular inspections but not repair medical equipment, inquire about purchasing spare parts with parties other than the agency, handle administrative procedures, etc.). Therefore, it is desirable to allocate a budget for recruiting and allocating maintenance staff according to the number of clinics and health posts in the areas covered by the hospitals.
- Sufficient consideration of the need for medical equipment procured with donor support: Cases have been observed in which medical equipment is left unused despite being usable if the necessary spare parts and consumables were to be purchased, due to duplicate medical equipment being provided by other donors. Therefore, in order to eliminate the provision of such duplicate medical equipment and use the aid funds more efficiently by sending them where they are needed the most, it is desirable that the staff of the Ministry of Health and the State Health Office carefully consider which medical equipment to provide based on close communication with the medical facilities and an understanding of what kind of support they need.

Recommendations for both Target Hospitals:

- Purchasing probes for ultrasonic diagnostic equipment and using the equipment in the maternity department: Both target hospitals have pointed out a shortage in ultrasonic diagnostic equipment in their maternity departments. If the budget for purchasing spare parts is secured, it is desirable to restore the ultrasonic diagnostic equipment to an operating state and utilize it for examinations in the maternity departments at both hospitals.
- Reinstallation of incinerators: At both target hospitals, the incinerators (although not procured through the project) have failed and cannot be used. For this reason, medical waste has not been disposed of properly; rather than being incinerated at these hospitals, it is transported to other hospitals for disposal. If the budget for replacing or repairing the incinerators is secured, it is desirable to restore

medical waste management to the appropriate state by utilizing incinerators.

Recommendation for the Chilenje Hospital:

- Repair and utilization of ECG: At Chilenje Hospital, patients who need to be examined with ECG are referred to UTH due to failure of the equipment. If the budget for repairing medical device is secured, it is desirable to repair the ECG and use it for examinations at the hospital.

Lessons Learned by JICA:

- Measures to secure long-term supplies of spare parts, consumable parts, test reagents, etc. for medical equipment: The difficulty in securing spare parts, consumable parts, test reagents, etc. for medical equipment is recognized as a common issue at other public hospitals in Zambia, mainly due to financial reasons. In other words, the current situation (i.e., that some of the medical equipment procured through the project has been out of service) could have been foreseen. Considering the situation, it would be effective at the planning stage for future grant aid projects to have discussions about expanding the scope of cooperation as follows and extending the period involving the Ministry of Foreign Affairs. For example, securing a certain amount of inventory needed within the useful life period is considered to be a measure which can be taken in advance: consumable parts and parts that are frequently used, and thus need to be replaced due to reasons such as breakage, could be procured at reasonable prices together with the medical equipment. For test reagents, which cannot be stored for long periods of time due to short expiration dates, long-term purchase contracts with medical equipment dealers could be concluded at the time of procurement. When implementing such countermeasures, it would be necessary to decide upon the ratio of the cost burden between the Japanese side and Zambian side and conduct a thorough investigation on and study the frequency of component damage and the consumption of reagents under similar usage conditions during the preparatory survey for cooperation. In addition, since the possibility of unauthorized use (e.g., resale) cannot be ruled out during inventory management and purchasing based on contracts, it is desirable for JICA to be involved in the management and checking of inventory and transactions. Specific methods of technical cooperation would be dispatching volunteers and implementing technical cooperation projects related to hospital operation management.

Matero Level 1 Hospital

External appearance (main entrance)

Many patients are visiting the outpatient waiting room

Inpatients in the pediatric ward

Chilenje Level 1 Hospital

External appearance (main entrance)

Same as the left

Emergency room

Column: Summary of Qualitative Survey Results

Purpose of the Survey:

A qualitative survey was conducted to obtain the following qualitative information that cannot be obtained from existing data.

- Effectiveness: Improvement of medical services for local residents at both Level 1 hospitals, Matero and Chilenje
- Impact: Alleviation of the congestion and thereby improved medical services at UTH as a result of the medical referral system becoming multi-layered and recovering functionality

Survey Results regarding the Effectiveness of the Project:

1. Improvement of medical services for local residents (interviews within a total of 26 waiting outpatients at the target level 1 hospitals and 50 residents in the surrounding areas)
   - When they were health centers, both target level 1 hospitals were small in terms of the size of their facilities, and the number of doctors and nurses was insufficient. Some patients could not be seen due to limited medical services, and some tests and treatments could not be provided. For this reason, many patients were referred to UTH, and some residents chose to visit private hospitals despite high medical costs. Because of the low capacity, the waiting time before consultation was longer than half a day.
   - After being upgraded, both level 1 hospitals have been ready to accept patients with enhanced facilities and equipment and sufficient doctors and nurses. Patients are now able to receive quality medical services without being referred to UTH or going to private hospitals. The advantages of receiving quality medical services at a local level 1 hospital are reduced travel time, costs and consultation costs for the local residents. Waiting times for patients have also been reduced.
   - Most of the interviewees replied that the frequency of consultations at both hospitals has been increased, and that having a level 1 hospital is contributing to the health of the residents in surrounding area.
   - However, many interviewees at both of the target level 1 hospitals have pointed out that the shortage of medicines is a challenge.
2. Improvement of medical services for women who are the users of maternity and gynecology and pediatric medical services (interviews with a total of 27 female patients for maternity and gynecology and pediatric medical services at the target level 1 hospitals)
   - The medical services provided by the doctors and nurses at both target hospitals have been improved since the hospitals have been upgraded to level 1 hospitals. Most of the necessary medical services are being provided now, including cesarean sections that were not performed when the two target hospitals were health centers. Therefore, the need for referrals to UTH has been reduced, except in complex cases (such as large fetuses). The advantages of reducing the need for referrals to UTH are reduced travel time, costs, and consultation costs. Waiting times for patients have also been reduced.
   - Most of the interviewees replied that the frequency of consultations at both hospitals has been increased, and that having a level 1 hospital is contributing to the health of the residents in surrounding area.
   - However, interviewees have pointed out that the shortage of medicines and issues related to testing using ultrasonic diagnostic equipment are challenges.
3. Improvement of medical services through the development of facilities and equipment as a result of the upgrade to level 1 hospitals (interviews with a total of 5 medical workers at the target level 1 hospitals)

1) Doctors in the maternity and general outpatient departments at Matero Level 1 Hospital

- Doctor in the maternity department: When the hospital was a health center, it only had midwives instead of obstetricians. Therefore, cesarean sections could not be performed, and many patients were referred to UTH. There were also problems with facilities, such as insufficient space, lack of a bathroom for patients, and lack of beds for newborns. In comparison, the department is now run by 2 or 3 physicians, although this is not necessarily enough. As a result, referrals of patients to UTH have declined significantly. Currently, most of the patients who are referred to UTH are those with complex gynecological disorders. However, the number of beds is becoming insufficient due to patients coming from areas such as Chipata outside of the area covered by the hospital. Regarding the obstetric medical care system, the hospital is making efforts to increase the number of midwives, which are also

currently insufficient. In addition, there has been a shortage of some consumables and medicines due to an insufficient budget.

- Doctor and nurse in the general outpatient department: Compared to when it was a health center, the hospital can now offer a wide range of medical services as a level 1 hospital. Therefore, a large number of patients are coming from George Compound, where there is a lack of public medical institutions, and from outside the area covered by the hospital (Chipata, Kanyama, etc.). This increase in the number of patients has led to a shortage of doctors and space at the hospital. In addition, there is a shortage of medicines at the hospital due to an insufficient budget.

2) Doctors in the maternity and general outpatient departments at Chilenje Level 1 Hospital

- Doctor in the maternity department: When the hospital was a health center, there was insufficient infrastructure and staff members; therefore, it was not able to provide effective medical care. The ability to provide medical services has been improved, thus bringing the hospital closer to the level of medical services that should be provided. Medical workers have also become more motivated and are doing what they need to do effectively. Capacity for inpatients was insufficient when the hospital was a health center; however, beds are now generally available and privacy is assured (However, the number of beds is becoming insufficient recently as a result of the population increasing in the area covered by the hospital due to factors such as an influx from surrounding areas, thus sometimes requiring 2 or 3 patients to share a bed). As for the medical care system in the maternity department, the number of doctors is not necessarily insufficient, but the number of midwives is insufficient (especially at night). The significant increase in cesarean sections is due to an increasing number of patients in complex situations requiring advanced medical care. Currently, cesarean sections are performed mainly in cases of gynecological diseases, HIV, high blood pressure, and for young pregnant women such as those who are 14-15 years old.
- Doctor in the general outpatient department: Compared to when the hospital was a health center, waiting space has been expanded, and there have been improvements in the screening room, internal telephone communication network, slopes going up to the second floor, and toilets. Together with the enhancement of facilities, the organization of the medical system in the hospital has been improved. As a result, waiting times for patients have been reduced. However, problems such as not enough space in operating rooms and a lack of privacy in examination rooms have arisen due in part to an increasing number of patients. In terms of the medical system, the number of doctors is sufficient, while the number of nurses has become insufficient.

Survey Results regarding the Impact of the Project:

1. The effects of medical referral system becoming multi-layered and recovering functionality (interviews with a total of 3 medical workers at UTH and Levi Mwanawasa General Hospital)

1) Doctors in the maternity and adult surgery departments at UTH

- As a result of the expansion of the facilities at the Matero and Chilenje health centers and their consequent upgrade to Level 1 hospitals, the number of referrals of patients has been reduced, not only from both hospitals but also from health centers in the city. As a result, congestion at UTH has been significantly alleviated. UTH can now concentrate on advanced medical treatment including heart surgery and is approaching a normal operating state in accordance with its intended purpose. The respondents are aware that the other three level 1 hospitals were expanded in phase 2[5] of the project and expect further normalization of referrals after completion.

2) Chief of general administration at Levy Mwanawasa General Hospital

- When Levy Mwanawasa General Hospital was a clinic (before it began operating as a level 2 hospital in 2011), patients with complex symptoms were referred to UTH. The hospital was upgraded to a level 4 hospital in May 2019, and, like UTH, has been rated as a university hospital. At present, specialists in all fields are available at the hospital, and it can now accept referred patients. Patients have been referred from the eastern Lusaka area. The respondent expects that upgrading and/or newly establishing

[5] "The Project for Upgrading Lusaka Health Centers to District Hospitals (Phase 2)" commenced in 2017 as a follow-up to the project described herein and is being implemented as of the ex-post evaluation. Under the MOH's plan (2008), both phases of this series of projects aim to strengthen and expand the functions of one health center in each of five areas in Lusaka to provide level 1 medical services. The second phase covers the remaining three areas. These three health centers were upgraded to level 1 hospitals in April 2017 prior to project implementation, on the premise of strengthening facilities and expanding functions.

lower-level hospitals will help bridge the referral system gap, specifically, further reduction of referrals through the completion of construction at the three level 1 hospitals where facilities are currently being expanded.