Ex-Post Project Evaluation 2015:
Package Ⅲ-6
(Ethiopia, Kenya, Burkina Faso)

January 2017

JAPAN INTERNATIONAL COOPERATION AGENCY

ALFAPREMIA CO., LTD.

GLOBAL LINK MANAGEMENT, INC.

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Federal Democratic Republic of Ethiopia

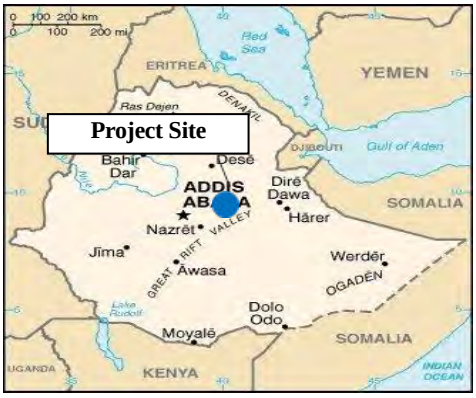
FY2015 Ex-Post Evaluation of Technical Cooperation Project
"The Ethiopia Water Technology Center Project[1]"
("The Project for Groundwater Development and Water Supply Training[2] Phase II")
External Evaluator: Noriyo Aoki, Alfapremia Co., Ltd.

0. Summary

The Ethiopia Water Technology Center Project ("The Project for Groundwater Development and Water Supply Training Phase II") was implemented to enhance the capacity of the human resources for groundwater and water supply management in Ethiopia. The details of the project are relevant to the development policies of Ethiopia and the priority fields of ODA policies of Japan, for which there are high development needs. Therefore, its relevance is high. Although the project period was within the plan, the project cost was higher than planned. Therefore, its efficiency is fair. The effectiveness is evaluated to be high because this project is developing human resources for groundwater and water supply management both qualitatively and quantitatively. The effects have been continuously manifested until the time of the ex-post evaluation due to training provided in Phase III and by the Ethiopia Water Technology Institute (hereinafter referred to as "EWTI"), a succeeding organization of this Center. The technologies and teaching materials for training are utilized by ex-trainees who are engaged in groundwater development and water supply for their work at the time of the ex-post evaluation. The impact of the project is also high. The sustainability of the policies is high and the organizational system of EWTI as an independent organization has been mostly established. The sustainability in terms of both organizations and systems is high. The financial sustainability is also high because an appropriate budget is secured for the plan. The sustainability is generally evaluated to be fair because the technical sustainability is regarded as an issue. There is a need for instructors with abundant work experience who could teach not only theories but also practical skills and the existing instructors also needed capacity enhancement.

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

1. Project Description



Project Location

Ethiopia Water Technology Institute (EWTI)

[1] Ethiopia Water Technology Center; hereinafter referred to as "EWTEC"

[2] The Project for Groundwater Development and Water Supply Training consists of three phases: Phase I (1998 – 2003), Phase II (this project) and Phase III (2005 – 2008). This project is named "Ethiopia Water Technology Center" but is called "Phase II" because the abbreviation of the project name is EWTEC, which is the same as the center name.

1.1 Background

After transition of Ethiopia to a federal system in 1995, the decentralization of the water supply administration was promoted. In the disparity between regions, the major issue was a shortage of human resources with water supply and groundwater development technologies. A low rate of access to safe water in the rural area forced many residents to spend much time and labor on securing water for their daily life. Therefore, the Ministry of Water Resources had planned providing the personnel and engineers engaged in groundwater development and water supply with training on planning, survey, well drilling, maintenance of wells and equipment and guidance on operation of water supply facilities at the community level. Then the Ministry submitted a request for assistance for this plan to the Government of Japan. In response, the Government of Japan implemented a seven-year human resources training project including a two-year extension period from January 1998, "Groundwater Development and Water Supply Training Project" (hereinafter referred to as "Phase I"). In Phase I, a new training center[3] was established in Addis Ababa that provided permanent training courses focused on well drilling technologies and supplemental courses. In the permanent training courses, the personnel of the regional governments and the Ministry of Water Resources received training. At the start of Phase II, the training center was beginning to be recognized as the core organization for development of human resources engaged in water resource development[4].

Table 1 Outline of Backgrounds Related to Phase I

Phase I: First five years January 1998 to January 2003	Phase I: Extension for two years January 2003 to January 2005
[Background] • Impoverishment of domestic economy due to civil war and drought • Transition to a federal system in 1995 • Shortage of human resources with water supply and ground water development technologies • The lowest water supply and sanitation coverage in Africa	[Background] • Acceleration of decentralization (enhancement of Regional Water Resources Bureaus and District Water Resources Offices) • Enhancement of human resources at the regional level • Establishment of District Water Resources Offices

Source: Created by the author based on the Project Design Matrix of Phase II

1.2 Project Outline

Overall Goal[5]		Access to facilities of water supply improves through water resource development and management.
Project Purpose		Human resources for appropriate groundwater and water supply management increase.
Output	Output 1	Technical trainings regarding groundwater and water supply management are conducted.

[3] Called EWTEC in Phase II and later.
[4] Based on the interview survey with Japanese former experts.
[5] English expressions in some parts of the project outline have been modified from the original ones.

	Output 2	The training courses are developed and improved through research activities.
	Output 3	Technical materials on groundwater management and water supply are developed.
Total Cost (Japanese Side)		436 million yen
Period of Cooperation		March 15, 2005 – March 14, 2008 (3 years)
Implementing Agency		Ministry of Water Resources
Other Relevant Agencies/ Organizations		None in particular
Supporting Agency/ Organization in Japan		None in particular
Related Projects		[Technical Cooperation Projects] "Groundwater Development and Water Supply Training Project Phase I" (1998 – 2005) "The Ethiopian Water Technology Centre Project Phase III" (2008 – 2013) "The Water Sector Capacity Development Project in Southern Nations, Nationalities and People's Region" (2007 – 2011) "Project for Rural Water Supply, Sanitation and Livelihood Improvement through Dissemination of Rope Pumps (RPs) for Drinking Water" (2013 – 2016) [Grant Aid Cooperation Projects] "The Project for the Water Supply in Amhara Regional State" (2005) "The Project for Water Supply in Southern Nations, Nationalities and Peoples' Regional State" (2005) "The Project for Water Supply in Afar Region" (2007) "The Project for Rural Water Supply in Tigray Region" (2010) "The Project for Rural Water Supply in Oromia Region" (2009)

1.3 Outline of the Terminal Evaluation

1.3.1 Achievement Status of Project Purpose at the Time of the Terminal Evaluation

The number of trainees who have completed the training course exceeded the initially planned number of 748 and reached 908 at the time of the terminal evaluation[6]. In the questionnaire survey, 87% of the trainees completed the training courses answered that the content of the training had been "very good" or "good" and 81% of the bosses of the ex-trainees answered that "their performance improved" and 77% of them answered that "the efficiency of work improved,"[7] which means that the project was evaluated to be highly likely to achieve its purpose in terms of the quantity and quality of training[8].

[6] July 2007
[7] Terminal Evaluation Report, p. A5-2.
[8] Terminal Evaluation Report, p. 24.

1.3.2 Achievement Status of Overall Goal at the Time of the Terminal Evaluation (Including Other Impacts)

A rural water supply rate[9] of 24% was specified as the standard value at the time of the ex-ante evaluation. However, the rural water supply rate based on a definition in the Universal Access Plan (hereinafter referred to as "UAP"), a new set of policies in the water supply sector, made a favorable growth afterwards, marking 35% in 2005 and 41% in 2006[10]. After the terminal evaluation, the rural water supply rate continued to improve and was expected to accomplish the 2015 rural water supply rate, an index specified as the overall goal.

Table 2 Standard, Actual Performance and Target Values of Water Supply Rates in Ethiopia

Indicator	Water supply rate: Standard value	Water supply rate: Performance value	Water supply rate: Performance value	Water supply rate: Overall goal value
	2004	2005	2006	2015
	Ex-ante evaluation time	One year after implementation	Two years after implementation	
Nationwide water supply rate	36.7%	45.7%	47.2%	-
Urban water supply rate	-	41.2%	78.0%	-
Rural water supply rate	24.2%	35.0%	41.6%	67.0%
Definition of rural water supply rate	WSDP* 20L per person a day	UAP 15L per person a day	UAP 15L per person a day	WSDP 20L per person a day

* The definition of the water supply rate at the ex-ante evaluation is based on WSDP established in 2002. It is different from the definition of the UAP water supply rate specified in 2005 after the start of the project. Since the definition of the water supply rate as the overall goal value was specified in WSDP at the ex-ante evaluation, the water supply rate in WSDP is used in this table. Note that the definitions of the WSDP and UAP water supply rates do not include the distance to a water supply point.
Source: Report on Record of Discussions, Terminal Evaluation Report and Data from the Ministry of Water Resources

Another impact was that the completion certificate for the Drilling Technology Course became the only official document that certifies a qualification of a drilling engineer during the implementation of the project[11].

1.3.3 Recommendations at the Time of the Terminal Evaluation

[Activities expected to be implemented by the end of this project]

Recommendation 1: Staff shall be assigned promptly as instructors to four of the five basic training courses for which they are needed.

Recommendation 2: The results of the research about the groundwater development and management and the water supply shall be summarized in order to

[9] The rural water supply rate was used as the principal indicator because training was basically provided with a focus on the improvement of the water supply rate in the rural area since Phase I.
[10] Based on the interview survey conducted at the Regional Water Supply Bureaus, Ministry of Water Resources.
[11] Project Completion Report p.59, Implementation and Management Summary Sheet p.1

complete the six teaching materials for the basic and advanced training courses.

Recommendation 3: The communications between the Ministry of Water Resources and EWTEC staff shall be improved for operation and management of the project.

[Activities expected to be implemented by or after the end of this project]

Recommendation 1: The Ministry of Water Resources shall take appropriate measures to secure budget for EWTEC and assign instructors from the viewpoint of operation and sustainability of this project by EWTEC.

Recommendation 2: The legal position of EWTEC shall be promptly established as an organization to define the roles, responsibilities and authorities of EWTEC.

Recommendation 3: EWTEC shall make further efforts to improve the curriculum and teaching materials of the training courses to develop human resources to contribute to improving the water supply rates.

2. Outline of the Evaluation Study

2.1 External Evaluator

Noriyo Aoki, Alfapremia Co., Ltd.

2.2 Duration of Evaluation Study

The following evaluation study was conducted for this ex-post evaluation.

Duration of the Study: October 2015 –February 2017

Duration of Field Study: March 3 - 28, 2016 and May 23 - 26, 2016

2.3 Constraints during the Evaluation Study

2.3.1 Sampling of Beneficiary Survey

The beneficiary survey was planned to extract 200 effective answers from the ex-trainees of Phase II. For the ex-trainees of Phase II, unfortunately only the name and organization at the time of training were recorded; only for ex-trainees of the Rope Pump Manufacturing Course[12] were telephone numbers and other information recorded. It was attempted that information on the ex-trainees of Phase II to be gained from the water resource-related bureaus and Water Works Construction Enterprises of the four major regions (Oromia Region, Amhara Region, Southern Nations, Nationalities and People's Region and Tigray Region). However, as eight or ten years have elapsed since the completion of training, only 95 effective answers[13] were able

[12] A rope pump is a kind of pump installed on a shallow well to enable easy and safe lifting of water using a rope. A rope pump was included in one of the training courses because it can be installed at a low cost and reduce water drawing labor.

[13] Out of all the answers from the Phase II ex-trainees, 95 samples of effective answers were extracted. Out of them, 32 samples of effective answers were extracted using a different questionnaire sheet sent to the ex-trainees of the Rope Pump Manufacturing Course.

to be extracted. The target persons in the survey were also the water supply staff who worked continuously in this field so that a bias in terms of extraction could not be avoided.

2.3.2 Project Design Matrix (hereinafter referred to as "PDM"[14])

Although PDM at the time of ex-ante evaluation needed revising, this project modified the Plan of Operation (hereinafter referred to as "PO")[15] instead of revising PDM, conducted activities based on PO and underwent the terminal evaluation. Although this evaluation examined the project purpose, overall goal and outputs described in PDM, the numeric targets for outputs were compared also with the indicators in PDMe[16] created at the time of the terminal evaluation and partially modified where needed to evaluate this project.

Furthermore, there is logical failure between the project purpose to the overall goal specified in the PDM at the time of ex-ante evaluation. PDM sets "a budget for improving the facilities for water supply is secured to ensure continuation of the water supply service" and "a maintenance system appropriate for the water supply facilities is established" as important assumptions. Although this ex-post evaluation was supposed to analyze also the contribution to achievement of the overall goals other than this project, the specified important assumptions were too large to verify and the evaluation on such aspect was difficult to be conducted. To enable appropriate monitoring of progress of activities and evaluation of this project, the overall goal, important assumptions and objectively verifiable indicators should have been modified to ones appropriate for the project purpose at an early date.

3. Results of the Evaluation (Overall Rating: B[17])

3.1 Relevance (Rating: ③[18])

3.1.1 Relevance to the Development Plan of Ethiopia

In 2002, the Government of Ethiopia established the "Sustainable Development and Poverty Reduction Program" (hereinafter referred to as "SDPRP"; 2005 - 2010) and designated the water sector as one of the high-priority issues. The "Water Sector Development Plan" (hereinafter referred to as "WSDP"; 2002 - 2016) established in the same year as above attached importance to the water resource development for the sake of poverty reduction and sustainable development and set the goal of improving the rural water supply rates throughout Ethiopia[19] from 23% in 2001 to 72% in 2015. The "National Water Supply and Sanitation Master Plan" established in January 2003 pointed out the necessity for securing personnel of

[14] The Project Design Matrix (PDM) is an outline plan of a Technical Cooperation Project and consists of goals, target values, activities, important assumptions, etc.
[15] The Plan of Operation (PO) is the schedule of planned activities.
[16] Although PDMe was not recently created for evaluation purposes, the objectively verifiable indicators were specified in PDMe particularly for Outputs 2 and 3 because PDM did not provide any detailed indicators for them at the time of the terminal evaluation of this project.
[17] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory.
[18] ③: High, ②: Fair, ③: Low.
[19] WSDP defines that the rural water supply rate is the percentage of persons who have access to 20 liters of safe water per day.

the district and regional governments, the implementing agencies and developing their capacities[20].

At the project completion, UAP established in 2005 emphasized the enhancement of development of human resources for water supply[21].

Therefore, this project is confirmed to have relevance with the development policies of Ethiopia both at the time of the ex-ante evaluation and at the project completion.

3.1.2 Relevance to the Development Needs of Ethiopia

Around Phase I, the decentralization policy had promoted the transfer of the rural water supply service to the regional governments and expanded the needs for human resources development at these regional governments. There was a large demand for basic training for the District Water Resources Office staff, an implementing department for the rural water supply project. Therefore, eight Technical Vocational Education Training Colleges (hereinafter referred to as "TVETC"), vocational schools for fostering district staff[22], had been founded at the time of ex-ante evaluation in November 2004. The new teachers hired at TVETC also needed to be provided with training[23].

At the time of the ex-ante evaluation in Phase II, both the central and regional governments recognized the necessity for capacity development of staff engaged in actual operations not only in well drilling technologies but also in planning and technical analysis of water resource development. Therefore, various training demands were manifested, such as the technologies for maintenance and the methods for organizational enhancement[24]. The research of the water field was considered necessary because the water resources were not fully utilized, compared with their potentials[25]. Due to the above needs, the functional enhancement of the training center founded in Phase I was required.

At the time of the terminal evaluation of the project[26] and the project completion[27], the personnel of the region, zone, district and Town Water Supply Services and Water Well Drilling Enterprise needed practical training to accomplish UAP. However, the water sector personnel did not have any other opportunity for practical training than at EWTEC. This project was implemented to satisfy the needs for training of engineers to be engaged in ground water development and water supply[28]. Regarding the needs for improving the capacities of the District Water Resources Office staff, this project provided training to both TVETC trainees

[20] Report on Record of Discussions, p.52. Ministry of Finance and Economic Development & UNDP, Ethiopia-MDGs Needs Assessment Final Draft Report: Water Supply, p.4, 2004.
[21] UAP, p.12.
[22] This is a polytechnic that provides a three-year course to graduates from a lower secondary school and gives them a diploma upon completion of the course. The graduates of the course were supposed to work for a district office at least for six years.
[23] Report on Records of Discussions, p.60-62
[24] Ex-ante evaluation sheet of Project.
[25] Report on Record of Discussions, p.40.
[26] Attachment to Terminal Evaluation Report, Eight Principal Meeting Records.
[27] Ex-ante Evaluation Report on the Project for Groundwater Development and Water Supply Training Phase III, p.5-18
[28] Terminal Evaluation Report, p.27.

and instructors, since the latter of whom were college graduates but did not have sufficient field experience.

The research was conducted on an area with relatively high rainfall but susceptible to adverse influence of droughts to investigate the groundwater potential amount, create well registers and study the volcanic geology information, etc. The establishment of Geographical Information System (hereinafter referred to as GIS) that accumulated various data such as ground water models was an activity that complemented the contents of training for specific case studies at EWTEC. It was appropriate to plan the use of the research results as teaching materials in the training.

The needs for a development of human resources for water supply, which was highly urgent at the time of the ex-ante evaluation, were satisfied by the enhancement of capacities of personnel by the end of this project.

From the above perspectives, the project had contents that were adequately selected and had high priorities and were highly relevant with the development needs from the time of the ex-ante evaluation to the completion of the project.

3.1.3 Relevance to Japan's ODA Policy

The "Country Assistance Program for Ethiopia" formulated in August 2000 listed "environment conservation" as one of the priority areas of assistance and specified to implement assistance for development of water and sewerage services. The Third Tokyo International Conference on African Development (hereinafter referred to as "TICAD III" (2003)) emphasized the necessity for specific assistance in the water resource development and water supply fields regarding two of the three priority fields in Japan's assistance to Africa: "human-centered development" and "poverty reduction through economic growth"[29].

In light of the above, this project has been highly relevant with Ethiopia's development plan and needs as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Effectiveness and Impact (Rating: ③)

3.2.1 Effectiveness

3.2.1.1 Project Output

The degrees of achievement of the objectively verifiable indicators are summarized in the attached table.

1) Output 1

The number of training courses was targeted at 21 at the time of the ex-ante evaluation but was modified to 20 in the March 2006 and July 2007 versions of PO. Although the numbers of basic courses[30] and advanced courses[31] were conducted as planned, the number of on-demand

[29] Keynote speech delivered by Prime Minister Koizumi at the Third Tokyo International Conference on African Development in September 2003.

[30] Consist of six permanent courses (Groundwater Management, Drilling Technology, Drilling Machinery Maintenance Technology, Local Social Development, Water Supply Engineering and Electro-Mechanical Maintenance Technology).

courses[32] did not reach the planned number. The targeted total number of trainings provided was evaluated using PO in the terminal evaluation because PDM did not provide a numerical goal. The total number of courses provided was mostly achieved because the value provided in PO was used as a goal. The demand survey about the content of the lectures in the training courses was conducted once in the first year. This demand survey was conducted on the directors or higher executives of the Water Resources Bureaus and Water Works Construction Enterprises of the four major regions (Amhara Region, Oromia Region, Southern Nations, Nationalities and People's Region and Tigray Region) using one of the two methods: (1) Interviews by asking them what kind of training they wanted their subordinates to receive and what kind of knowledge they wanted them to gain and (2) multiple-choice system in which they were asked to select from many training choices prepared in advance[33].

Table 3 Number of Training Courses: Targets and Actual Performances

Indicator	Number of courses: Target value (Dec. 2005)	Number of courses: Performance value (Jul. 2007)	Number of courses: Performance value (Mar. 2008)
	PO	Terminal evaluation time	Project completion time
Basic Courses	6	6	6
Advanced Courses	6	6	6
On-demand Courses	8	3	4
Total	20	15	16

Table 4 Total Number of Trainings: Targets and Actual Performances

Total number of trainings: Target value (Dec. 2005)	Total number of trainings: Performance value (Jul. 2007)	Total number of trainings: Performance value (Mar. 2008)
PO	Terminal evaluation time	Project completion time
30	24	28
15	11	13
15	12	16
60	47	57

Source: PO, Terminal Evaluation Report, Project Completion Report - Summary Table, Project Completion Report p.2-6.

Regarding the management of training courses, the basic courses implemented by the Ethiopian side were managed by the Ethiopian counterpart in the second year onwards while the advanced and on-demand courses were managed jointly by the Japanese and Ethiopian sides[34]. In the beneficiary survey[35], 94% of the respondents answered that "training had been properly managed."

[31] Consist of six courses for advanced learners (Groundwater Modeling, GIS/Information Management (1), GIS/Information Management (2), Water Supply Engineering (Planning and Designing), Water Supply Engineering (Operation and Maintenance) and Remote Sensing).

[32] Additional courses to the basic and advanced courses, which are supplementally established on a demand basis. The Rehabilitation of Well, Rope Pump Manufacturing and Electro-Mechanical Maintenance Technology are included in the on-demand courses.

[33] Based on the interview survey with Japanese former experts.

[34] Based on the interview survey with Japanese former experts.

[35] The ex-trainees in Phase II were surveyed. Sixty-three samples were collected as effective responses (excluding the 32 samples from the ex-trainees of Rope Pump Manufacturing Course). When classified by attributes, the samples were composed of 44% region personnel, 22% zone personnel, 17% District Water Resources Office personnel, 3% TVETC personnel and 11% Water Works Construction Enterprise personnel. By age groups, they were composed of 5% in 20s, 24% in 30s, 48% in 40s, 21% in 50s and 3% in 60s. By sexes, they were composed of 95% male and 5% female personnel.

2) Output 2

For Output 2, study activities were conducted to develop and improve training courses. The demonstration site for research activities for Output 2 served also as the practical training site for Output 1 and contributed to diversifying the training content both for instructors and trainees. In this sense, the outcome of the study activities contributed to improving and reinforcing the training content for Output 1. The study activities included experimental verification study and activities related to making and popularizing rope pumps based on the verification test from the viewpoint of low cost technology[36]. The Rope Pump Manufacturing Course, established as an on-demand training course, fostered 43 rope pump artisans in the four major regions[37] and distributed 500 rope pumps in the four regions, successfully achieving the goal, with the cooperation of the Regional Water Resources Bureau and District Water Resources Offices. Although the installation of rope pumps was not included in the activities at first, ex-trainees who were trained in the Rope Pump Manufacturing Course to be experts in soldering and manufacturing installed 144 rope pumps under the supervision of the District Water Resources Offices[38]. In view of these series of activities, this project is considered to have achieved Output 2.

3) Output 3

Output 3 regarding development of teaching materials for training courses was regarded as a required improvement in the terminal evaluation. According to the Project Completion Report, however, six teaching materials were completed based on the research activity results from Output 2 by the time of project completion. Since the teaching materials were completed nearly at the end of Phase II, such teaching materials as a hydrogeological map of the Butajira-Ziway areas were utilized in the training in Phase III such as the Groundwater Management and GIS Courses. At present, the series of the survey results are stored in the library of EWTI and used by instructors as references. This project is considered to have achieved Output 3.

3.2.1.2 Achievement of Project Purpose

The Terminal Evaluation Report and the Project Completion Report showed that, regarding Indicator 1 of the project purpose, 162% of the planned number of trainees who completed the training courses was achieved as shown in Table 6. Regarding Indicator 2, the training impact survey conducted on the ex-trainees found that 87% of them thought that the training was either excellent or good. The survey conducted on the immediate bosses found that 76% of them thought that the training was either very effective or fairly effective, thus confirming their high degree of satisfaction.

[36] In this project, "*Tekisei Gijutsu*" in Japanese (appropriate technology) is translated as "low cost technology" in English.
[37] The number of participants in the Rope Pump Manufacturing Course was 68 and included the water service personnel of District Water Resources Offices, etc.
[38] Project Completion Report p.8-2. These installed rope pumps were provided with follow-up and 100% installation was achieved in the "The Water Sector Capacity Development Project in Southern Nations, Nationalities and People's Region (2007 – 2011)."

At the time of the ex-post evaluation, the results of the interview and beneficiary survey were sufficient to conclude that the activities in this project enhanced the capacity of human resources for water supply in Ethiopia both qualitatively and quantitatively and achieved the project purpose.

Table 5 Achievement Status of Project Purpose

Goal	Indicator	Actual performance value
Project purpose	Indicator 1: Number of trainees who completed the training courses	Achieved as shown in Table 6.
	Indicator 2: Degrees of satisfaction of ex-trainees and their bosses regarding the outcome of training	The training impact survey confirmed high degrees of satisfaction.

Table 6 Number of Trainees Who Completed the Training Courses: Plan and Actual Performance
(June 2006 to March 2008) (Unit: Person)

Year	Number of trainees who completed the training courses: Target value (Dec. 2005)	Number of trainees who completed the training courses: Performance value (Jul. 2007)	Number of trainees who completed the training courses: Performance value (Mar. 2008)
	Ex-ante evaluation sheet	Terminal evaluation time	Project completion time
First year	172	519	519
Second year	288	334	334
Third year	288	55	359
Total	748	908	1212

Source: Ex-ante Evaluation Sheet, Terminal Evaluation Report p.20, Project Completion Report - Summary Sheet by Leader

As described earlier, the survey results of Output 2 were summarized into teaching materials of Output 3 during the project period. The teaching materials were created by the experts, project participants and counterpart personnel while the involvement of internal personnel was mostly achieved. Although the utilization of these teaching materials in actual training began only in Phase III, the research site of Output 2 was utilized as the practical training site of Output 1, which contributed to diversifying the training contents and increasing the training time on site[39].

In a comprehensive view of the circumstances, the project purpose was achieved with these three Outputs.

3.2.2 Impact

3.2.2.1 Achievement of Overall Goal

The objectively verifiable indicator specified for the overall goal (“Access to improved facilities of water supply increases through water resource development and management”) is the rural water supply rate, but the definition of a rural water supply rate at the time of ex-post evaluation was changed. WSDP, the policy at the time of ex-ante evaluation, defines that the

[39] Based on the interview survey with Japanese former experts.

rural water supply rate is the percentage of persons who have access to 20 liters of water per day. However, GTP, the policy at the time of ex-post evaluation, defines that it is the percentage of persons who have access to 15 liters of water per day in an area with a radius of 1.5km or less, with a lower supplied water amount but with a defined distance. Although the definition was changed, Table 7 shows that the actual performance value of 2015 for rural water supply rate is 98.0%, which was high enough to consider that the target value at the time of ex-ante evaluation had been achieved.

Table 7 Water Supply Rates of Ethiopia (Standard, Target and Actual Performance Values)

Indicator	Water supply rate: Standard value	Water supply rate: Long-term target value	Water supply rate: Performance value
	2004	2015	2015
	Ex-ante evaluation time		Ex-post evaluation time
Nationwide water supply rate	36.7%	-	98.5%
Urban water supply rate	-	-	100%
Rural water supply rate	24.2%	67.0%	98.0%
Definition of rural water supply rate	WSDP 20L per person a day	WSDP 20L per person a day	GTP 15L per person a day Radius of 1.5km or less

Source: PO, Terminal Evaluation Report, Project Completion Report p.2-6.

Furthermore, human resources development is continued after the project completion and the technologies and knowledge acquired in the training of this project are utilized at the time of ex-post evaluation. Therefore, the development of human resources engaged in groundwater development and water supply in this project is considered to have generally contributed to improving the access to water supply facilities through water resource development and management.

It is therefore concluded that the project generally achieved the overall goal.

3.2.2.2 Continuation of Training Activities in Phase III, EWTI

1) Training Activities in Phase III

After the completion of Phase II, Phase III was implemented for five years to enhance the functions for development of human resources for underground water development and water supply. While continuing the training courses in Phase II, the Ethiopian side managed the operation of all the courses and the Japanese side provided support from technical point of view so that activities are conducted in a way to enhance the future sustainability. EWTEC was positioned as the project of JICA and the Ministry of Water Resources. In Phase III, organizational enhancement was promoted so that it could become an Ethiopian agency with legal foundation as an exit strategy for the cooperation so far.

2) Training Activities by EWTI

EWTEC was reorganized to EWTI in August 2013 after the project completion of Phase III. As described in the section on sustainability, short-term training for workers in the water field has been provided with the budget and management of the Ethiopian side.

3.2.2.3 Other Positive and Negative Impacts

1) Satisfaction of Assistance Needs of TVETC

The teachers of TVETC were taken into the Electro-Mechanical Maintenance Technology (hereinafter referred to as "EMMT") course of EWTEC. Also, short EMMT courses were held for students at five TVETCs in the local area[40]. These are a kind of on-demand courses at TVETCs to which equipment was brought and at which training were provided to teachers and trainees, which is similar to the form of delivery services. Since the TVETC teachers were not providing their students with training that was practical in the field, the EWTEC lectures based on actual experience and including a variety of examples satisfied the assistance needs of TVETCs at the time[41].

2) Re-evaluation of Training Courses at the Time of Ex-Post Evaluation

The beneficiary survey on ex-trainees was conducted to re-evaluate the training in Phase II. As a result, 78% of the respondents re-evaluated it as "very useful" and 96% answered that the reason was "acquisition of knowledge and technologies useful for work" (multiple answers allowed).

Table 8 Usefulness of Training Courses (Re-evaluation at the Time of Ex-Post Evaluation)

	Number of samples	Ratio
Very useful	**49**	**78%**
Useful	12	19%
Partially useful	2	3%
Not very useful	0	0
Not useful	0	0

Source: Beneficiary survey on the ex-trainees in Phase II.

Table 9 Reason for Answering Useful (Multiple Answers Allowed) (Re-evaluation at the Time of Ex-Post Evaluation)

	Number of samples	Ratio
I acquired knowledge and technologies useful for work.	**58**	**96%**
I can teach knowledge and technologies*.	32	51%
I acquired new knowledge and technologies.	57	91%
A network was created with other participants in training.	9	14%

* This means that the ex-trainees can transfer knowledge and technologies to their colleagues and subordinates.

Source: Beneficiary survey on the ex-trainees in Phase II.

[40] Project Completion Report p.7-8.

[41] Based on the interview survey with former EWTEC instructors and experts.

As an impact to work after the end of training of ex-trainees, it was confirmed, at the time of the ex-post evaluation, that some of them were utilizing the teaching materials used in the training in Phase II. The teaching materials were shared in the organizations to which the ex-trainees belonged and has been used continuously for the past eight to ten years[42]. As shown in Table 10, the beneficiary survey also discovered that 49% of the ex-trainees used the teaching materials utilized in the training for their work. Two trainees who came from other countries (Lesotho and Tanzania) to participate in the training also answered in the e-mail beneficiary survey that they used the teaching materials for their work[43]. Since they used teaching materials that were created mainly in Phase I, they cannot be classified into the output of Phase II. However, it is apparent that the training content was organized effectively so that it can be utilized for daily work.

Table 10 Contents and Utilization of Teaching Materials (Multiple Answers Allowed) (Re-evaluation at the Time of Ex-Post Evaluation)

	Number of samples	Ratio
The contents are appropriately described.	52	83%
Easy to understand.	49	78%
Difficult.	0	0%
Many technical terms are used.	9	14%
Teaching materials are used for work at present.	**31**	**49%**

Source: Beneficiary survey on the ex-trainees in Phase II.

3) Synergy Effects with Japanese Grant Aid Projects Related to Water Supply

Phase II was implemented in a period when the Japanese grant aid projects for construction of water supply facilities were either planned or implemented in the Southern Nations, Nationalities and People's Region, Afar Region, Amhara Region, Tigray Region and Oromia Region. The numbers of trainees completed the training courses in Phase II are 149 from the Southern Nations, Nationalities and People's Region, 35 from the Afar Region, 103 from the Amhara Region, 71 from the Tigray Region and 175 from the Oromia Region. Some ex-trainees of Phase II gave comments that they were either directly or indirectly engaged in grant aid projects and that they had made the most of the training that they had received at EWTEC in their work[44]. This project provided well rehabilitation training using borehole investigation by television camera targeted at the Regional Water Resources Bureau personnel in consideration of the project in the Afar Region[45].

[42] Based on the interview survey conducted at the Tigray Regional Water Resources Bureau.
[43] The questionnaire sheet for beneficiary survey was sent via e-mail to third-country trainees in Phase II (four effective responses). The questionnaire sheet was sent to 15 ex-trainees.
[44] Based on the interview survey conducted at the Tigray Regional Water Resources Bureau.
[45] Project Completion Report p.7-8.

4) Other Ripple Effects

(1) There were several local water supply experts who pointed out that the long-term supply of training since Phase I in the courses on groundwater investigation, drilling machinery and drilling technology increased the number of groundwater drilling engineers and improved the success rate in drilling wells although these impacts cannot be regarded only as those of Phase II[46]. Since there was no practical training organization before the Phase I cooperation project, this impact can be considered, in a broad sense, as one of the impacts of the groundwater development and water supply training project.

(2) Phase II was a stage for fully informing the water supply personnel of the convenience of rope pumps, which were not yet widely used in Ethiopia at the time and promoting publicity and widespread use among the general public. Therefore, supplemental technical training related to manufacturing was provided. For example, it was necessary to teach how to tension a belt and how to install a rope pump in relation to the depth of a well so that a follow-up was provided during the period of Phase II. Later, the rope pumps distributed and installed over the four major regions in Phase II were provided with further full follow-up as activities in the technical cooperation project, "The Water Sector Capacity Development Project in Southern Nations, Nationalities and People's Region." Specifically, the follow-up included explanation on the installation method, training for quality control of rope pumps and monitoring required after use for a certain period.

Out of the 35 effective responses in the beneficiary survey on the ex-trainees of the rope pump training in Phase II, there were 26 manufacturers. According to the result, Phase II was the stage for creating the demand[47] and, due to the guaranteed purchase by the government, all the manufacturers who were ex-trainees started manufacturing rope pumps immediately after the training. However, there were such problems as difficulty in acquiring parts and materials. In one example reported for Phase II, an installed rope pump was used for small-scale irrigation for cultivation of cash crops in an effort to increase cash income[48]. After the benefit of rope pumps became well-known, private manufacturers of low-price and low-grade rope pumps entered the market, causing such problems as difficulty in sale and loss of trust in the products. However, there are three ex-trainees who continue to manufacture rope pumps while gaining profits on a market basis even at the time of the ex-post evaluation. One of these ex-trainees (a TVETC instructor) who continued to make improvements on his own to ensure technical sustainability manufactured 2,000 units in the Amhara Region by the time of the ex-post evaluation. These rope pumps were distributed through the District Water Resources Offices and are in use in the rural villages in this region[49].

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[46] Interview survey on ex-trainees and former instructors of Phases I and II.
[47] Arousing potential demand by showing the convenience and usefulness of rope pumps.
[48] Experts' Report and Experts' Report on Low Cost Technology Expansion Plan
[49] Interview survey.

(3) While it was a commonly accepted view that the groundwater in the Rift Valley Basin contained lots of fluorine, the hydrogeological survey in the Butajira-Ziway areas in Phase II discovered the presence of a stratum with abundant groundwater with exceedingly low fluorine content and fit for drinking, triggering the implementation of a groundwater development study and a water supply project in relation to the Rift Valley Basin[50].

In light of the above, the effectiveness is evaluated to be high because the project has achieved the project purpose of developing human resources for appropriate groundwater management and water supply management. The effects are continuously manifesting themselves due to training provided in Phase III and by EWTI. The impact is also high because a variety of technologies and teaching materials provided in the training are in use by the personnel engaged in groundwater development and water supply even at the time of the ex-post evaluation and the technologies acquired in this project are utilized for work at present. Therefore, the effectiveness and impact of the project are considered to be high.

3.3 Efficiency (Rating: ②)

3.3.1 Inputs

Table 11 Comparison of Plan and Actual Performance of Inputs

Inputs	**Plan**	**Actual Performance** (Project completion time)
(1) Experts	- Long-term: 2 persons Chief Advisor and Coordinator - Short-term: Number of persons not indicated 11 fields: Groundwater modeling, GIS, remote sensing, geophysical investigation, hydrogeology, drilling technology and rehabilitation of well, water supply management, water supply engineering and designing, machinery maintenance workshop management, electro-mechanical maintenance and rural community development	- Long-term: 2 persons Chief Advisor and Coordinator - Short-term: 15 persons Total: 17 persons, 81.35 MM 13 fields: Maintenance technology for electro-mechanical equipment related to water supply, groundwater modeling, borehole investigation by television camera, hydrology and hydraulics, remote sensing, groundwater modeling, GIS/information management, water supply engineering (planning and designing), water supply engineering (structure and calculation), volcanic geology, rehabilitation of well, training course management
(2) Trainees Received	17 million yen (the planned number of trainees was not described)	2 persons
(3) Equipment	48 million yen	6 million yen Spare parts for well drilling equipment, accessories for well drilling, etc.
(4) Third-country Training[51]	Planned but the number of participants is unknown.	78 persons
(5) Project Operation	Not indicated	147 million yen

[50] Based on the interview survey with Japanese former experts.
[51] This training was planned to invite trainees from African countries to Ethiopia (EWTEC) in this project.

Inputs	Plan	Actual Performance (Project completion time)
Expenses		
Total Project Cost (Japanese Side)	360 million yen	436 million yen
Inputs from the Government of Ethiopia	1. Allocation of the counterpart personnel 1) Project Director 2) Project Manager 3) Training Center Manager 4) Assignment of a Course Coordinator for dispatch of short-term experts 2. Providing land and facilities, providing project offices and payment of electric and water expenses 3. Payment of local costs, C/P salaries and payment of part of training implementation costs	1. Allocation of the counterpart personnel: 14 persons 1) 1 Project Director, Ministry of Water Resources 2) 1 Project Manager, Director of Rural Water Bureau 3) 3 Technical Advisors 4) 1 Training Center Manager 5) Assignment of 7 Course Coordinators for dispatch of short-term experts 6) 1 Drilling Engineer and 1 Electric Engineer In addition, 43 persons for administrative staff, drivers and security guards were assigned. 2. Providing land and facilities, providing of project offices and payment of utility charges such as electric and water expenses 3. Local cost of 58 million yen Mainly salaries of contract and temporary employees and daily allowances and transportation costs for training participants during implementation of basic courses

Source: Record of Discussions, Project Completion Report, Terminal Evaluation Report

3.3.1.1 Elements of Inputs

This project adopted a system for dispatching directly employed experts in the first year and experts on a contract basis to perform duties in the second and third years. As for acceptance of trainees, training in Japan was provided to the project-related personnel of the Ministry of Water Resources to strengthen their involvement. Technology transfer was conducted mainly through the project activities in Ethiopia, not through the training in Japan[52].

3.3.1.2 Project Cost

As for the project cost, the planned amount of the Japanese-side cost was 360 million yen whereas the actual amount was 436 million yen. Therefore, it was higher than planned (121% of the planned value). Although the planned project cost did not include Ethiopia's share of the project cost, the Ethiopian side paid 58 million yen for it.

[52] Based on the interview survey with Japanese former experts.

Furthermore, a local consultant was hired for the detailed research activities for Output 2[53]. The cost of this research for Output 2 was the largest spending item in the two-year period of the JICA Consultancy Contract.

The provision of equipment was planned to be 48 million yen at the time of the ex-ante evaluation but was indicated as 6 million yen in the Terminal Evaluation Report. According to a Japanese former expert, spending of 15 million yen was confirmed at the project completion as the material and equipment cost in the two years of the contract. The spending on the equipment cost in the entire project period could not be confirmed.

3.3.1.3 Period of Cooperation

The project period was planned as and actually was 36 months from March 2005 to March 2008. The project was completed as planned.

In light of the above, whereas the project period was as planned, the project cost exceeded than the original plan. Therefore, the efficiency of the project is fair.

3.4 Sustainability (Rating: ②)

3.4.1 Related Policy and Institutional Aspects for the Sustainability of Project Effects

At the time of the ex-post evaluation, the water supply sector strategy described in the "Growth and Transformation Plan II (hereinafter referred to as "GTP II" (2016 - 2020)" emphasized the importance of human resources development for the sake of the implementation of the water supply plan and specified the planned number of persons for the training plan. This plan also refers to the training on the drilling technologies and others at EWTI.

The Government of Ethiopia has set a new goal for water supply rate, which specified an amount of water supply and a shorter distance of access to a water supply point[54] and is pursuing development of human resources for water supply in accordance with it. Therefore, the sustainability of this project in terms of policies is high.

3.4.2 Organizational Aspects of the Implementing Agency for the Sustainability of Project Effects

3.4.2.1 Organizational System

At the time of implementation of this project, EWTEC was a project not included in the organizational chart of the Ministry of Water Resources at the time. The position and the long-term role & responsibility of EWTEC were not altogether clear. In August 2013, EWTEC was reorganized to EWTI[55], becoming an independent organization from a project

[53] The spending was for production of geological and hydrogeological maps of the Butajira-Ziway areas, construction of GIS database, inventory survey on existing water sources at 14,700 locations, test drilling of six observation wells, implementation of water level observation for 12 months, production of a research report, a socio-economic survey report on six villages and a groundwater modeling, etc.

[54] Refers to public water taps and wells.

[55] Council of Ministers Regulation, No.293, 2013.

of the Ministry of Water Resources[56]. EWTI receives budget from the Ministry of Finance and Economic Development, has a Director-General appointed by the Council of Ministers attached to the Office of the Prime Minister and submits reports to the Federal Parliamentary Assembly. However, these reports are always submitted also to the Ministry of Water, Irrigation and Energy. Furthermore, EWTI is subject to evaluation and monitoring by the Assembly.

The Business Process Restructuring that provides job descriptions of personnel of EWTI has already been approved. For establishment of the five-year plan (2016 - 2020) of EWTI, a Balance Score Card (BSC)[57] is simultaneously under preparation.

3.4.2.2 Personnel System

In Phase II, the job separation rate was not particularly high except for personnel reshuffles at the Ministry of Water Resources. The job separation rate increased in Phase III and later. Many people left their jobs after EWTEC was reorganized to EWTI after the end of the JICA project cooperation. There were also some employees who quit because of their employment conditions, particularly salaries. At the time of the ex-post evaluation, the employment of new instructors was progressing.

GTP II that addresses the targets of the government, describes the number of human resources to be developed for water supply. EWTI established the GTP II plan of EWTI in accordance with GTP II and set the target numbers of instructors and personnel. Table 12 shows the number of personnel of EWTI.

Table 12 Transition of Number of Instructors & Staff and Future Plan (Unit: Person)

Indicator	Phase II (2005 – 2008)	Ex-post evaluation time (2016)	GTP II targets (2019)
Instructors	16*	21	58
Contract instructors	NA	3	4
Personnel	47	94	177
Total	63	118	239

* Not including Japanese experts.
Source: Terminal Evaluation Report A2-15 and answers to questionnaire sheets.

3.4.2.3 System for Providing Training

In Phase II, EWTEC had classrooms and accommodations with a limited capacity for 40 persons. At the time of the ex-post evaluation, however, the extension and expansion work was in progress. The training courses were limited to short-term courses. However, long-term courses in accordance with the Ethiopian Occupational Standard are planned for the future.

[56] This organization has the following four purposes: 1. Providing middle and long-term training on the water and water-related fields; 2. Conducting survey and technology transfer on the water and water-related fields; 3. Enhancing the capacities of TVETC instructors; 4. Constructing special laboratories and providing laboratory services (Director of Ethiopia Water Technology Institute; EWTI).

[57] BSC serves both as a plan and a tool for evaluating the performance to check whether the plan has been implemented.

For EWTEC, new equipment was procured in the provision of equipment in Phase III and in grant aid project implemented after Phase III.

In FY2015, the planned number of training participants was 298 but there were actually 219 participants. The following table shows the training courses planned to be provided by EWTI. In 2015, additional instructors were hired and the number of courses was increased. The permanent training courses for TVETC teachers are under review. The training demand survey was conducted in Phase III. Even after transition to EWTI, detailed demand survey for personnel related to water supply is conducted[58].

Table 13 Training Courses Planned to Be Provided by EWTI

	EWTI	Annual plan
Basic Courses (classification in Phase II)		
Groundwater Investigation	Yes	60 persons per year
Drilling Technology	Yes	40 persons per year
Drilling Machinery Maintenance Technology	Yes	40 persons per year
Water Supply Engineering	Yes	60 persons per year
Electro-Mechanical Maintenance Technology	Yes	60 persons per year
Advanced Courses (classification in Phase II)		
Groundwater Modeling	No	
GIS/Information Management	Yes	15 persons per year
On-demand Courses (classification in Phase II)		
Rehabilitation of Well	Yes	30 persons per year

Note) Annual plan of trainees in 2016-2017. A new course on irrigation and drainage designing will be added.
Source: EWTI

The sustainability of the organization, which required improvement at the project completion, is being improved and the organization and personnel systems of the implementing organization have been almost established; the system for providing training has been mostly improved.

3.4.3 Technical Aspects of the Implementing Agency for the Sustainability of Project Effects

The part of teaching materials related to technological progress in IT and others is revised by the EWTI instructors. The production of other teaching materials is contracted out to external persons. The training demand survey is also conducted by entrusted external persons. For some of the courses, the EWTEC teaching materials will be updated by instructors who were hired at the time of the ex-post evaluation. There is a need for instructors with a wealth of work experience who are capable of delivering lectures regarding not only theories but also practical skills. To enhance the capacity of the instructors, EWTI is planning to allow newly hired instructors after the establishment of EWTI to study abroad or advance to the PhD and master's courses of universities. It also considers it necessary to support the existing instructors in gaining practical work experience for the sake of substantial capacity

[58] Based on the interview survey with Japanese former experts. Answer to the EWTI questionnaire sheet.

enhancement. Since most of the instructors in the days of EWTEC have resigned, how to hire instructors experienced in actual work including field work for the respective training courses is an issue to be solved.

3.4.4 Financial Aspects of the Implementing Agency for the Sustainability of Project Effects

EWTI is receiving budget directly from the Ministry of Finance and Economic Development based on the GTP II plan of EWTI that was approved by the Council of Ministers attached to the Office of the Prime Minister. As the financial information, the actual expenditure for the EWTI training in 2013 is 1.651 million birr. Although the actual expenditure in 2014 was not available[59], the actual expenditure for the EWTI training in 2015 increased significantly to 4.342 million birr[60]. In 2016, a budget of 6.689 million birr was secured for the EWTI training and, as of May 2016, 5.435 million birr has been spent. It was confirmed with the implementing agency that a budget from the Ministry of Finance and Economic Development would be secured in accordance with the GTP II plan (five-year plan) of EWTI. Therefore, there was no problem identified with the finance.

The sustainability of the policies is high, the organizational system of EWTI as an independent organization has been mostly established and the system for providing training has been generally secured. Therefore, sustainability in terms of both organizations and systems is high. The financial sustainability is also high because an appropriate budget is secured for the plan. However, some minor problems have been observed in terms of the sustainability from technical aspects: There was a need for instructors with abundant work experience who could teach not only theories but also practical skills and the existing instructors also needed capacity enhancement.

Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Ethiopia Water Technology Center Project ("The Project for Groundwater Development and Water Supply Training Phase II") was implemented to enhance development of the human resources for groundwater and water supply management in Ethiopia. The details of the project are relevant to the development policies of Ethiopia and the priority fields of ODA policies of Japan, for which there are high development needs. Therefore, its relevance is high. Although the project period was within the plan, the project cost was higher than planned. Therefore, its efficiency is fair. The effectiveness is evaluated to be high because this project is developing human resources for groundwater and water supply management both qualitatively

[59] No detailed financial information was available because no annual activity plan report was created for 2014 and the person in charge of finance was transferred.
[60] EWTI 2015 Annual Budget Year Completion Report.

and quantitatively. The effects have been continuously manifested until the time of the ex-post evaluation due to training provided in Phase III and by the Ethiopia Water Technology Institute (hereinafter referred to as "EWTI"), a succeeding organization of this Center. The technologies and teaching materials for training are utilized by ex-trainees who are engaged in groundwater development and water supply for their work at the time of the ex-post evaluation. The impact of the project is also high. The sustainability of the policies is high and the organizational system of EWTI as an independent organization has been mostly established. The sustainability in terms of both organizations and systems is high. The financial sustainability is also high because an appropriate budget is secured for the plan. The sustainability is generally evaluated to be fair because the technical sustainability is regarded as an issue. There is a need for instructors with abundant work experience who could teach not only theories but also practical skills and the existing instructors also needed capacity enhancement.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

Utilization of Human Resources with Abundant Work Experience as Instructors

As a capacity enhancement plan for human resources who serve as instructors, EWTI is planning to develop human resources mainly through degree acquisition. To reinforce the contents of training courses, there is a need for instructors with abundant work experience who are capable of delivering lectures regarding not only theories but also practical skills. Since most of the instructors in the days of EWTEC have resigned, it is necessary to hire or make the most of instructors with experience in actual work and in the field for the respective training courses. Refresher training will be provided to the currently employed instructors, starting with those who have more work experience than others.

Reorganization of Knowledge and Experience Gained in the Days of EWTEC and Providing Practical Work-Oriented Training Based on It

The teaching materials and modules used in Phases I, II and III of EWTEC are treasured by the ex-trainees and utilized in some fields even at present. Since these teaching materials were based on work experience, they are utilized also in the organizations to which they belong. Although EWTI was outsourcing the production of teaching materials at the time of the ex-post evaluation, it is required to utilize the teaching materials in the days of EWTEC in the lectures related to practical training to ensure supply of training that is useful in actual work. It is necessary to learn what can be picked up from experience accumulated about the operation and management of the training courses in the days of EWTEC.

4.2.2 Recommendations to JICA

The beneficiary survey and others confirmed that the benefits and impacts of the 15-year cooperation on groundwater development and water supply training plan of the technical

cooperation project are positively materializing in the water supply field of Ethiopia. This ex-post evaluation is targeted at Phase II and therefore is focused on this phase only. It is important to conduct summative evaluation and impact evaluation on the 15-year technical cooperation to clarify the contribution to the water supply field of Ethiopia and extract and record suggestions and lessons to be learned, if any.

4.3 Lessons Learned

Necessity of PDM Guidelines

This project was implemented in three years during which no mid-term evaluation was conducted. Therefore, PDM formulated at the project planning was not revised and PO was modified and used instead until the terminal evaluation. When the second-year JICA Consultancy Contract period was started, the overall goal, project purpose and indicators of the PDM should have been set appropriately so that the description of activities of the PDM matched with the PO for the sake of appropriate project management. If the objectively verifiable indicators of a technical cooperation project have not been set within one year after the project start, or if the goals and/or purposes need structural improvement, JICA should positively encourage the project to revise the PDM. Furthermore, JICA should create PDM guidelines that provide many good and bad examples of PDM, such as those with good organization and leaps in logics, which can be referred to when planning, implementation, monitoring and evaluation. Such PDM guidelines should be utilized to facilitate and ensure appropriate creation, supervision and revision of PDM for JICA technical cooperation projects.

Attached Table: Achievement Status of the Objectively Verifiable Indicators
(PDM and PDMe indicators used for the terminal evaluation and indicators modified at the time of the ex-post evaluation)

	Objectively Verifiable Indicator	Reason for not using indicators; used indicators; their status of achievement
Output 1: Technical trainings regarding groundwater and water supply management are conducted.		
PDM	(Indicators) Implementation of the planned number of the training courses Number of created documents related to training course management 1. Annual plan 2. Implementation plans for respective training courses formulated 3. Evaluation reports for respective training courses formulated	These indicators were not used for the ex-post evaluation because no numeric targets were provided. The PDMe indicators were used instead.
PDMe	(Indicator 1) The planned number of training courses (21) are implemented. (Indicator 2) The documents related to the management of training courses (annual plan, implementation plans for respective training courses and evaluation reports for respective training courses) are created.	(Indicator 1) While 21 courses were planned, 16 courses were implemented. Six basic courses and six advanced courses were implemented as planned. Although six on-demand courses were planned, three courses were implemented. Most of the planned courses were implemented. (Indicator 2) The annual plan of training was formulated by the Manager of EWTEC and the Japanese experts. The implementation plans of basic courses and evaluation reports for respective training courses were compiled by the C/P. All of these documents related to training course management were submitted to and approved by the Director of the Rural Water Supply and Sanitation Bureau, Ministry of Water Resources. The evaluation reports for respective training courses were summarized in the summative evaluation.
Output 2: The training courses are developed and improved through research activities.		
PDM	(Indicators) Number of developed or revised textbooks/teaching materials and curricula of the training courses related to groundwater development and development of low cost technology	These indicators were not used for the ex-post evaluation because no numeric targets were provided. The PDMe indicators were used instead.

	Objectively Verifiable Indicator	Reason for not using indicators; used indicators; their status of achievement
PDMe	(Indicator 1) Status of creation of geological and hydrogeological maps of the Butajira-Ziway survey areas (Target: completion) and status of utilization of these maps as the teaching materials in the training courses	(Indicator 1) Geological and hydrogeological maps were created based on the survey. They were utilized as teaching materials in training in Phase III.
	(Indicator 2) Status of construction of GIS database on the Butajira-Ziway survey areas (Target: completion) and status of utilization of it in the training courses	(Indicator 2) The construction of related maps and GIS database was completed within the project period. They were utilized as teaching materials in training in Phase III.
	(Indicator 3) Number of inventories of existing water sources in the Butajira-Ziway survey areas (Target: 8,000 locations or more)	(Indicator 3) Inventory survey was conducted on all the existing wells including traditionally dug wells. Inventory was created for 14,700 locations, exceeding by far the target of 8,000 locations.
	(Indicator 4) Number of test-drilled observation wells in the Butajira-Ziway survey areas (Target: six locations or more) and number of times of monthly water level observation (Target: 12 times or more)	(Indicator 4) Six observation wells were dug, where monthly water level observation was conducted for 12 months. The result was included in the research report.
	(Indicator 5) Status of production of socio-economic survey report covering six villages in the Butajira-Ziway survey areas	(Indicator 5) Socio-economic survey was conducted in the six villages where observation wells were test-drilled and a report was created.
	(Indicator 6) Status of production of groundwater models (Target: end of production)	(Indicator 6) A model of groundwater flow mechanism in the Butajira-Ziway areas was created.
	(Indicator 7) Status of establishment of low cost technology promotion plan (Target: established) and status of implementation	(Indicator 7) The Low Cost Technology Promotion Plan was established. The experience about the water supply facilities designed and promoted in the project was summarized.
	(Indicator 8) Status of check of endurance of prototype spare parts of Afridev handpumps that are locally produced (Target: checked. Then, the prototype and its manufacturer are recommended to the NGOs and relevant agencies.)	(Indicator 8) The endurance test system was manufactured and used to conduct endurance test. The test was extended by a couple of months to survey how much more the load on parts is increased and whether endurance is influenced if the arm of a pump is extended and a final result was derived. Then, some domestic manufacturers of parts were recommended.
	(Indicator 9) Number of technicians who can manufacture rope pumps as a result of manufacturing training (Target: 40 persons)	(Indicator 9) 63 persons completed their training. Among them, 43 are technicians who started manufacturing rope pumps immediately after the training.
	(Indicator 10) Status of distribution and installation of rope pumps in the four major regions (Target: 500 units)	(Indicator 10) 500 rope pumps were distributed during the project period in the four major regions:
	(Indicator 11) Status of creation of manuals on manufacturing and installation of rope pumps	(Indicator 11) Manuals on manufacturing and installation of rope pumps (in English) were created. The manuals were distributed to the technicians who participated in the training courses.
Output 3	Technical materials on groundwater management and water supply are developed.	
PDM	(Indicator) Numbers of teaching materials, cases, etc. of the water supply project created in relation to the operation, maintenance, construction	These indicators were not used for the ex-post evaluation because no numeric targets were provided. The PDMe indicators were used instead. The number of volumes indicated with an asterisk (*)

	Objectively Verifiable Indicator	Reason for not using indicators; used indicators; their status of achievement
	and rehabilitation for water supply	varies depending on how they are compiled. At the time of the ex-post evaluation, therefore, the target number of volumes was used only as a reference.
PDMe	(Indicator 1) Numbers of teaching materials, cases, etc. of the water supply project created in relation to the operation, maintenance, construction and rehabilitation for water supply (Indicator 2) Number of created teaching materials for training related to water supply using the result of development of low cost technologies (such as water supply facilities, rope pumps, rainwater storage and artificial recharge) (Target: 4 volumes)* (Indicator 3) Number of teaching materials for training on groundwater management such as geological survey, groundwater survey, geophysical exploration, observation wells, GIS and groundwater modeling that utilize the results of the development survey in the Butajira-Ziway areas (Target: six volumes)*	(Indicator 1) The results of activities for Output 2, such as the reports of geological and hydrogeological maps, related maps and GIS database, inventory of the existing wells, survey on test-drilled observation wells' water level observation, socio-economic survey, report on model of groundwater flow mechanism in the Butajira-Ziway areas, were produced as a technical reference. (Indicator 2) The result of activities for low cost technology development were summarized as a teaching material. (Indicator 3) Although the survey results were submitted by the local consultant, the analysis and application of them were modified by the Japanese experts to improve the accuracy. Teaching materials on hydraulic physics, drilling and pump tests, water quality, hydraulic physical maps, GIS mapping and socio-economic survey were produced. The above teaching materials were compiled as six volumes in the end. Since this is experimental study, some of them are only like teaching aids. However, each of the volumes contains 400 pages or more.

Federal Democratic Republic of Ethiopia

FY2015 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Rural Water Supply in Tigray Region"

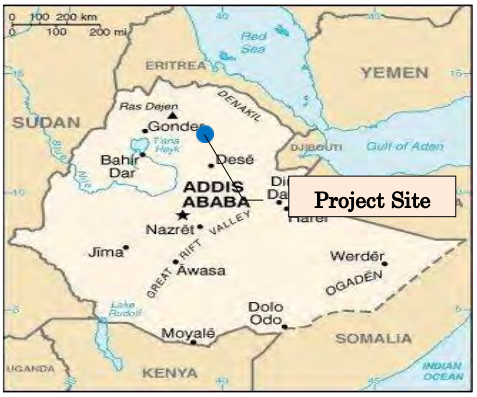
External Evaluator: Noriyo Aoki, Alfapremia Co.,Ltd.

0. Summary

This project aimed to develop water facilities to improve reliable access to safe drinking water in 91 villages across 10 districts in the Tigray Region. The project is highly relevant, as its contents are consistent with both the prioritized areas of the development policies of Ethiopia and the Japanese ODA policy, with the great need for development. The efficiency is low in terms of contents cost and time period, significantly exceeding the plan due to unfavorable outcomes in the bidding process. The project effects expected in the planning stage have been observed: The target water supply population was achieved at the time of ex-post evaluation, and safe, stable water supply was secured in general. With greater volume of water, improved water quality and improved hygiene behavior, water-borne illnesses decreased, and productive activities increased on account of reduced time spent on water-fetching labor. The project has high effectiveness and impact, as demonstrated by improvements in the living environment. Under the supervision of the Regional Water Resources Bureau, adequate maintenance structures are established at every level, and monitoring and reporting systems are also functioning. Financials are favorable at every level and future budgets are expected to be allocated sufficiently; thus, future financials are likely to be sustainable. The technical level of the staff at the District Water Resources Offices and elsewhere is strengthened, enabling them to address on-site problems immediately. The implementing agency recognizes the need to provide refresher trainings (re-training) for technical staff in committees, and the District Water Resources Offices plan training sessions and execute them periodically. The maintenance status is favorable as a result of these initiatives, and the sustainability of the effects generated by the project is high.

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

1. Project Description



Project Location

Hand-pumped Water Fetching Site
(Enderta District)

1.1 Background

Ethiopia is a landlocked country located at the heart of the "Horn of Africa" in East Africa, with an area of 1.127 million km^2, a total population of 99.39 million, and a 2.5%[1] population growth rate. The project target area, the Tigray Region, is located in northern Ethiopia at the western edge of the Great Rift Valley, and its total population was estimated to be 6.31 million[2] in 2014. Its topography includes mountainous regions and plateaus at an altitude around 2,000 m. Annual average precipitation is 200-800 mm, with much of the precipitation concentrated in the wet season from June to September. As a result, most rivers in the region are seasonal rivers that flow exclusively in the rainy season. The region is known for its serious drought damages, and all 10 districts selected for the project are classified as drought districts[3].

1.2 Project Outline

Reliable access to safe water is improved by development of water facilities in 91 villages[4] across 10 districts in the Tigray Region, thereby contributing to improving the livelihood environment.

E/N Grant Limit or G/A Grant Amount /Actual Amount		1st Detailed Design - 6 million yen / 26 million yen 1st Construction and Equipment －737 million yen / 4 million yen 2nd Detailed Design -104 million yen / 0.9 million yen 2nd Construction and Equipment－1,264 million yen / 1,151 million yen
Exchange of Notes Date (Grant Agreement Date)		1st Detailed Design - Dec. 2007/Dec. 2007 1st Construction and Equipment － Jun. 2008/Jun. 2008 2nd Detailed Design - Feb. 2010/Feb. 2010 2nd Construction and Equipment － May 2010/May 2010
Implementing Agency		National State of Tigray, Water Resources, Mines and Energy Bureau (planning stage) Name changed on Oct. 2010 National State of Tigray, Water Resources Bureau (ex-post evaluation stage)
Project Completion Date		Completed Jan. 2013 Completion of soft components Apr. 2013
Contractors	Main	Construction: Tone Engineering Co., Sato Kogyo Co., Ltd. Equipment: Toyota Tsusho Co.
	Consultant	Kokusai Kogyo Co., Ltd.
Basic Design		Basic Design Study on Project for Rural Water Supply in Tigray Region Dec. 2006 Implementation Review Study on Project for Rural Water Supply in Tigray Jul. 2009
Detailed Design		1st Detailed Design Study on Project for Rural Water Supply in Tigray Region Dec. 2007 2nd Detailed Design Study on Project for Rural Water Supply in Tigray Region Feb. 2010

[1] World Development Indicators Database, World Bank (July 2016).
[2] Estimation based on 2007 Census by the Ethiopian Central Statistical Agency.
[3] The districts in which water shortage is significantly severe and livestock and crops are as vulnerable as people (definition by the Ethiopian Ministry of Water, Irrigation and Energy).
[4] There are 97 settlements. The smallest administrative unit is the village.

Related Projects	Technical Cooperation Project “Groundwater Development and Water Supply Training Project” (Phase 1) (1998-2005) Technical Cooperation Project “Ethiopian Water Technology Center Project” (Groundwater Development and Water Supply Training Project) (Phase 2) (2005-2008) Technical Cooperation Project “Ethiopian Water Technology Center Project Phase 3” Groundwater Development and Water Supply Training Project (Phase 3) (2009-2013)

2. Outline of the Evaluation Study

2.1 External Evaluator

Noriyo Aoki (Alfapremia Co., Ltd)

2.2 Duration of Evaluation Study

Studies for this ex-post evaluation were conducted during the following periods:

Duration of the Study: October 2015 –February 2017

Duration of the Field Study: February 18 – March 2, 2016; May 27 – June 1, 2016

2.3 Constraints during the Evaluation Study

During the study, the location for some of the facilities could not be identified from its district name, village name, and facility ID alone. This problem affected the efficiency of the study because it took time to physically find the facilities during the visits. After three to four years since completion of the project, name plates for the facilities were faded, damaged, or even removed. These name plates contained technical information, such as the drilling depth and moving water level during drilling, which would be important in determining the cause of non-function or in predicting future possibility of operation after repairs. The difficulty in identifying facilities became a constraint upon analyzing the sustainability of the project during the evaluation.

3. Results of the Evaluation (Overall Rating: B)[5]

3.1 Relevance (Rating: ③)[6]

3.1.1 Relevance to the Development Plan of Ethiopia

The government of Ethiopia identified the promotion of water resource development as a high-priority subject in its national five-year development plan (Plan for Accelerated and Sustained Development to End Poverty [PASDEP], 2005-2010)[7]. A national strategy that aligns with the Millennium Development Goals proposed by the United Nations, “Universal Access Plan” (UAP), was also formulated in 2005 as a national plan for the water sector. UAP defined the volume for rate of rural water supply as 15 L/day per person, and set the goal of raising the national rate of rural water supply from 35% (2005) to 98% by target year, that is, 2012. The Tigray Region set its own target at 88% by 2012, lower than that of UAP, based on

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

[6] ③: High, ②: Fair, ①: Low

[7] Implementation Review Study Report on Project for Rural Water Supply in Tigray P.S-i

the lower rural water supply rate at 33% across the region.[8]

At the time of the ex-post evaluation, supply of safe drinking water was positioned as a strategically important subject. It was identified as essential for socio-economic development, improved quality of peoples' livelihood, and reduction of poverty by a new national five-year development plan formulated in 2010, the "Growth and Transformation Plan" (GTP, 2011-2015). A new target rate for rural water supply was defined in the GTP, and the definition of rural water supply rate was updated to 15 L/day per person (within 1.5 km radius). A target for rural water supply rate, similar to that of the GTP, was also set in the updated UAP (2011), the national plan of the water sector.

GTP II (2016-2020) began in 2016 with a new target for rural water supply rate and the volume of rural water supply was defined as 25 L/day per person (within 1.0 km radius). The Tigray Region set its new target to 85% by 2020 to be increased from its rural water supply rate of 49% in 2016 under the new definition, and is planning additional facility construction and expanding its staffing accordingly[9].

In light of the above, this project was consistent with the development policies of the government of Ethiopia at the time of planning and at the time of the ex-post evaluation.

3.1.2 Relevance to the Development Needs of Ethiopia

At the planning stage, many residents in the project target area had no choice but to use unhygienic water due to chronic water shortages, and therefore suffered from water-borne illnesses. The necessity of water-fetching labor that consumed many hours affected the livelihood of women and children. Water shortage in the target area was an urgent problem. Therefore, it was regarded as highly urgent need.[10]

At the time of the ex-post evaluation, the needs identified at the planning stage were satisfied by this project, which will be discussed later in detail in the section for effectiveness.

While there are demands for additional facilities to achieve the new target rural water supply rate set by GTP II, the highly urgent development needs identified in Tigray Region at the planning stage were satisfied by the project at the time of the ex-post evaluation, and the project priority and selected target area are deemed highly relevant.

3.1.3 Relevance to Japan's ODA Policy

The Japanese government selected "environmental conservation" as a priority area for assistance in its "Country Assistance Program for the Federal Democratic Republic of Ethiopia," formulated in August 2000, and stated that it would extend water and sewage water development assistance. At the Third Tokyo International Conference on African Development (TICAD III, 2003), the need for specific assistance in water resource development and water supply was reinforced in two of the three emphasized fields in the Japanese Assistance for

[8] Implementation Review Study Report on Project for Rural Water Supply in Tigray P.1-2. Comparison of quantitative data before and after the project was not possible due to lack of quantitative data on the needs of the target area (target settlements, etc.) at the planning stage.

[9] Interview survey with the Regional Water Resources Bureau

[10] Implementation Review Study Report on Project for Rural Water Supply in Tigray P.1-2.

Africa, “human-centered development” and “reduction of poverty by economic growth”.

In view of the above, the implementation of the project is in full conformity with the development policies and development needs of Ethiopia, as well as with Japan’s assistance policy; therefore, its relevance is high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

Table 1 shows the outputs developed and provided by Japan, Table 2 shows the procured equipment provided by Japan, and Table 3 shows the outputs developed and provided by Ethiopia.

Table 1 Outputs developed and provided by Japan (planned vs. actual)

Item	Plan		Actual
Number of hand pump wells (level 1): 82			
77 villages	Water source	Wells built: 82	As planned
(82 settlements)	Facility	Hand pumps attached: 82	As planned
		Platforms: 82	As planned
Powered pump-based piped water facility (level 2): 9			
11 villages	Water source	Wells built: 6	As planned
(12 settlements)		Use of test wells: 3	As planned
	Reservoir	Above-ground reservoirs: 10	As planned
		Overhead tanks: 1	As planned
	Machine room	Power generator rooms: 6	As planned
		Pressurized pump rooms: 1	As planned
		Switchboard rooms: 3	As planned
	Pipeline	Water supply: GS/DI 23.6 km Water distribution: GS/DI 11.8 km	As planned
	Power installation	Exchange and installation of power generators: 3 Exchange and installation of submersible pumps: 3	As planned
	Power source	Diesel generators: 6 Secondary wiring of commercial power: 4	As planned As planned
	Public faucet	Public faucets: 22	As planned
	Water fountain for livestock	Water fountains for livestock: 9	As planned
Improvements to existing powered pump-based piped water facilities (level 2)			
3 villages	Reservoir	Overhead tanks: 3	As planned
(3 settlements)	Machine room	Power generators: 3	As planned
	Pipeline	Water supply: GS 0.045 km	As planned
		Water distribution: GS 0.47 km	As planned
	Power installation	Exchange and installation of power generators: 3	As planned
		Exchange and installation of submersible pumps: 3	As planned
	Public faucet	Additional installation of public faucets: 3	As planned
	Water fountain for livestock	Water fountains for livestock: 3	As planned

Source: Interview survey with the Regional Water Resources Bureau, Implementation Review Study Report on

Soft component deliverables (workshop reports; usage rules; operation and maintenance plans, including plan of action for malfunctions; activity reports; monitoring results evaluations; training reports; and records of health patrols and instructions) were submitted as planned. Hygiene education reports were embedded within the training report.[11]

Table 2 Procured equipment provided by Japan (planned vs. actual)

Item	Plan	Actual
1) Well repair equipment		
	1. Service rig[12]: 1	As planned
2) Equipment for pumping tests		
	1. Crane truck: 1	As planned
	2. Submersible pump: 1	As planned
	3. Power generator: 1	As planned
	4. V-notch weir: 1	As planned
	5. Water gauge: 1	As planned
	6. pH meter: 1	As planned
	7. Electrical conductivity/TDS meter: 1	As planned
	8. ORP meter: 1	As planned
	9. Turbid meter: 1	As planned
3) Equipment for construction and transportation		
	1. Crane trucks: 2	As planned

Source: Interview survey with the Regional Water Resources Bureau, Implementation Review Study Report on Project for Rural Water Supply in Tigray, JICA provided documents

Table 3 Outputs developed and provided by Ethiopia (planned vs. actual[13])

Plan	Actual
1) Acquisition of construction sites	As planned
2) Construction of access roads	As planned
3) Provision of property for temporary residence during construction	As planned
4) Construction of fences and gates	Almost as planned[14]
5) Installation of motor pump and generators for rehabilitation work	As planned
6) Installation of power transmission and distribution lines	As planned
7) Coverage of government staff's expenses for onsite activities, transportation, lodging, and allowances	As planned
8) Requests to the central government and acquisition of approval for activities with EWTEC[15]	Partially completed
9) Coverage of expenses related to EWTEC and human resource provisioning for training (daily allowance, transportation fees)	As planned

Source: Implementation Review Study Report on Project for Rural Water Supply in Tigray P.3, 65-73; interview surveys with relevant parties; documents provided by implementing consultants.

Most items under Ethiopia's responsibility were completed.

[11] Implementation Review Study Report on Project for Rural Water Supply in Tigray , JICA provided documents, interview surveys with the Regional Water Resources Bureau, etc.

[12] Excavator for repairing non-operating wells.

[13] Information on expenditures related to these outputs was not obtained (questionnaire survey with the Regional Water Resources Bureau).

[14] Fences were to be built by the residents in this project.

[15] EWTEC (Ethiopian Water Technology Center) is a technical professional training center from phase 1 of the "Groundwater Development and Water Supply Training Project" started from 1998, which continued on to phase 2 and phase 3. Refer to the "Related Projects" row on P.2.

A design change was made for the site which had to build a 3 km access road to the well , and was judged to be beyond the development capability of the district and target village; as a result, the well site was changed to a nearby village, but its influence on the project effect is not confirmed. Changes in well location from unsuccessful wells to successful wells were made within the same village in the same district, and were thus implemented with maximum attention to the local conditions.[16] Some of the water supply pipes had to be extended due to changes in the position of well drilling, which slightly affected the amount of work, but not the construction period or cost.[17] Therefore, no influences on the project cost and period resulted from changes in design.

At the time of project implementation, the Tigray regional government sent its staff to the Ethiopian Water Technology Center (EWTEC) for training in coordination with the project, to ensure that staff learned the necessary water supply techniques for maintenance works.

The capacity building activities for operation and maintenance (hereafter referred to as ‘’soft component’’) were generally executed as planned. Soft component activities included awareness-raising workshops with participation from village water committees[18] and other water committees[19] (both hereafter referred to as “committees”); formulation of operation and maintenance plans including rules of use and plans of action in case of malfunction; technical workshops on facility repair for facility managers within committees; and hygiene education, health hygiene patrol and instructions for residents. The original plan for technical workshops on facility repair was to be conducted by the Japanese consultants with support from EWTEC or EWTEC trainees, but the construction contractors provided technical instructions during construction. Residents and committees alone were the intended participants in the training for resident meetings and resident participation, but according to the interview survey, the village council also participated as an observer.

3.2.2 Inputs

3.2.2.1 Project Cost

Based on the Basic Design Study, this project planned to conduct detailed design in 2007 and build facilities in 2008 and 2009. Bidding took place three times in July 2008, September 2008, and December 2008, but all instances were unsuccessful; the project was thus cancelled, as completion of the project within the timeline defined in the E/N became impossible. Following the results of the Implementation Review Study of the project and a conclusion of the E/N in January 2010, the project was confirmed for re-implementation.

Based on this course of events, because costs were incurred since the initial planning stage, this evaluation combined the planning cost of 26 million yen for the detailed design from December 2007 (item 1 in Table 4) with the planning cost of 737 million yen (item 2 in Table

[16] JICA provided documents and interview survey with implementing consultants.
[17] Implementing consultants.
[18] Committees responsible for operation and maintenance of piped water facilities. Specifically, committees consisting of users from areas covered by piped water facilities. Depending on size, a committee may reflect a settlement level or a village level.
[19] Committees responsible for operation and maintenance of hand pump wells. Specifically, committees consisting of hand pump users near the hand pump well facilities.

4) for construction, yielding a total planning cost of 789 million yen. Actual cost incurred was calculated by adding the Detailed Design cost of 26 million yen (item 5 in Table 4); the actual cost from the cancelled construction[20], 4 million yen (item 6 in Table 4); the amount spent on investigations for specific planning after E/N conclusion in January 2009 (item 7 in table 4), 90 million yen; and construction cost 1.151 billion yen which started from May in 2010 (item 8 in Table 4), for a combined total of 1.271 billion yen (161% of the planned cost). This amount significantly exceeded the plan.

Table 4 Timeline for Detailed Design and implementation of the project

	E/N Concluded	Status	Planned Cost	Actual Amount
Dec. 2007	Detailed Design	Completed	26 million (1)	26 million (5)
Jun. 2008	Construction	Cancelled due to unsuccessful bidding	737 million yen (2)	4 million yen (6)
Feb. 2010	Detailed Design	Completed	104 million yen (3)	90 million yen (7)
May. 2010	Construction	Completed	1.264 billion yen (4)	1.151 billion yen (8)

Source: JICA provided documents

Comparison of the soft component input plan and the actual values shows that while the plan was 4 MM (man-months) for Japanese experts and 12 MM for local consultants, for a total of 16 MM,[21] actual result was 5 MM for Japanese experts and 26 MM for local consultants, where MM for local consultants increased by 14 MM.[22] A major reason for the increase was uninterrupted implementation of soft component activities such as monitoring at each target site during a period during which procurement of materials and equipment for the piped water supply system was delayed. Additionally, MM at the planning stage did not account for geographic accessibility or telecommunication difficulties, which resulted in a need for higher MM during execution of planned activities. As a result, total MM increased, but because the increased local consultant MM costs were covered by the implementing consultant's own cost, project costs were not affected.[23] It should be noted that the project cost covered by the Ethiopian side could not be verified.

3.2.2.2 Project Period

From the initial E/N conclusion in December 2007 to completion of construction in December 2012 and then to completion of soft components in April 2013, the project took 65 months. Given that the initial plan was designed to last 27 months, actual time spent was 241% greater than the plan, significantly exceeding the planned project period. Project period excess was due to three rounds of unfavorable bidding.

In light of the above, both the project costs significantly exceeded the planned total and the project period exceeded the planned term; therefore, the efficiency of the project is low.

[20] Costs related to bidding for the project construction.
[21] Implementation Review Study Report P.3-72,73.
[22] JICA provided documents.
[23] Interview survey with implementing consultants.

3.3 Effectiveness (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

This project uses water supply population utilizing facilities as its major indicator, and evaluates effectiveness based on the operation rate of the facility, improvements in water quantity and quality, and so on.

The definition of water supply rate in Ethiopia varies depending on the formulation period of water sector policies. This project defines water supply population[24] as the effective indicator, verifying actual values by re-configuring the baseline and target values at the ex-post evaluation. Changes in the definition of water supply rate in Ethiopia do not affect the indicator of water supply population as the major indicator.

3.3.1.1 Water Supply Population

Target values for water supply population in the planning phase had used the 2006 village population taken from the data in the request document, and made calculations with consideration for rate of population increase. Values calculated at the ex-post evaluation had to use a similar data acquisition method, but because settlements are lower in level than administrative villages, population data could not be obtained; additionally, given that these settlements have undergone new deep well construction in recent years to improve water supply rate, and that it is difficult to assess the number of facilities outside of the project, beneficiary population of the project could not be extracted.

In lieu of this, target value and actual value for increase in water supply population were calculated by adding the population that uses each hand pump wells and piped water facilities built by the project.[25] According to these calculations, target water supply population by this project was 38,347. Given that the water supply population[26] three years after completion of the project was 40,266 (based on the information collected at the ex-post evaluation), the project was deemed to reach a target achievement rate of 105%.

Table 5 Major effect indicator of this project (units : persons)

Indicator	Baseline	Target	Actual	Actual
	2009	2013	2013	2016
	Planning Year	Year of Completion	Year of Completion	3 Years after Completion
Water Supply Population	0	38,347	N/A	40,266

Note: Water supply population is defined as the population able to access safe water. Base water supply unit is 15 L/person/day.
Source: Implementation Review Study Report on Project for Rural Water Supply in Tigray, documents provided by JICA, and reports from the District Water Resources Offices

[24] Population able to draw water more than 15 L/day per person.
[25] Water is supplied to 5,547 people by hand pump wells (5,309 from increased population by new facilities and 238 from refurbished facilities). Calculation of expected water supply population assumes that one hand pump well supplies 400 people (3-26 design standard from the Implementation Review Study Report); 400 people x 82 wells = 32,800 people; and the project's expected water supply population is 38,347.
[26] Since the telecommunications environment is poor in the target area, CD-ROMs with a list of questionnaire items on water supply population by facility were distributed to the District Water Resources Offices. The CD-ROMs were collected after the responses were recorded, and the results were aggregated.

3.3.1.2 Rate of facility operation[27]

The number of hand pump wells was 82 and the number of piped water facilities was 12, for a total of 94 facilities. Of these, 76 were in operation at the ex-post evaluation, meaning that overall operation rate was 81%. Drought persisted for several years leading up to the time of ex-post evaluation (conducted three years after the project's completion), and the number of unavailable facilities was on the rise, especially during the first on-site surveys, due to lower groundwater level. Of the 16 non-operating hand pump wells, 12 were non-operating because of lowered groundwater level.[28] Factors such as lowered groundwater level are external conditions, but the operation rate was nevertheless 80%, showing that sufficiently high project effectiveness.

Table 6 Number of water facilities and

Indicator	Target	Actual	Actual	Actual
	Year	2013	2013 and 2014	2016
	Time	Completion	Defect Inspection	Ex-post Evaluation
	Years of Completion	Year of Completion	1-2 Year after Completion	3 Years after Completion
Hand Pump Wells	82	82 (100%)	82 (100%)	66 (81%)
Piped Water Facilities	12	12 (100%)	11 (92%)	10 (83%)
Total and Average Rate of Operation	94	94 (100%)	93 (99%)	76 (81%)

Source: Responses to questionnaires sent to the District Water Resources Offices, and documents provided by JICA

According to the beneficiary survey[29] with water committees on operating facilities, 87% reported that their facility had not malfunctioned in the three to four years since completion of the project.

3.3.1.3 Improvements in Water Quality and Volume

According to the results concerning water quality in the beneficiary survey of water users, turbidity, smell, and taste improved significantly. For water volume, 97% of survey respondents indicated that it was "improved." As shown in Table 7, 63% of previously used

[27] The definition of "operating" is having the capability to draw water, regardless of volume or quality, (i.e., "usable"). Rate of operation was calculated as number of operating facilities ÷ total number of facilities.

[28] Reasons for non-operation other than decreased groundwater level were delayed procurement of spare parts (2 facilities); need for repair of hand pump wells manageable at the district level (2 facilities); and for piped water facilities, breakdown of power generators (difficulty in procuring spare parts, because the manufacturer is foreign) or malfunction of power pumps (difficulty in procuring spare parts, because the manufacturer is foreign).

[29] Two types of beneficiary surveys were conducted. One surveyed water users, and the other the water committees or village water committees. In this report, the former is referred to as "the beneficiary survey with water users," and the latter as "the beneficiary survey with committees." Face-to-face interview surveys were conducted using different questionnaires. Target sites covered all 10 districts and selected operating facilities to compare status before and after the project. By consulting with the District Water Resources Offices, taking into account accessibility and local security, and planning a route maximizing the number of sites surveyed within the time allotted for onsite surveys, 55 facilities in 46 out of 91 villages were visited, and 147 samples for water users were extracted. No more than five samples from a single facility were taken, and they were randomly extracted in layers with minimal bias in terms of age group or sex. One sample was extracted per facility from all 55 facilities for committee samples. Of the 55 extracted samples, 50 contained valid responses. Attributes of water users were as follows: 24% teenagers, 25% in their 20s, 23% in their 30s, 12% in in their 40s, 13% in their 50s, 1% in their 60s, 1% in their 70s or above; 34% male and 65% female. Attributes of committees were as follows: 28% in their 30s, 41% in their 40s, 20% in their 50s, 9% in their 60s, 9% in their 70s or above; 67% male and 33% female. The ratio of organizational attributes was 80% for village water committees and 20% for water committees. 47% of respondents were committee heads, 26% treasurers, 2% caretakers or operators, 2% cleaners, 15% security guards, and 4% others.

water sources were rivers or streams. Protected shallow wells accounted for 20% of the previously used water sources.

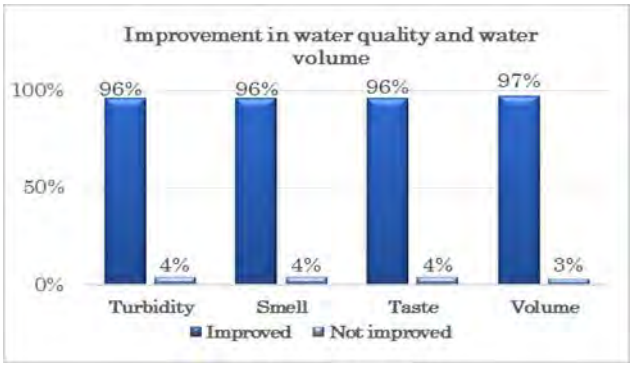


Chart 1 Improvement in Water Quality and Water Volume
Source: beneficiary survey of water users

Table 7 Previously used water sources (multiple responses)

Water Source	Responses	Ratio
Rivers or Streams	93	63%
Protected Shallow Wells	29	20%
Unprotected Shallow Wells	4	3%
Spring Water	5	3%
Purchased Water Tanks	0	0%
Others (Usually Ponds)	16	11%

Note: Users may have had access to multiple water sources.
Source: Beneficiary survey of water users.

3.3.1.4 Decrease in Time Spent Fetching Water

Time and travel distance required for water-fetching labor were significantly shortened for water users. 50% of water users said that time was shortened by 1 hour to 2 hours. About 10% of water users said the time was shortened by 2 to 3 hours, and 5% said between 3 to 4 hours.

Table 8 Shortened time and distance for water-fetching labor

	Shortened	Not Shortened
Distance	99%	1%
Time	97%	3%

Source: Beneficiary survey of water users

Table 9 Shortened time

Shortened Time/Day	Ratio
Not Shortened	3%
A Few Min to 30 Min	22%
30 Min to 1 Hour	8%
1 Hour to 2 Hours	50%
2 Hours to 3 Hours	10%
3 Hours to 4 Hours	5%
4 Hours to 5 Hours	1%
Other	1%

Source: Beneficiary survey of water users

3.3.1.5 Number of Established Committees, Rate of Water User Fee Collection

At the time of the ex-post evaluation, the establishment rate of committees for hand pump wells was 88%, and establishment rate of village water committees for piped water source facilities was 92%. The water user fee collection rate for established committees was 100%. The water user fee collection rate for the entire project, including non-available facilities, was 88% (83 of 94) at the time of the ex-post evaluation, and was thus considered to be high.

Table 10 Committees established in the project (number of committees/number of facilities)

Indicator	Target	Actual	Actual	Actual
	Year	2013	2013 and 2014	2016
	Time	Completion	Defect Inspection	Ex-post Evaluation
	Years of Completion	Year of Completion	1-2 Year after Completion	3 Years after Completion
Number of Committees Established				
Hand Pump Wells	82	82 (100%)	82 (100%)	72 (88%)
Piped Water Facilities	12	12 (100%)	11 (92%)	11 (92%)
Number of Committees Collecting Fees				
Hand Pump Wells	82	82 (100%)	82 (100%)	72 (88%)[30]
Piped Water Facilities	12	12 (100%)	11 (92%)	11 (92%)[31]

Source: Basic Design Study documents, documents provided by JICA, responses from the District Water Resources Offices

3.3.2 Qualitative Effects (Other Effects)

3.3.2.1 Volume of Water

Of the operating facilities, some hand pump wells experience water shortages during the dry season. Piped water facilities are able to supply water stably during both dry and wet seasons. Water is secured consistently by adjusting the running time for the power pump based on the judgment of the village water committee responsible for the maintenance of the piped facility. There are no problems with water pressure at the faucets. Drought was not observed during the dry seasons in piped water facilities.

3.3.2.2 Transition to Safe Water-Fetching Ways

Hand-dug, unprotected wells[32] are few in the Tigray Region because the position of water sources are deep. Falling accidents at rivers during water-fetching were reported in the past, as 63% of the previously used water sources were rivers and streams (according to the results of the beneficiary survey). Completion of the project secured safety in water-fetching labor.[33]

3.3.2.3 Rehabilitation of Facilities beyond the Project Scope

According to the Regional Water Resources Bureau, the service rig provided by the project to fix non-operating wells improved the number of wells repaired annually across the Tigray

[30] Fees continued to be charged at non-operating facilities to fund their repair.
[31] Fees continued to be charged at non-operating facilities to fund their repair.
[32] Refer to Table 6 for previously used water sources.
[33] Interview surveys with the District Water Resources Offices.

Region from 0 per year to 54 per year, contributing to improvement in well operation across the region.

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Improvements in Hygiene Activities Related to Water Use

According to the beneficiary survey with water users, 99% of respondents indicated that "awareness on water usage and sanitation has improved." Specifically, as shown in Table 11, the improvement rate of "increased hand washing" was highest. The rates of "increased washing clothing" and "Increased body washing" also illustrate changes in sanitation activities due to increase in usable water. "Increased boiling water" rate remains low, but according to the interview survey with the water resource office and the local water supply expert, this is perhaps related to accessibility of fuel.

Table 11 Shift in Hygiene Activities (multiple responses)

	Responses	Ratio
Increased Hand Washing	131	89%
Increased Body Washing	86	59%
Increased Washing Clothing	67	46%
Increased Boiling Water	11	7%

Source: Beneficiary survey with water users

3.4.1.2 Decrease in Water-borne Disease[34]

99% of water users reported in the beneficiary survey that water-borne disease had decreased. In an interview at the town of Gerjele in Alamata District (piped water facility, 3 public faucets, water supply population 1,640), a health center staff member said that the occurrence of diarrhea and dysentery decreased significantly as a result of this project.[35]

3.4.1.3 Use of Excess Time Generated by Shortened Water-Fetching Labor

Beneficiaries use the time gained from reduction in time required for water-fetching labor, a result of this project, for agricultural activities, non-agricultural income-generating activities, and community activities. According to the results of beneficiary survey of water users, 81% of multiple respondents said that they use the excess time for agricultural work, and 73% of multiple respondents use the time for non-agricultural income generating activities. 53% of multiple respondents answered they use the time for community activities.[36]

3.4.1.4 Impact on Children in Water-Fetching Labor

[34] Includes illnesses or infections spread by water, such as parasites.

[35] 1,640 beneficiaries of piped water facilities from the project reside in the surveyed target area, which was chosen because it was deemed sufficiently large to clearly assess changes in conditions surrounding the beneficiaries. In other areas, locations with large enough numbers of beneficiaries for similar interview surveys could not be found.

[36] For the utilization of the excess time by disaggregating gender, 54% out of total women's respondents said they engage in agriculture work. 82% of total women's respondents said they use the time for non-agricultural income generating work. It can be concluded that reduction of women's water-fetching labor has an effect contributing to income generating activities.

According to the results from the beneficiary survey of water users, 99% said that the role of children in water-fetching labor itself has not changed, but that the project did have an impact. 43% also indicated that time spent studying increased as a result of reduced water-fetching labor time requirements.

3.4.1.5 Impact on Other Village Activities by Residents

During the interview, village water committees and water committees stated that villagers began participating in mutually supportive activities with a sense of responsibility as a result of the establishment of a villager-based operation and maintenance system. In the beneficiary survey with water users, 84% responded positively to the question asking whether they observed or felt that community activities had become more prominent as a result of this project. As stated in the section of 3.5.1.2.3. Village Water Committee and Water Committee, since the project set a basic principle of equal participation by men and women, the project promoted women to participate in decision-making for formulating regulation on operation and maintenance, and to become members in committees, thus women actively get involved in operation and maintenance.

3.4.2 Other Positive or Negative Impacts

3.4.2.1 Impact on the Natural Environment[37]

According to the interview with the District Water Resources Offices, there were no impacts such as ground subsidence by the project. The regional environmental protection bureau conducted a region-level environmental monitoring project during construction and after start of facility use, and determined that there was no negative impact to the environment as a result of this project.[38]

3.4.2.2 Resettlement and Land Acquisition

This project did not cause any resettlement or land acquisition.[39]

3.4.2.3 Impact of Construction on Nearby Residents

There was no impact on irrigation wells, water rights, water use, or other wells. During construction, following discussions with the residents, construction work inside farm fields was conducted during non-planting periods. Upon selecting the location for well drilling, work was done during the day to minimize the impact of noise and vibration to the surrounding area, based on explanations made to and discussions with the nearby residents.

In light of the above, this evaluation verifies that the major water supply population target was achieved, and that effects of the project's implementation were as planned, such as improvement of water volume and quality, reduction of time and travel distance required for

[37] There was a possibility that EIA report was described in the Basic Design. It was confirmed whether the implementing consultant and implementing agency might have information on EIA. However, it was not possible to obtain it.

[38] Interview surveys with the Regional Water Resources Bureau.

[39] Interview surveys with the Regional Water Resources Bureau.

water-fetching labor, and securement of safety in water-fetching labor. Additionally, incidence of water-borne disease decreased, hygiene behavior improved, and productive activities increased as a result of the reduced time required for water-fetching labor; the impact on the living environment is being generated. Therefore, the effectiveness and impact of the project are evaluated to be high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

Table 12 shows the maintenance structure organized by departments relevant to water supply facilities, and the distinct roles and responsibilities of technical staff; roles are defined at every level.

Table 12 Maintenance structure, and roles and responsibilities of technical staff at each level

	Roles and Responsibilities	Communication System, etc.
Regional Water Staff[40]	Conducts large-scale repairs and repairs too complex for the District Water Resources Offices; supplies spare parts to the District Water Resources Offices	Monitoring and reporting system is functioning, and all facility updates are acquired monthly at the regional level
District Water Staff	Provides operational support for spare parts revolving funds[41]; provides district technical staff to conduct repairs	
Technical Experts (Village)	(One allocated per 3 villages) Provides monitoring and instruction on technical matters in facility operation and maintenance; reports facility status to the District Water Resources Office monthly	
Village Water Committee (1)	Operates and maintains facilities; collects user fees	
Water Committee (2)	Operates and maintains facilities; collects user fees	

Notes: (1) Village water committees are responsible for most maintenance in piped water facilities. User groups maintain the public faucets at the end. (2) Committees set up for each hand pump well comprising of users for operation and maintenance.
Source: Interview surveys with the Regional Water Resources Bureau and District Water Resources Offices

3.5.1.1 Regional Water Resources Bureau

The implementing agency was renamed in October 2010 from the "Regional Water, Minerals, and Energy Bureau" to the "Regional Water Resources Bureau." The Regional Water Resources Bureau consists of five departments: the water supply department, water resource management department, irrigation department, administrative department, and coordination department. The water supply department includes the survey and design assessment division, the construction supervision division, and the monitoring, support, and maintenance division. The Regional Water Resources Bureau underwent organizational reform in October 2008 in an attempt to improve the organization's efficiency; instead of conducting lay-offs, it expanded its

[40] Includes staff from the Regional Central Workshop.
[41] A system in which the District Water Resources Offices increase profit by selling spare parts supplied to the region by donors and NGOs; these profits are allocated to cover costs when large-scale repairs are needed. There are cases in which the District Water Resources Offices run the operation, and cases in which village water committees run it.

staff, enabling it to handle necessary operations. The Regional Water Resources Bureau exerts a strong supervising influence over the District Water Resources Offices.

The Regional Central Workshop is a unit within the water supply division of the Regional Water Resources Bureau. It employed eleven technicians at the time of the ex-post evaluation. The Regional Central Workshop assists with repairs that are too difficult for the District Water Resources Offices to handle independently. Specifically, the technical staff repair electrical control panels, submersible pumps, wells, and power machines, etc.[42]

Table 13 Transition in number of technical staff at each level (units: persons)

	Planning	Ex-post Evaluation	Future Plan
Year	2009	2016	2019
Regional Technical Staff	56	87	131
District Technical Staff (1)	3-6	9-14	18-20

Note: (1) District technical staff are also responsible for irrigation and energy areas. They specialize in areas such as hydrogeology, electrical engineering, environmental management, water resource management, and water administration; 1-2 engineer-level technical positions are also assigned to strengthen the district office's capabilities.
Source: Interview surveys with the Regional Water Resources Bureau and District Water Resources Offices

3.5.1.2 District Water Resources Offices

The District Water Resources Offices are organizationally positioned as offices under the District Government, but in technical and staffing terms, they are local supervised branches of the Regional Water Resources Bureau. Irrigation and energy staff also work at the District Water Resources Offices, assuming multiple responsibilities as needed. Staff specialize in areas such as hydrogeology, electrical engineering, environmental management, water resource management, and water administration, and an additional 1-2 engineer-level technical staff positions are also assigned, strengthening the functions of the office. According to the Interview with the offices, the 9-23[43] water supply points[44] were assigned to each staff member specializing in water supply at the time of ex-post evaluation. The number of staff will increase as additional facilities are built under the GTP II plan, and the number of water supply points assigned per staff member will even out.

At the time of planning, District Water Resources Office staff communicated with the committees only when facilities broke down at a level beyond the committee's capacity to respond. No periodical patrol was conducted by District Water Resources Office staff. A technical expert position was assigned to the office in 2014, responsible for visiting villages and monitoring the water supply facilities, irrigation facilities, and energy-related facilities at least once a month, and for reporting from the district to the region. One technical expert is assigned per village, and assists in solving technical problems that cannot be addressed by the committee alone. According to the interview with the District Water Resources Offices,

[42] EWTEC offers an electrical machine maintenance course (basic course and advanced course), allowing regional-level technical staff to learn technique for electrical repairs of submersible pumps and control panels. According to the interview with Regional Central Workshop, some staff from the Tigray Regional Central Workshop attended the courses.
[43] Compared to the number of water points assigned to water supply staff in other east African countries, this number is less and is at a manageable level for monitoring.
[44] Refers to faucets and well pumps, that is, the points at which a user uses water.

village-level technical experts are also responsible for work on irrigation and energy.

3.5.1.2.1 Spare Parts[45] Supply System

According to the beneficiary survey of committees, 15% of surveyed committees own spare parts that are exchanged periodically. The District Water Resources Offices stock major spare parts and the committee purchases them from the office. Repair is free.

3.5.1.2.2 Information Management at the District Water Resources Offices

Report documents received from the implementing agency, such as Completion Reports and Detailed Design reports, are supposed to be distributed to the responsible District Water Resources Offices in a hard copy[46]. However, information was not shared properly with some offices in which the staff member in charge was transferred to a different position. Soft component manuals are distributed from the regional level in a hard copy to the District Water Resources Offices, and are used. District staff gave guidance in the language used at the villages based on the manual. Records of health patrols and instructions were used by the health staff at the District Water Resources Offices during periodical patrols and instruction.

3.5.1.2.3 Village Water Committees and Water Committees

The village water committees and the water committees are organizations of water users designated to operate and maintain the facilities, each consisting of six members—head, sub-head, treasurer, facility manager, accountant, and health staff member—elected by vote at a villager meeting. The ratio of male to female members is generally even, but women are the majority in some cases[47]. At the time of the committees' establishment, election of women was encouraged through awareness-raising activities within the project's soft components. In the case of piped water facilities, a maintenance group for public faucets collects water user fees, presents the collected fees to the village committee accountant, and manages the water area at the public faucets.

For hand pumped wells, the water committee itself acts as the maintenance committee for the water-fetching site, collects water user fees, manages accumulated fees as bank savings, and records collected fees.

The committee also has ownership to judge over matters such as providing households who have difficulties in paying fees with discounts or in exchange for labor.[48]

[45] "Spare parts" in this report refers to frequently exchanged parts, for example O-rings, U seals, foot valves, and so on. Price varies by area, but O-rings are usually 6.18 birr, U seals 9.27 birr, and foot valves 107.12 birr (Interview survey with Enderta District Water Resources Office).

[46] Interview surveys with the Regional Water Resources Bureau.

[47] Many committees understand participation rate by men and women shall be men to women by 50:50. The soft component also deal with a basic principle to promote participation by men and women.

[48] In the soft components of the project, residents were instructed to make proactive decisions to avoid excluding economically vulnerable households or individuals.

Table 14 Exemptions for the economically vulnerable

	No. of Responses	Ratio
Available	37	67%
Not available	18	33%

Source: Beneficiary survey of committees

3.5.2 Technical Aspects of Operation and Maintenance

3.5.2.1 Technical Level of the Regional Staff

The technical level of the regional staff, including those from the Regional Central Workshop, was sufficient, and they are capable of fixing wells and maintaining water supply facilities. As part of the JICA technical cooperation project "Groundwater development and water supply training project," 67 staff were trained during phase 1 (1998-2005), 71 during phase 2 (2005-2008), and 103 during phase 3 (2009-2013), for a total of 241 staff, the majority of whom (according to the interview survey) were regional government staff and employees of public corporations for water works.[49] Training content included drilling techniques, groundwater investigation, drilling machine repair, electrical machine maintenance, water supply management, and water supply techniques. The regional government bears responsibility for the training needs of their staff, and conducts refresher training sessions for necessary training items once every half a year.

3.5.2.2 Technical Level of the District Water Resources Office Staff

To strengthen the capabilities of the office, technical staff with specialty in areas such as hydrogeology, electrical engineering, environmental management, water resource management, and water administration are placed at the District Water Resources Offices, along with 1-2 engineer-level technical positions. According to an interview survey with a local water supply expert, the technical level of the district staff was verified to be sufficient for operation and maintenance of the facilities built by this project. The Regional Water Resources Bureau provides periodical training on well maintenance techniques to the technical staff at District Water Resources Offices to improve their ability to repair facilities.[50]

3.5.2.3 Technical Level of Committee Technical Staff

Technical staff members for piped water facilities are called operators, whereas technical staff for hand pump wells are called caretakers. Operators and caretakers receive technical training from District Water Resources Office staff and technical experts sent to the village as needed.[51] Furthermore, the District Water Resources Offices also provide necessary technical training to 20 operators and caretakers from each committee every year. In terms of the soft components, a sufficient technical level is maintained at the committee level through training for committee technical staff in operation and maintenance, provided by the staff of each District Water

[49] At the time, the water work and construction enterprise was involved in construction for this project. Twelve employees participated in the EWTEC training in phase 1, 13 in phase 2, and 18 in phase 3, for a total of 43 employees(EWTEC Participant List).

[50] Interview surveys with the Regional Water Resources Bureau.

[51] Interview survey with the District Water Resources Offices.

Resources Office.

3.5.3 Financial Aspects of Operation and Maintenance

3.5.3.1 Regional Water Resources Bureau

Table 15 shows the expenditures and budget for the Regional Water Resources Bureau. Human resources, maintenance, and new facility development costs are on the rise each year, and budget is also expected to continue increasing to achieve the goals specified under GTP II.[52] The region, which is semi-arid and vulnerable to drought, also receives a large sum of donations from NGOs,[53] an amount that far exceeds aid funds received from international donors such as UNICEF. These NGOs provide spare parts to the regional government, intended for use in the spare parts revolving funds managed by the District Water Resources Offices. Elsewhere, budgets for Millennium Development Goals and Sustainable Development Goals are received continuously from the federal government, but because allocations vary by category each year and the budget is specified for the entire region, securing a specific amount for a water resource bureau is difficult, and this is therefore not included in the expenditures and budget listed in Table 15. According to the interview survey with the Regional Water Resources Bureau, the regional government receives donations that exceed those from international donors every year, and this can be expected to continue in the future.

A budget for the Tigray Regional Water Resources Bureau has been definitively allocated in the past, and because the region is a drought area, it is likely to receive allocations with emphasis from the central government. The evaluation of the overall situation reveals no financial problems.

Table 15 Actual expenditures and 2015 budget for the Regional Water Resources Bureau (1)

(units: 1,000 birr)

	2012-2013	2013-2014	2014-2015	2015-2016
	Expenditure	Expenditure	Expenditure	Budget
Labor Cost	12,442	14,899	17,989	19,195
Maintenance Cost	13,721	15,502	22,957	23,394
New Facility Development Cost	141,203	156,335	268,000	290,493
International Donors, etc.	145,450	165,000	275,000	295,000
Tigray Region NGOs	153,866	175,962	216,153	N/A[54]
Total	466,682	527,698	800,099	628,082

Note: (1) Fiscal year is from July 1 to June 30 of the following year.
Source: Documents provided by the Regional Water Resources Bureau

3.5.3.2 District Water Resources Offices

The budget for the District Water Resources Offices is allocated from the district administration and Regional Water Resources Office. Employee payroll, bonuses, and pension

[52] Interview survey with the Regional Water Resources Bureau.
[53] A specific NGO works exclusively in the Tigray Region. It is involved in local development with some support from international NGOs. While many NGOs provide water supply-related support, REST (Relief Society of Tigray) in particular provides approximately 8 million US dollars (year 2015) only in the water supply sector for water supply facilities in the Tigray Region.
[54] This amount is not able to be confirmed, although it is to be increased.

funds are funded by the district administration. According to the interview survey, a sufficient budget for indispensable maintenance is allocated to each District Water Resources Office from the Regional Water Resources Office and the regional government.

According to the survey, water users are typically responsible for facility maintenance costs, but repair costs are also covered by the spare parts revolving funds managed by the District Water Resources Offices. Committees that cannot cover repair costs can receive loans from the District Water Resources Offices that manage the funds, and are exempt from interest for a given period of time. Power pumps malfunctions do not occur frequently, but such cases often require exchange for a new pump; soft components stress the necessity for village water committees to secure purchasing funds from income gained from daily water user fees. In cases of malfunction where accumulated funds from water user fees are insufficient, and an expensive repair is required for components like power pumps or power generators, the District Water Resources Office and Regional Water Resources Bureau cover the cost of repair as needed.

3.5.3.3 Committees

Water user fees for both piped water supply facilities and hand pump wells are determined by each committee based on the cost of operation and maintenance as well as the accumulated income from water use. In the beneficiary survey of committees, 98% replied that they record the water user fees they collect, which is high.[55]

Water user fees are charged by village committees of piped water facilities, and water supply meters and accumulation of water user fees were recorded in detail in most cases.[56] In the case of piped water facilities, accumulated water user fees vary by the size of the facility or the number of public water faucets, but range between 60,000 birr[57] (approx. 360,000 yen) and 80,000 birr (approx. 480,000 yen). The state of fee collection is generally favorable. The accumulated sum of water user fees increases along with the number of water users. Among the piped water facilities that use a fuel-based power generator, some mitigate fuel use by limiting operation of the generator to two hours in the morning and two hours at dusk. Three out of 12 facilities (25% of the piped water facilities) use commercial power. According to estimates by a District Water Resources Office, comparison of power pump operation using commercial power and operation using diesel fuel shows that operational costs of the power pump vary by facility and local fuel costs, but that use of commercial power can run the pump at a third of the cost of diesel fuel. As a result, accumulated water user fees for village committees that use commercial power are greater than those that use diesel fuel, due to the lower fuel costs. However, at the time of ex-post evaluation, few facilities could find commercial power equipment in their proximity.

To account for future maintenance, water user fees are also collected by water committees at

[55] Interview surveys with the committees.

[56] Soft components provided guidance on areas such as pricing for water use and fee collection, observance of rules of use, and verification of residents' roles.

[57] Converted assuming 1 birr = 6 yen (currency exchange rate as of the end of March 2016).

hand pump wells. Accumulated water user fees are usually between 3,000 birr and 5,000 birr. The state of fee collection is generally favorable.

The committees also hold operational rights over exemption policies for households who struggle to pay for water; exemptions are determined at the discretion of the committee.

98% of committees replied that they consult the District Water Resources Offices if funds to cover repair costs are insufficient, suggesting that the committees depend on the District Water Resources Offices not only technically but also financially.

Table 16 Cumulative water user fees (bank deposits)

	Average Cumulative Amount (1)
Piped Water Facilities	50,394 birr
Hand Pump Wells	3,692 birr

Note: (1) Extracted from operating facilities only
Source: Beneficiary survey of committees

Table 17 Measures in case reserves are insufficient for repair

	No. of Responses	Ratio
Consultation with District Water Resources Office	54	98%
Consultation with Village Bureau	1	2%
Other	0	0%

Source: Beneficiary survey of committees

Record of a reserve and bankbook

Piped water facility public water faucets

People waiting in line to fetch water

Bade Arga settlement in Raya Azebo District
(piped water facility, using a power pump by public power)

3.5.4 Current Status of Operation and Maintenance

To evaluate facility use and current maintenance status, status of each facility was organized into a table by the District Water Resources Offices, and the evaluator visited 55 sites on foot to confirm current status of operation and maintenance.[58]

Facility rules were organized at each facility, and were respected by users. Users tended to determine rules autonomously via dialogue. Specifically, users agreed on their own on regulation items, such as implementation of a no-shoes policy,[59] limitation on the accessible time period, placement of a watchman during well use, and assignment of nighttime patrol.[60]

The committees conduct maintenance activities, such as cleaning and drainage around the

[58] Facilities located in nine settlements were studied on-site by the evaluator.
[59] A rule for removing shoes upon entering the platform, to maintain hygiene standards.
[60] Interview surveys with the committees.

water pumping area, and the status of maintenance is generally favorable. Hand pump wells are disinfected and reservoir tanks of piped water facilities are cleansed and disinfected periodically. The rate of fence installation was 83% at hand pump wells and 100% at piped water facilities at the time of the ex post evaluation.

According to the beneficiary survey of committees, 49% replied that unusable periods due to repair were 2-3 days in length, 18% replied more than 2-3 days but less than a week, 27% replied more than a week but less than a month, and 6% replied more than a month; 27% of committees indicated that they "stock consumable spare parts." Time required for repair of facilities built by this project is short, and facilities are maintained well.

With respect to repair of out-of-order facilities, foreign-made power pumps have malfunctioned and power generators have broken.[61] Purchase of replacements is being considered in both cases, using accumulated water user fees and assistance from the District Water Resources Offices.[62]

In light of the above, no issues were found in maintenance of the project from institutional, technical, or financial perspectives; the current status of operation and maintenance was favorable, and thus the sustainability of the impact generated by this project is evaluated to be high.

4. Conclusion, Lessons Learned, and Recommendations

4.1 Conclusion

This project aimed to develop water facilities to improve reliable access to safe drinking water in 91 villages across 10 districts in the Tigray Region. The project is highly relevant, as its contents are consistent with both the prioritized areas of the development policies of Ethiopia and the Japanese ODA policy, with the great need for development. The efficiency is low in terms of contents cost and time period, significantly exceeding the plan due to unfavorable outcomes in the bidding process. The project effects expected in the planning stage have been observed: The target water supply population was achieved at the time of ex-post evaluation, and safe, stable water supply was secured in general. With greater volume of water, improved water quality and improved hygiene behavior, water-borne illnesses decreased, and productive activities increased on account of reduced time spent on water-fetching labor. The project has high effectiveness and impact, as demonstrated by improvements in the living environment. Under the supervision of the Regional Water Resources Bureau, adequate maintenance structures are established at every level, and monitoring and reporting systems are also functioning. Financials are favorable at every level and future budgets are expected to be allocated sufficiently; thus, future financials are likely to be sustainable. The technical level of the staff at the District Water Resources Offices and elsewhere is strengthened, enabling them to address on-site problems immediately. The

[61] Deletie and Kepan settlements in Raya Azebo District.
[62] Interview survey with the Regional Water Resources Bureau and Raya Azebo District Water Resources Office.

implementing agency recognizes the need to provide refresher trainings (re-training) for technical staff in committees, and the District Water Resources Offices plan training sessions and execute them periodically. The maintenance status is favorable as a result of these initiatives, and the sustainability of the effects generated by the project is high.

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

4.2 Recommendations

4.2.1 Recommendations to Implementing Agency

Information Management at the District Water Resources Offices

According to the interview surveys with the Tigray Region Water Resources Bureau, report documents acquired from the implementing agency, including the Completion Reports and the Detailed Design Reports, were already distributed to the District Water Resources Offices as hard copies. However, information was not shared properly with some offices in which staff members in charge moved to other positions. Information must be thoroughly managed at the District Water Resources Office level in order to properly store design drawings and so forth, which are needed for maintenance and management and to utilize them when repairs are needed.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Raising awareness among residents on importance of name plates with information for wells

Facility name plates have already worn out in the three to four years since their installation, and finding target facilities was often difficult if only based on district, village, and facility ID information alone. The facility name plates included technical information such as drilling depth and moving water level during drilling, which are important for assessing cause of malfunction and future operational outlook, and the poor conditions of the name plates hindered the investigation on sustainability aspects.

Well name plates including valuable information such as drilling depth and moving water level were not recognized as important by residents in most cases, and were often removed by children's pranks. An awareness raising activity among residents on the value of this information for the well maintenance should be integrated into the soft components.

Requirement of recording facility location in official project documents such as completion report, and submission of well drilling data to JICA

As stated in the constraints of evaluation, due to the lack of information of facilities location, it took an unexpected time for surveyors to find the facilities.

Positional information, such as coordinates of Universal Transverse Mercator (UTM) and

GPS, should be described in the Completion Report. When contractors and consultants alone possess this positional information, obtaining the data is difficult without a special request to them. Additionally, data such as well drilling depth and moving water level should also be submitted electronically to JICA headquarters and the local JICA office.

(At present, positional information for facilities is not required for the Completion Report. Well drilling depth and moving water level data are found in as-built drawings submitted by the contractor to the implementing agency these as-built drawings, which include more than a dozen booklets as hard data, are also not required to be submitted to JICA.)

Placement of technical expert at the village level

The Tigray Region assigns a technical expert to each district office which manages water supply, irrigation, and energy facilities including district water resources. The technical experts visit each water supply facility at least once a month, and instruct the facility operators and caretakers on its maintenance. Development of such a thorough operation and maintenance system is an effort unique to the Tigray Region, and has contributed to improvement in operation and maintenance and decrease of the non-operating water supply facilities. This is a good practice given that the monitoring systems for many cases of water supply in rural areas are generally weak.

Federal Democratic Republic of Ethiopia

FY2015 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Rural Water Supply in Oromia Region"

External Evaluator: Noriyo Aoki, Alfapremia Co., Ltd.

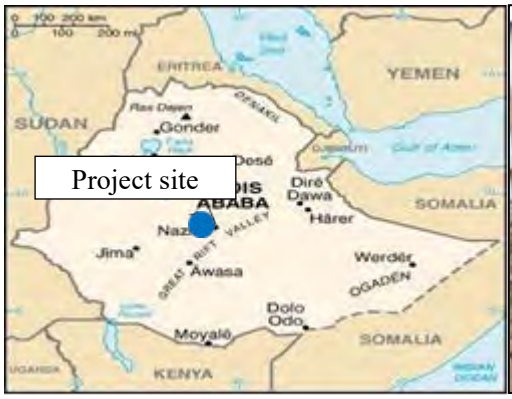
0. Summary

This project was implemented with the aim of developing water supply facilities in 46 villages in the West Shewa, Horo Guduru and Jimma Zones of Oromia Region to improve and reliable access to safe water.

This project is highly relevant, as its objective is consistent with priority areas in Ethiopia's development policy and Japan's Official Development Assistance (ODA) policy, and the needs for such a development are high. Though the total project cost was within the plan, the duration of the project was longer than planned; thus, the efficiency of the project is fair. The effects have been observed that reliable access to safe water supply is generally secured, the amount and quality of available water are improved, and there was reduction in the time spent and the distance traveled for fetching water. The project effects expected at the time of planning have been gained. The project has generated impacts of livelihood improvements, such as a decrease in water-borne diseases; improved hygienic behavior; an increase in productive activities, owing to the reduced time spent fetching water; and others. Consequently, the project's effectiveness and impacts are judged to be high. Operation and maintenance system has been established; in terms of the technical aspects, refresher training is necessary for Zonal Water Resources Offices, District Water Resources Offices, and Water Committees. Within the Regional Water Resources Bureau, and Zonal and District Water Resources Offices, the budgets is mostly secured; however, since some Water Committees are not collecting user fees for water, there are some on-going technical and financial problems. Overall, the sustainability of this project's effects is fair.

In light of the above, this project is evaluated as satisfactory.

1. Project Description



Project Location

Horo Guduru Zone
Public Faucet in Jardega-Jarte District

1.1 Background

Oromia Region as the target region is located at the center of Ethiopia, surrounding the capital city of Addis Ababa. The population of Oromia Region is 33,690,000,[1] which is 34% of the total population of Ethiopia (recorded as 99,390,000 in 2015[2]). Three zones, that is, West Shewa Zone, Horo Guduru Zone, and Jimma Zone which are the project target areas are located adjacent to each other on the west side of Oromia Region. West Shewa The elevation ranges from 1,500 to 2,500m above sea level, and among the relatively gentle hills, there are several steep mountains over 3,000m in height. The annual mean of the precipitation ranges between 700mm and 1,900mm, depending on the area. March and April are the light rainy season, while June to October is the heavy rainy season. The people in the target region run traditional farms with livestock. The shortage of water caused by drought which often occurs has severely affected the local economy and social activities[3].

1.2 Project Outline

By developing water supply facilities in 46 villages spread throughout 17 districts of the three zones (West Shewa, Horo Guduru, and Jimma) of Oromia Region,[4] the project aimed to achieve and reliable access to a safe water supply, thereby contributing to improving the residents' living environment.

E/N Grant Limit or G/A Grant Amount /Actual Grant Amount		Detailed Design: 28 million yen/28 million yen Construction and Equipment: 1.029 billion yen/1.004 billion yen
Exchange of Notes Date (Grant Agreement Date)		Detailed Design: Jan. 2009/Jan. 2009 Construction and Equipment : Jul. 2009/Jul. 2009
Implementing Agency		(At the planning) Oromia Water Resources Bureau: OWRB (At the ex-post evaluation) Oromia Water, Mineral and Energy Bureau (name changed in Oct. 2010)
Project Completion Date		Date of completion: Nov. 2012 Soft components completed: Nov. 2012
Contractors	Main	Construction: Tone Engineering Corporation Equipment: Tone Engineering Corporation
	Consultant	Kokusai Kogyo Co., Ltd.
Basic Design		The Project for Rural Water Supply in Oromia Region, Basic Design Study, Nov. 2008
Detailed Design		The Project for Rural Water Supply in Oromia Region, Detailed Design Study, Sep. 2009
Related Projects		Technical Cooperation Project " Groundwater Development and Water Supply Training Project (Phase 1)" (1998-2005) Technical Cooperation Project "The Ethiopian Water Technology Center Project (The Groundwater Development and Water Supply Training Project: Phase 2)" (2005-2008) Technical Cooperation Project "The Ethiopian Water Technology Centre Project Phase III" (2008 – 2013)

Source: Prepared based on documents provided by JICA.

[1] The 2015 population is estimated based on the 2007 population census (Ethiopia Central Statistical Agency).
[2] World Development Indicators Database, 2015 population is estimated, World Bank (Jul. 2016).
[3] Ex-ante evaluation sheet.
[4] The lowest administrative unit is the village; and lower communities than a village are referred to as settlements.

2. Outline of the Evaluation Study

2.1 External Evaluator

Noriyo Aoki (Alfapremia Co., Ltd.)

2.2 Duration of Evaluation Study

Studies for this ex-post evaluation were conducted during the following periods:

Duration of the Study: October 2015 –February 2017

Duration of the Field Study: February 6 -17 and June 2-7, 2016

3. Results of the Evaluation (Overall Rating: B[5])

3.1 Relevance (Rating: ③[6])

3.1.1 Relevance to the Development Plan of Ethiopia

The Ethiopian government proposed promotion of water resource development as one of the priority issues in the national five-year development plan (Plan for Accelerated and Sustained Development to End Poverty: PASDEP. 2005-2010). Though the Water Sector Development Program (WSDP: 2002-2016) was initially formulated, the Universal Access Plan (UAP: 2005), in accordance with the Millennium Development Goals, was subsequently proposed, reducing the target indicator definition of the rural water supply rate from 20L/day per person stipulated by the WSDP (no distance set) to 15 L/day per person (no distance set), to be achieved by 2012.

At the time of the ex-post evaluation, the Growth and Transformation Plan (GTP: 2011-2015) established in 2010 as the new national five-year development plan, addressed that the reliable supply of drinking water was essential to socioeconomic development, improvement in the people's quality of life, and reducing the poverty. Therefore, it was determined to be a strategically important issue. GTP defined the rural water supply rate as 15 L/day per person (within a radius of 1.5 km), which was scheduled to be 98% achieved by 2015.[7] In the revised UAP formulated in 2011, the definition of rural water supply rate stated in the GTP was used.

The definition of the rural water supply rate in GTP II (2016-2020) increased the amount of the standard water supply to 25L/day per person, aiming to ensure access to water supply points, such as wells and public faucets, within a radius of 1.0 km. The plan is to achieve 85% of the national rural water supply rate by 2020. Oromia Region adopted the GTP II's definition of rural water supply rate, and set the region's standard rural water supply rate in 2016 to be 53%; in accordance with the GTP II water sector plan, Oromia Region aims to achieve a rural water supply rate of 79% by 2020.[8]

In the light of the above, this project is consistent with the national policies of Ethiopia and

[5] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[6] ③: High, ②: Fair, and ①: Low.
[7] GTP, Vol 2, P.15.
[8] Interview with the Regional Water Resources Bureau.

Japan during both the planning and ex-post evaluation stages.

3.1.2 Relevance to the Development Needs of Ethiopia

At the planning stage, 85% of Ethiopia's population living in villages and settlements spent a large amount of time and effort securing water for livelihood. Similarly, in Oromia Region, especially in rural areas, target area residents suffered from chronic water shortages, and problems such as the daily water fetching labor of women and children for many hours were serious. Due to unhygienic drinking water, residents suffered from water-borne illnesses, such as diarrhea and parasites. Since much time and labor was spent on fetching water, this affected the region's economic activities for sustenance of life.

At the time of the ex-post evaluation, as explained below in the section on effectiveness, the needs identified at the planning stage were satisfied. The expansion of water supply facilities was delayed in the target area in Oromia Region, and there was a high priority for implementation of the project; thus, the selection of the target area is considered to have been appropriate. Conversely, as described earlier, an increase in number of facilities in accordance with the Oromia Region GTP II Water Sector Plan is required now.

As such, at the time of the ex-post evaluation, facility expansion with a new plan is required, but the development needs identified at the planning stage are satisfied by the project, and the relevance of the priority and target selection of the project is high.

3.1.3 Relevance to Japan's ODA Policy

The Japanese government selected "environmental conservation" as a prioritized assistance field in its "Country Assistance Plan for the Federal Democratic Republic of Ethiopia": when the program was developed in August 2000, the government stated that it would prioritize water and sewage management development assistance. Subsequently, when the same plan was revised in June 2008, ensuring water for livelihood and management of drinking water were proposed as priority areas for assistance. In addition, the Japanese government stated its commitment to support effective water source management and access to safe water at the Fourth Tokyo International Conference on African Development (TICAD IV) in May 2008.[9]

In view of the above, the implementation of the project fully conforms with the development policies and development needs of Ethiopia, in addition to Japan's assistance policy; therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

This project constructed hand pump wells in 58 locations, spring on-spot water supply facilities in eight locations (hand pump well facilities and spring on-spot facilities are classified as "Level 1"), and piped water supply facilities in 15 locations (piped water supply facilities are classified as "Level 2"). The water sources for the piped water supply facilities comprised nine deep wells and six springs. The project installed above ground distribution

[9] TICAD IV Yokohama Action Plan, May 2008.

reservoirs at 15 locations, and installed overhead tanks, water distribution pipes, and collection wells as needed. For the 15 piped water supply facilities, a total of 148 public faucets were installed. In addition, equipment was procured by Zonal and District Water Resources Offices.[10]

Table 1 shows the outputs developed and provided by the Japanese side (planned vs. actual). Table 2 shows the outputs developed and provided by the Ethiopian side (planned vs. actual).

Table 1. Outputs Developed and Provided by Japan (planned vs. actual)

Item	Planned Number	Actual (compared to the plan)
Deep wells	67 (level 1: 58, Level 2 :9)	As planned
Spring protection facilities	14 (Level 1: 8, Level 2 :6)	One location was built by Ethiopian side, others as planned
Machine rooms	12 (Level 2: motorized pump 12, except three gravity fed facilities)	As planned
Water distribution pipes	80.1 km	Almost as planned
Above-ground reservoirs	15 (Level 2)	As planned
Overhead tanks	3*(Level 2)	As planned
Hand pumps	58 (Level 1)	As planned
Motorized pumps	12 (Level 2, except three gravity fed facilities)	As planned
Sources for powered pump	12 (Level 2, except three gravity fed facilities)	As planned
Public faucets	148 (Level 2)	As planned
Collection wells	3*(Level 2)	As planned
Decompression tanks	4*(Level 2)	Added
[Procured equipment]	Number	Actual (compared to the plan)
Motorcycles	17	As planned
Pickup trucks	3	As planned
GPS	20	As planned
Geophysical prospecting equipment	3	As planned
Survey equipment	3	As planned
Water quality analysis kit	20	As planned

Sources: Basic Design Study Report, materials provided by JICA; interview with the consultant; implementing agency's responses to the questionnaire.
*These outputs have been set up at the time of the design for the facilities based on the site conditions.
Note. For spring protection facilities, eight spring on-spot facilities and six piped water supply facilities that use springs as the water source were planned; however, in one spring on-spot facility, the spring protection construction, in which the facility content was changed for reasons discussed later, became the duty of Ethiopian side

Table 2. Outputs Developed and Provided by the Ethiopian side (planned vs. actual[11])

Items for which Ethiopia is responsible	Actual (compared to the plan)
1) Securing water sources (acquisition of water rights)	As planned
2) Acquisition of construction sites (acquisition of exclusive rights)	As planned
3) Securing storage space for acquired equipment	As planned
4) Ensuring Access to points of wells	Almost as planned
5) Prevention measures against surface water inflow, such as rainwater	As planned
6) End of the stream drainage	As planned

[10] Materials provided by JICA.
[11] No information has been provided by the implementing agency on the expenditures associated with these outputs.

Items for which Ethiopia is responsible	Actual (compared to the plan)
7) Fences around the main structures	As planned
8) Fences around hand pumps and public faucets	Almost as planned
9) Construction and provision of commercial power facilities	As planned
10) Equipment tax exemption cost	As planned
11) Personnel for soft components	As planned
12) Ensuring organization, personnel, and budget for developing operation and maintenance system	As planned
13) Development of monitoring system for operation and maintenance conditions	As planned

Sources: Basic Design Study Report P.3-77, P.3-96, materials No.8; materials provided by JICA; interview with the implementing consultant; the implementing agency's responses to the questionnaire.

Regarding changes to the outputs, since an access road was not secured due to erosion during the rainy season, the site of one well had to be changed to another location within the same district. In addition, as the roads that the Ethiopian side was constructing contained bedrock, and therefore it required considerable time to develop, and vehicles transporting materials could not pass along these roads; therefore, one of the spring on-spot facilities was transferred to be the Ethiopian side. Similarly, for the facilities to which materials could not be transported using vehicles because of the road access, the facility structures were changed and materials were transported using carriages pulled by donkeys. In addition, to lower water pressure in some pipes, decompression tanks were added.[12] These changes to the outputs were made in accordance with the local conditions described above, and the influences to effectiveness of the project were minimized. Regarding the facility changes, although there was no influence to the project expenditure, the addition of the decompression tanks influenced the duration of the project construction. Furthermore, in the areas that did not require decompression tanks, it took time to adjust water pressure in the pipes, and exchanging some parts of the pipes impacted the construction period.

The capacity building activities for operation and maintenance (hereafter referred to as ''soft component'') were implemented with the aim of establishing community ownership on operation and maintenance systems, and ensuring sustainable maintenance management. Specifically, these components comprised: resident meetings, formation of Village Water Committees[13] and Water Committees[14] (When the term "Committee" appears in this report, it refers to Village Water Committees and Water Committees), development of maintenance plan by residents, learning necessary skills, and education on hygiene.

3.2.2 Project Inputs

3.2.2.1 Project Cost

While the planned project cost was E/N Grant Limit of 1.057 billion yen, the actual cost was 1.032 billion yen, which was within the plan (98% of the planned total expenditure). Since

[12] Materials provided by JICA. Interview with the implementing consultant.

[13] The Village Water Committees lead on operations and maintenance for piped water supply facilities. Specifically, the Committee which consists of the water users from the area where the pipe water supply facilities cover. Some are settlement units, and some are village units.

[14] The Water Committees refers to the Committees centered around a single water platform, such as a hand pump well or a spring on-spot facility which leads operation and maintenance for those facilities.

the third party evaluator was unable to obtain information on Ethiopia's expenditure, we excluded it from the evaluation.

Comparing the inputs planned and the actual results for soft components, in contrast to the planned 3 man-months (M/M) for Japanese experts and 18M/M for local consultants,[15] the actual results were 4M/M for Japanese experts and 22M/M for local consultants: the M/M of the local consultants increased. The reason for this is that the extent of soft component activities increased with the prolonged construction. The cost for the increase in M/M was borne financially by the consultant companies; thus, it did not influence on the cost of the project.[16]

3.2.2.2 Project Period

In the initial plan, the project duration was 35 months;[17] however, the actual project took 47 months, from January 2009 (Detailed Design E/N agreement) to November 2012 (134% of the planned duration). The reason for the project's duration exceeding the plan was the exchange of part of the pipes to manage water pressure and the addition of decompression tanks.

In the light of the above, though the project cost is within the plan, since the duration of the project exceeded that in the plan, its overall efficiency is fair.

3.3 Effectiveness (Rating: ③)

In this project, the evaluator used the water supplied population which are using facilities as the main indicator. The operation rate of the facilities, the improvement in water quality/amount and so on were considered in evaluating the project's effectiveness.

In Ethiopia, the definition of the water supply rate differs depending on the timing of the water sector policy. In this project, the water supply unit is set at 15 L/day per person, and the standard and target values were set at the time of planning. Changes in the definition of the water supply rate do not affect the indicators concerning the water supply population, which is the project's main indicator. For example, although the distance has been set for the water supply rate definition in the water sector policy at the time of the ex-post evaluation, the distance is not included in the indicators of the water supply population to ensure consistency with the indicator conditions at the time of planning and at the time of the ex-post evaluation.

3.3.1 Quantitative Effects (Operation and Effect Indicators)

3.3.1.1 Water Supply Population (Main indicator)

The target value at the time of planning was a water supply population of 101,338 people

[15] Basic Design Study Report, p. 3-94.
[16] Interview with the implementing consultant.
[17] Ex-ante evaluation sheet.

by 2016[18]. As shown in Table 3, at the time of ex-post evaluation in 2016, a water supply population target of 106,961 was achieved[19] (106% of the plan).

Table 3. Main Effect Indicator of This Project (unit: person)

Indicator name	Standard value	Target value	Actual value	Actual value
	2007	2016	2012	2016
	Planned year	5 years after completion	Time of completion	4 years after completion
Water supply population	0	101,338	-	106,961

Notes. "Water supply population" is defined as the number of people who can access water. The water supply unit is 15 L/day per person.
Sources: Basic Design Survey Report; materials provided by JICA; reports from the water resources office in each zone.

3.3.1.2 Operating Rate

The operating rate at the time of ex-post evaluation of the facility when three water supply types (hereafter referred to as "water supply schemes") are combined[20] was 78% (63/81). Of the 14 non-operating hand pump well facilities, nine are not operating due to the lowered level of the groundwater level. This is an external factor: drought due to the shortage of precipitation in recent years. Including these facilities, the operating rate was calculated to be 78%. Conversely, excluding the facilities not operating due to low groundwater levels, the operating rate was 88% (63/72); thus, it was judged that the operating rate shows high effectiveness.

Table 4. The Operating Rate of the Water Supply Facilities (unit: number of facilities)

Type of water supply (Water supply scheme)	Target value	Actual values	Actual values	Actual values	Operating rate
	2011	2012	2014	2016	2016
	Time of completion	Time of completion	2 years after completion	4 years after completion	4 years after completion
Hand pump well facilities	58	58	57	44	76%
Spring on-spot water supply facilities	8	8	8	7	88%
Piped water supply facilities	15	15	13	12	80%
Total number of facilities/mean operation rate	81	81	78	63	78%

Notes.1.The completion of this project was scheduled for 2011.
2.The operating rate of a facility is calculated by dividing the number of facilities in operation by the total number of facilities. The mean operating rate for the total facilities was 63÷81=77.8%.
3.The planned values are the planned number of facilities. The actual values are the number of facilities in operation of the total number of facilities that were actually built.
Sources: Ex-ante evaluation sheet p. 3; Basic Design Study Report p. 3-4; information on the operating facilities collected for each zone.

[18] The planned population for the project implementation target was calculated by taking the sum of the water supply population requested by the region (90,000: 2007) and factoring in the rate of the annual population increase of Oromia Region's rural population (2.3%) up to the planned target year. The definition of water supply unit was 15 L/day per person, taking actual water use and the UAP standard into consideration.
[19] Since the communication via internet was difficult in target areas, the survey team distributed a CD-ROM containing questionnaire items, such as the water supply population per facility, etc. to each Zonal Water Resources Office as targets of the ex-post evaluation. The surveyors then collected the CD-ROMs after each office had inputted its responses, and then summarized the results.
[20] "Operating" is defined as a condition in which water is being retrieved, regardless of the amount or quality of the water; namely, it means "being used." The operatingng rate is calculated as the number of facilities in operation divided by the total number of facilities.

The reasons for non-operational facilities include damages to connecting pipes, shortage of water in wells due to lower groundwater levels, and unhygienic water quality due to insufficient disinfection of wells[21], making them unusable. Though this matter includes a technical issue, it will be discussed further in the section on sustainability.

3.3.1.3 Water Quality

The results of the beneficiary survey of water users[22] showed that water quality, turbidity, odor, and taste have been improved greatly, as shown in Figure 1. The amount of available water also improved.

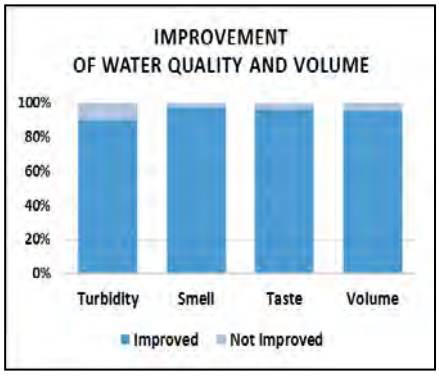
Please see Table 5 for the previously used water sources.

Table 5. Previously Used Water Sources

(multiple responses)

	Number of responses	%
Springs	104	66%
Protected shallow wells	10	6%
Unprotected shallow wells	5	3%
Rivers and streams	45	29%
Purchasing water tanks	0	0%
Others (ponds, etc.)	16	11%

Note. Users may have multiple water sources.
Source: Beneficiary survey of water users.



Source: Beneficiary survey of water users

Figure 1. Improved Water Quality and

[21] In Ethiopia, they tend to be unhygienic, as here are lots of animals in rural area, even if the wells are fenced. Therefore, the facility itself and the surrounding area are sterilized by chlorine every three months.

[22] Two types of beneficiary survey were conducted: a survey that targeted water users and a survey that targeted Village Water Committees or Water Committees. In the report, the former is called the "beneficiary survey of water users" and the latter the "beneficiary survey of committees." In the survey of water users, the surveyors targeted people who fetch water. Different questionnaires were useddepending on the target group.

No more than three samples were collected from each facility; though selection was random, sampling was stratified to minimize bias in age and/or gender. In the beneficiary survey of water users, the surveyors selected 27 Level 1 and 29 Level 2 samples from West Shewa, 36 Level 1 and 24 Level 2 samples from Horo Guduru , and 42 Level 1 and 43 Level 2 samples from Jimma, totaling 201 samples. Effective responses were obtained from 187 of those 201 samples. The breakdown of the respondent's ages was as follows: 8.5% in 10s, 20.2% in 20s, 29.3% in 30s, 28.3% in 40s, 8.0% in 50s, 2.7% in 60s, and 2.6% older. The respondent gender ratio was as follows: 60.5% women and 39.5% men.

In the beneficiary survey of Committees, the ratio of Village Water Committee respondents and Water Committee respondents was 15:66. Because piped water supply facilities managed by Village Water Committee have a large number of public faucets, and maintenance management is difficult, therefore, as a target of a more detailed survey, sample selection from the Village Water Committees is especially valued; consequently, the selection ratio is higher for the Village Water Committees. The selection method took into consideration geographical accessibility, safety measures, etc.; therefore, it had to be intentional. The selected samples comprised 12 Village Water Committees and 13 Water Committees. Since the size of the samples was limited, the findings are not statistically significant, but intended as case studies.

3.3.2 Qualitative Effects (Other Effects)

3.3.2.1 Volume of Water

In the Level 1 hand pump well facilities, depending on the depth of the wells, either Afridev[23] or India Mark II pumps is being used. At the operating facilities, there is no problem with the water pressure of the faucets. Shortages of water during the dry season occur in some of the hand pump well facilities. Dried wells or wells with poor water quality are unused. The Level 1 spring on-spot water supply facilities secure sufficient amounts of water throughout the year. The Level 2 piped water supply facilities also provide reliable water access during both dry and wet seasons. In these facilities, Village Water Committees decided to limit the operating time of the pump to secure a stable volume of water supply. According to the interviews in the field survey, when the volume of water fetched by one household was divided in athe number of the household, the supply was 18 to 24L/day per person.[24] For Level 2 piped water supply facilities, there was no drought of water during the dry season.

3.3.2.2 Shortened Time and Distance to Fetch Water

The time required and the distance travelled to fetch water were shortened by this project. For 57% of the recorded cases, the time was shortened by less than 30 minutes. Thirty-two percent of water users responded that the time was reduced by 30 minutes or more but less than 1 hour.

Table 6. Shorter Time and Distance to Fetch Water

	Shortened	Not shortened
Distance to fetch water	87%	3%
Time taken to fetch water	95%	5%

Source: Beneficiary survey of water users

Table 7. Shortened Time Fetching Water

Shortened time/day	%
< 30 min.	57%
≥ 30 min, < 1 hr	32%
≥ 1 hr, < 2 hr	10%
≥ 2 hr	1%
No change	0%
Total	100%

Source: Beneficiary survey of water users.

3.3.2.3 Safety of Fetching Water

As shown in Table 5, springs were the main water source used prior to the project; thus, by using hand pumps and water faucets, accidents, such as slipping around muddy springs, were eliminated, securing the ty of water users.

3.3.2.4 Effects of Soft Components

Soft components were planned with the aim of establishing maintenance structure by residents' ownership, but they were not tailored to each water supply scheme and differences in the water sources; thus, the subjects of the implementation, the methods, and the contents of the soft components were not consistently in accordance with the nature of each water supply scheme. However, since technological instruction of facilities was conducted on-site by the contractors in accordance with the water supply scheme, it was easy for the operators and

[23] This is a type of deep well manual pump that is able to pump water to level of about 40 m. Conversely, the India Mark II pump is used when the dynamic water level is 40 m or more.
[24] These survey results were recorded in February, during the dry season.

caretakers of the Committees to learn.[25] It was determined in the plan that, during residents meetings, the opinions of women, as the main users of water supply facilities, were to be respected; however, in practice, there were cases where information and opinions provided by women were not reflected by the Committees. This matter will be discussed further in the section on sustainability. Though implemented as soft components, the areas in which instructions were insufficient were augmented by staff from the District Water Resources Office, who instructed how to collect fees and hygiene issues, such as sewage and cleaning.

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Improved Hygienic Behavior Regarding Water Use

In the survey of water users, 98% responded that their "awareness of water use and hygiene changed." Many indicated changes in hygienic behavior based on an increased amount of water use, such as "more frequent hand-washing (43%)," "increased washing of clothing (34%)," and "more frequent bathing (37%)." Not many responded with "boiling water (3%)" but according to the interview with the Water Resources Bureau and local water supply experts, this is associated with difficulty obtaining fuel.

Table 8. Changes in Hygienic Behavior (multiple responses)

	Number of responses (persons)	Percentage of respondents
Boiling water	6	3%
Frequent hand-washing	81	43%
More washing of clothing	63	34%
Frequent bathing	69	37%

Source: Beneficiary survey of water users.

3.4.1.2 Decrease in Water-borne Diseases, such as Infectious Diarrhea

Ninety-nine percent responded that infectious water-borne diseases, such as diarrhea, had decreased.[26] In the interview survey at a health center in the settlement of Gutena Beguru.[27] under the jurisdiction of the Horo Guduru Zone, Abay Chowmen District Water Resources Office, the responses reported that since this project had begun, the number of patients suffering from diarrhea and dysentery had significantly decreased.

3.4.1.3 Changes in use of time

The labor time required for fetching water was shortened by this project. The beneficiaries

[25] The maintenance staff of Level 2 piped water supply facilities are called "operators," while those of Level 1 facilities are called "caretakers."

[26] Beneficiary survey of water users.

[27] Level 2 piped water supply facilities were constructed in this settlement. The water source is a deep well, and nine public faucets were installed. The population that received water numbers 3,223. As this was determined to be sufficient sample size to clearly understand the changes in the beneficiaries' conditions, this area was selected. For other areas, even with similar interviews, there was no health center etc., through which the direct impact of the project could be confirmed.

are spending this time on agricultural activities, household chores, and community activities. According to the results of the beneficiary survey of water users (multiple answers permitted), 92% responded that the time they spent fetching water were "shortened," and that the time saved was "spent on agricultural activities." In addition, 60% responded that time saved was also spent on "improving income from non-agriculture." Analysis on use of the surplus time by gender resulted almost the same.[28] The reduced labor required in fetching water contributed to further engaging in income generating activities by men and women.

3.4.1.4 Impact on Children who Fetch Water

In the beneficiary survey of water users, 98% responded that there was an impact on the lives of children who fetch water. Though their role in fetching water did not change much, 43% responded that "the amount of time spent on education increased," while 36% responded that "children are helping parents more (activities except water fetching; caring for cattle, etc.)." In addition, the enrollment situation of school age children were confirmed by educators in villages to have been positively impacted by the reduced time required to fetch water. Specifically, "school children can get to school earlier than before."

3.4.1.5 Impact on Other Community Activities by Residents

In this project, as residents were responsible for implementing the development of fences and drainage, with access road to water supply points being constructed by contribution from both residents and the District Water Resources Office, it became a joint maintenance initiative. Through this process, community activities and creating an organization to solve issues jointly became much easier. In the beneficiary survey of water users, 98% responded positively to the question, "did you observe or feel that this project made community activities more active?"

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

As a result of monitoring during and after the construction by the Zonal Water Resources Offices, ground subsidence due to pumping or drought of water sources did not occur. Furthermore, the construction process did not damage nature.[29]

3.4.2.2 Resettlement and Land Acquisition

There has not been any resettlement and/or land acquisition due to implementation of this project.[30]

[28] Beneficiary survey of water users.

[29] Interview with the Zonal Water Resources Offices. An Environmental Impact Assessment (EIA) was to be asked to confirm that due consideration had been given to environmental impact, etc. It is possible that there was a description concerning EIA information in "Preliminary Study on the Project for Rural Water Supply in Oromia Region" (August to September 2007), which was implemented before Basic Design; however, despite raising this issue with the implementing consultant and agency, such information could not be obtained.

[30] Interview with Regional Water Resources Bureau.

3.4.2.3 Impact of Construction on Area Residents

When construction sites were near residences, working times were regulated, proscribing loud work being conducted during the early morning or in the evening, including meal times. Since the transport ty of area residents was considered while drilling, there was no impact on residents. To prevent runoff of excavated soil due to rain, drilled areas were promptly filled, etc.[31]

In the light of the above, the target value for water supply population, which was the main indicator at the time of planning, was achieved at the time of the ex-post evaluation, and reliable access to safe water supplies had been secured. Through improvements to the amount and quality of accessible water, and reductions of the time and distance required to fetch water, the effects expected at the time of planning were achieved. In addition, there are impacts that have improved the livelihood improvement, such as a decrease in water-borne diseases, improvement in hygienic behavior, increased productivity due to the reduced time fetching water, etc. Therefore, the project's effectiveness and impact are judged to be high.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

The roles and responsibilities of technicians and the maintenance system for each department of the water supply facilities are shown in Table 9. Each responsibility was clearly assigned and they have mostly been implemented.

Table 9. Roles and Responsibilities for Facility Operation and Maintenance (ex-post evaluation)

	Roles and responsibilities	Communication system, etc.
Regional Water Resources Bureau	Provides spare parts to the Zonal Water Resources Offices. Communication with each Zonal Water Resources Offices in relation to policies and budgetary matters.	Reporting system of malfunction and repairs is established, and damages are nearly all reported.
Zonal Water Resources Offices	Report information and data from the District Water Resources Offices to the Regional Water Resources Bureau. Undertake difficult repairs on behalf of the District Water Resources Offices. Provides spare parts to the District Water Resources Offices	
District Water Resources Offices	Facility inspections, repairs, collection of maintenance fees, quarterly reports to the Zonal Water Resources Offices.	
Village Water Committees	Supervise regular facility inspections, cleaning, minor repairs, collecting water user fees, and the operation and maintenance of the overall water supply facilities in villages.	
Water Committees	Regular facility inspections, cleaning, and collection of water user fees. Simple exchange of spare parts.	

Sources: Interviewing with the Regional Water Resources Bureau; responses to questionnaires; interviewing with each District Water Resources Office.

[31] Interview with the implementing consultants.

3.5.1.1 Implementing Agency

The implementing agency changed its name to "Oromia Water, Mineral and Energy Bureau" in October 2010. There was also an organizational change in 2010, and the Regional Water Resources Bureau was placed in line with the Regional Mineral and Energy Bureau. The Regional Water Resources Bureau consists of the water supply facilities management department, the community operation coordination department, the contract /construction /supervision department, the survey design department, and the water resources management department. The irrigation and health departments that used to be part of the Regional Water Resources Bureau were separated from it in 2010. In Oromia Region, the number of staff in the Zonal Water Resources Offices remains similar to those accounted for in the project's plan; however, to strengthen the function of the District Water Resources Office in charge of each facility, the number of staff at District Water Resources Office and human resources are increased compared to the planning period.

In addition to overseeing water resources, the District Water Resources Offices have geography staff, electrical technicians, environmental managers, water resource managers, water administration officials, and staff with other expertise are all also responsible for minerals and energy. Each staff member is responsible for around 15 water supply points (wells and public faucets), which is a sufficient system to cover each responsibility.[32] The communication system for operation and maintenance is diverse among the District Water Resources Offices, but it is more or less established and functioning. The system for supplying spare parts involves the District Water Resources Offices storing spare parts that are often exchanged, selling at a lower cost than the market price. Only spare parts for foreign pumps and generators that cannot be produced in Ethiopia require time to procure.

Table 10. Number of staff at Regional Water Resources Bureaus and Zonal & District Water Resources Offices (unit:person)

	At the time of planning	At the time of ex-post evaluation
Regional Water Resources Bureau	NA	293
Zonal Water Resources Offices	12–18	12‐20
District Water Resources Offices	3‐10	15‐18

Sources: Basic Design Study Report P.2-1; response to questionnaires; interview with the Regional Water Resources Bureaus and District Water Resources Offices.

Based on the difficulty of facility repair, operational checks and maintenance of facilities are regularly performed. The communication system for reporting malfunctions is now functioning most of the time.

3.5.1.2 Village Water Committees and Water Committees

For Level 2 facilities, Village Water Committees lead on the operation and maintenance.

[32] In other east African nations, each staff often supervises 40 or more water supply points.

These Committees consist of a chairperson, a vice-chairperson, members in charge of financial, accounting, hygiene and an operator as facility manager, all who are elected from residents. The maintenance group for public faucets collects water user fee as an organization under the Village Water Committees, and pay this money into the Village Water Committees' accountant to fund the management of public faucets.

Regarding Level 1 facilities, Water Committees operate and maintain both hand pump water supply facilities and spring on-spot water supply facilities. A Water Committee consists of a chairperson, a vice-chairperson, caretakers for managing facilities, accountants, and persons in charge of hygiene who are elected from residents. Water Committees are responsible for collecting water user fees, managing the bank savings from cumulative water user fees, recording the collected fees, cleaning the platform and so on.

The rules and management plans for operation and maintenance are prepared by each committee. Each committee also discusses setting the amount of the water user fee, the times when the facilities should be open for use, and any exemption system for households that have difficulties paying water user fees. When creating a committee, if instructions from the District Water Resources Office and soft components are appropriate, regulations such as alternate exemption from payment for households with financial difficulties - for example, through provision of labor - becomes easier to establish. Furthermore, it would be easier for women to participate in the Committees if the gender ratio of participation in members of Committees is designated beforehand. Based on the beneficiary survey of the Water Committees, participation by women was low. In 68% of the Committees, women' participation as member in committee is less than 30%. According to an interview survey with the members, Leaders or sub-leaders who are engaged in decision-making are almost men. Only 12% of the Committees are considering financial exemptions. Though female participation was promoted by the project through soft components, the soft component activities held during the day time - such as residents meetings, instruction for operation and maintenance, etc. - were predominantly attended by men.

Table 11. Women's Participation Rate for Each Committee

Women's participation rate	Number of responses	%
No participation	3	12
≥1%, <30%	14	56
≥30%, <50%	6	24
≥50%, <80%	0	0
No response	2	8

Source: Beneficiary survey of Committees.

Table 12. Exemption for People with Financial Difficulties

	Number of responses	%
Yes	3	12%
No	22	88%

Source: Beneficiary survey of Committees.

3.5.2 Technical Aspects of Operation and Maintenance

Among those trained by the Ethiopian Water Technology Center (EWTEC), which is

supported by the Technical Cooperation Project Phases 1 and 2, the number of trainees was 152 during Phase 1 and 175 during Phase 2[33]. Some of those trained personnel are assigned positions in the Oromia Regional Water Resources Bureau or at Zonal levels, and have received practical training from instructors with ample experience.[34] Many of those got the managerial post or a technically leading post by the time of the ex-post evaluation.

The technical levels of each person associated with operation and maintenance at the completion of the project are shown in Table 13. Technicians from the Zonal and District Water Resources Offices, the Village Water Committees, and the Water Committees need to have continuous refresher training.[35]

Table 13. Technical Levels (at the time of ex-post evaluation)

	Skill levels
Zonal Water Resources Offices	Skill training is required to repair damage that could not be performed by the District Water Resources Offices. High level and expert training similar to that of the EWTEC was only provided to some staff. Though other staff needed training, opportunities were limited.
District Water Resources Offices	The human resources of the District Water Resources Offices are being strengthened. Since there are staff with expert knowledge and skills in electricity, geography, chemistry, environmental science and piping, most of the required skills are available when required. For example, at Level 1 hand pump well facilities, pipes are extracted for inspection and repair through the process of maintenance management. If there are problems with pipes at Level 2 water supply facilities, experts in piping perform the repairs. However, foreign motorized pumps and generators are often difficult to repair.
Village Water Committees	Operators receive hands-on training from the local construction company, and learn operation and maintenance methods. However, they are required to undergo refresher training on important points for technical monitoring in operation and maintenance.
Water Committees	Caretakers of Water Committees can perform simple exchanges of spare parts under the supervision of the District Water Resources Offices: e.g., exchanging a U-seal,[36] the need for which could be determined during pulling of rods in hand pump well facilities.[37] As in the Village Water Committees, refresher training for caretakers is required.

Source: Interviewing with the stakeholders

[33] The courses include groundwater investigation, drilling techniques, drill equipment maintenance management, water supply plan design, electrical equipment repair, water supply facility maintenance, etc.

[34] Interview with the Regional Water Resources Bureau, and the beneficiary survey performed in an ex-post evaluation of EWTEC Phase 2.

[35] In the ex-post evaluation, some individuals at the District Water Resources Offices who had received instructions in soft components had already been transferred to other districts.

[36] Part that constitutes the hand pump.

[37] Spare parts of the hand pump.

Example of the motorcycles provided,
West Shewa Zone
Ejere district

Record of cumulative water user fees,
Horo Guduru Zone
Abay Chomen district

Pump well water supply facility,
West Shewa Zone
Jalduu district

3.5.3 Financial Aspects of Operation and Maintenance

3.5.3.1 Financial affairs of the Regional Water Resources Bureau

As shown in Table 14, the financial affairs of Regional Water Resources Bureau were well supported with an increased regional budget. The budget is secured for future spending in accordance with the GTP II plan.

Table 14. Oromia Regional Water Resources Bureau's revenue and expenditure (unit: 1,000 Birr)

	2013 (actual)	2014 (actual)	2015 (actual)	2016 (actual)	2017 (budget)
Revenue					
Budget from regional government	815,486.50	1,326,497.00	1,290,990.00	1,745,719.00	1,920,290.90
Subsidy from federal government	684,240.00	343,004.00	341,557.00	279,968.00	307,964.80
Funds from donors	819,976.00	327,832.00	697,161.00	724,513.00	796,964.30
Total Budgetnote1)	**2,319,702.50**	**1,997,333.00**	**2,329,708.00**	**2,750,200.00**	**3,025,220.00**
Expenditure					
Personnel expenses	26,716.00	41,844.80	36,068.80	43,728.80	48,101.68
Maintenance fees	40,074.00	62,767.20	54,009.20	65,593.20	72,152.32
Construction expenses	1,723,809.00	1,462,924.00	1,430,210.00	2,640,877.00	2,904,964.70
Total Expenditure note2)	**1,790,599.00**	**1,567,536.00**	**1,520,288.00**	**2,750,199.00**	**3,025,218.70**

Note 1) Total budget except other items. Other items mean surplus of the previous year, an income by collection of loan. etc.
Note 2) Total expenditure except depreciation and other items. Other items are payment for interest, expenses for office supplies and so on.
Source: Interview with the Regional Water Resources Bureau and responses to the questionnaire.

3.5.3.2 Zonal Water Resources Offices

These offices operate with budgets allocated from the region. According to interview with the Zonal Water Resources Offices, when sufficient budget can be secured at the regional level, there are no difficulties with zonal finances; though the budget allocation from the region was reported to be sufficient, no specific information on income and expenditure was provided.

3.5.3.3 District Water Resources Offices

Annual revenue is allocated from the region and district administration offices to the District Water Resources Offices. The district administration office provides funds covering the personnel cost of staff and the operating costs of the District Water Resources Offices. Regarding new construction costs and maintenance costs provided by the region, the specific budget or funding allocation could not be determined. However, according to the District Water Resources Offices, the necessary maintenance expenditure was allocated with the requested budget, and in the future, a similar budget for maintenance is likely to be provided.

3.5.3.4 Village Water Committees and Water Committees

Of the 63 operating facilities, 50 facilities (80%) collect fees. For the Level 2 facilities, a pay-as-you-go system is adopted. Many Level 1 facilities use a flat-rate system. Within the information that could be understood, Level 2 facilities hold a bank reserve of about 60,000 Birr to 100,000 Birr (per facility), while Level 1 facilities hold 1,000 Birr to 2,000 Birr (per facility). However, main reserve is in the form of cash; thus, it is often not disclosed, and information was difficult to fully apprehend. When there is no exemption for residents with financial difficulties, those who have trouble making payments often return to the springs and rivers that they previously used as water supplies.

Among the Level 2 facilities, two use commercial electricity. Since the cost of diesel fuels for generators is three times more than that of commercial electricity, if powered pumps are operated using commercial electricity, this contributes to reduced maintenance costs and increased accumulative water user fees. In addition, two of the Level 2 facilities benefit from natural flow, and do not, therefore, require fuel for generators or commercial electricity, thus keeping the operation and maintenance cost low. Table 15 shows the opinions of the water users regarding the water user fee.

Table 15. Opinion of Water Users on the Water User Fee

	Level 1 facilities		Level 2 facilities	
	Number of responses	%	Number of responses	%
Appropriate	62	59%	22 [1)]	27%
A little high	3	3%	20	24%
Very high	0	0%	40 [2)]	49%
Unpaid	40 [(3)]	38%	0	0%
Total	105	100%	82	100%

Notes:
1) About 60% of the respondents who answered 'Appropriate' use gravity-fed facilities.
2) About 90% of the respondents who answered 'Very high' use facilities that use a diesel generator.
3) The majority of the respondents previously used rivers and springs as the water source.
Source: Beneficiary survey of water users.

The results of the beneficiary survey of Committees showed that all the Village Water Committees that collect fees in operating facilities all keep records. Regarding the Water Committees, 72% are taking accounting records.

According to the explanation provided by the District Water Resources Offices, as the

applicable national guideline stipulates self-payment on principle, the District Water Resources Offices instruct each Water Committee to preserve the accumulated water user fee paid by the users for future repairs of the facilities. For large-scale repairs, instead of the Committees, the responsible District Water Resources Office or Zonal Water Resources Office may perform the repair as part of the compensation.

3.5.4 Current Status of Operation and Maintenance

In principle, a regular inspection of each facility is performed four times a year by the District Water Resources Offices. In many facilities, the users mostly follows the user regulations for maintenance at the village level. Residents install fences around the facilities (the rate of fence installation for the three types of water supply schemes is 75.3%), and the drainage conditions around the facilities are generally favorable.

The reasons for non-operation of some of the facilities include a dropped pump cylinder or lifting pipe, a shortage of groundwater volume, deteriorating water quality, and the impact of alternative water sources constructed nearby. In addition, users may return to their original water sources to avoid payment. At facilities where the water quality of the wells has deteriorated, some District Water Resources Office were not fully disinfecting the wells. Regarding future repair of non-operating facilities, the staff of the responsible District Water Resources Offices confirm the current conditions, and respond if repair can be performed. In relation to the damage of the connection pipe, Zonal Water Resources Office will take measures as soon as Zonal Water Resources Office obtains the budget. At the ex-post evaluation, the equipment procured (as shown in Table 1) was found to be mostly utilized.

Though there are no problem with the systems, regarding the technical aspects, refresher training is required for staff of the Zonal Water Resources Offices, District Water Resources Offices, Village Water Committees, and Water Committees. From a financial perspective, for the Regional Water Resources Bureau, and the Zonal and District Water Resources Offices, the majority of the necessary budget is secured; however, among the operating facilities, some Water Committees do not collect maintenance fees. In these facilities, financial sustainability cannot be secured unless fees are collected; therefore, instruction in this regard is necessary. The operation and maintenance conditions of the facilities and equipment at the time of the ex-post evaluation were mostly favorable.

In the light of the above, given the minor issues with operation and maintenance of this project from technical and financial perspectives, the sustainability of the effects of this project is fair.

4. Conclusion, Lessons Learned and Recommendation

4.1 Conclusion

This project was implemented with the aim of developing water supply facilities in 46 villages in the West Shewa, Horo Guduru and Jimma Zones of Oromia Region to improve and

reliable access to safe water.

This project is highly relevant, as its objective is consistent with priority areas in Ethiopia's development policy and Japan's Official Development Assistance (ODA) policy, and the needs for such a development are high. Though the total project cost was within the plan, the duration of the project was longer than planned; thus, the efficiency of the project is fair. The effects have been observed that reliable access to safe water supply is generally secured, the amount and quality of available water are improved, and there was reduction in the time spent and the distance traveled for fetching water. The project effects expected at the time of planning have been gained. The project has generated impacts of livelihood improvements, such as a decrease in water-borne diseases; improved hygienic behavior; an increase in productive activities, owing to the reduced time spent fetching water; and others. Consequently, the project's effectiveness and impacts are judged to be high. Operation and maintenance system has been established; in terms of the technical aspects, refresher training is necessary for Zonal Water Resources Offices, District Water Resources Offices, and Water Committees. Within the Regional Water Resources Bureau, and Zonal and District Water Resources Offices, the budgets is mostly secured; however, since some Water Committees are not collecting user fees for water, there are some on-going technical and financial problems. Overall, the sustainability of this project's effects is fair.

In light of the above, this project is evaluated as satisfactory.

4.2 Recommendation

4.2.1 Recommendation for Implementing Agency

Refresher training

As in the GTP II water sector plan, for the operators, caretakers, and technicians of the District and Zonal Water Resources Offices, refresher training is necessary in relation to responding to technical issues. The implementing agency should regularly implement the refresher training that is necessary for associated institutions and organizations.

Thorough cleaning and disinfection of well facilities surrounding area

Since wells are not cleaned and disinfected at some Level 1 hand pump well facilities and the surrounding area, the responsible District Water Resources Offices should conduct thorough cleaning and disinfection of the wells to prevent pollution of water of wells.

Construction of information sharing system

The staff of the Zonal and District Water Resources Offices did not have information concerning this project, such as the blueprints of the facilities. Especially for Level 2 facilities, information on the design of the water supply facilities affects the repair response to malfunctions; therefore, the Oromia Regional Water Resources Bureau as the implementing agency needs to share information concerning the Basic Design, the Detailed Design, and the Completion Report with the Zonal and District Water Resources Offices who actually manage

the facilities.

4.2.2 Recommendation to JICA
None.

4.3 Lessons Learned

Implementation of capacity building and input period (M/M)

In the case of water supply projects that target villages and settlements, as the maintenance abilities of the residents have a strong influence on sustainability, people's lifestyles and activities associated with water need to be examined in detail to achieve sustainable operation and management of facilities. In this manner, needs for both men and women must be understood and reflected in the project design. At resident meetings, the traditional role of women in society needs to be considered, such as through mandating 50% female participation, and the time to hold meetings needs to be decided taking women's availability into consideration. Those who implement capacity building and the counterparts should clearly and specifically explain to the residents the rules for exemption from the water user fee for those experiencing financial difficulties, payment options with providing other labors, the payment principle, and maintenance methods.

The soft component plan is an important input in promoting effective operation and maintenance by the residents; thus, when the needs and background of each facility differ, activities, and the input period (M/M) of capacity building need to be customized for each different characteristic, and this customization should be incorporated into the approximate cost. In addition, plan for geographical distribution, distance of travel, etc., need to be sufficiently reflected in the input duration.

Republic of Kenya

FY 2015 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Improvement of the Water Supply System in Embu and the Surrounding Area"

External Evaluator: Yukiko Sueyoshi, Global Link Management Inc.

0. Summary

This project was conducted in Embu city and the surrounding area of Kenya to supply safe water stably to the residents by expanding a water treatment plant and by constructing water distribution pipes. The relevance of the project is high, because the project was consistent with the development policy of Kenya and needs of the target area both at times of the project planning and the ex-post evaluation and with Japan's assistance policy at the time of planning. The efficiency is fair as the project outputs were completed almost as planned and the project cost was within the plan, although the project period was far longer than the plan because construction of distribution pipes by the Kenyan side was delayed. Implementation of the project brought positive effects including increase of water service connections, water revenue, and water supply amount as well as improvement of water supply hours. In addition, some positive impacts such as reduction of water borne diseases and water fetching labor were observed. Therefore, effectiveness and impact of the project are high. The facilities and the equipment were maintained as appropriate and no major issues were observed in the institutional and technical aspects of Embu Water and Sanitation Company (EWASCO). On the other hand, some issues remain to be improved in the financial aspect, thus the sustainability is deemed fair.

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

1. Project Description

Project Location

Mukangu Water Treatment Plant Constructed by the Project

1.1 Background

Embu is a provincial city with a population of around 60,000 (as of 2007), located around 100 km northeast of the capital Nairobi. At the time of the planning, EWASCO was supplying water to an area of 933km^2 including Embu and the surrounding areas such as Gachoka district and part of Nembure district. EWASCO suffered from low water supply rate because of several issues. The issues included capacity shortages of its intake facilities and water treatment plant, an inadequate distribution pipe network and aging of distribution pipes. The people who could not receive the water supply service depended on unsanitary sources such as streams and puddles of rainwater for their domestic water, contributing to the spread of water-borne diseases. Thus, there was an urgent need to supply safe water to Embu and the surrounding areas.

Under these circumstances, in June 2006, Kenya's Ministry of Water and Irrigation (MWI) requested to the Japanese government for a grant aid project to develop water supply and sewage facilities in Embu city. In response to the request, a preparatory study was carried out to assess population dynamics of the target sites and to determine priorities of the cooperation in August 2008. In addition, based on the issues determined by the preparatory study, a basic design study was implemented to formulate a more suitable design and project plan in September 2009. Final decisions were then made about the cooperation component of the project.

1.2 Project Outline

The project aimed to increase access to safe water by upgrading and constructing water supply facilities, thereby contributing to improvement of residents' living conditions in Embu and the surrounding areas.

<Grant Aid Project>

E/N Grant Limit or G/A Grant Amount / Actual Grant Amount	2,560 million yen・2,560 million yen /2,285 million yen
Exchange of Notes Date /Grant Agreement Date	July, 2010 / July, 2010
Implementing Agency	Tana Water Services Board Embu Water and Sanitation Company (EWASCO)
Project Completion Date	December, 2012(completion of construction and procurement by Japanese side) February, 2013(completion of soft components)
Main Contractor	KONOIKE Construction Co., Ltd
Main Consultant	NJS Consultants Co., Ltd
Preparatory Study	August, 2008
Basic Design Study	September, 2009
Related Projects	The Project for Management of Non-Revenue Water (2010-2014) Japan Overseas Cooperation Volunteer (water quality examination :2010-2012) Senior Volunteer (maintenance of water treatment plant:2014-2016)

2. Outline of the Evaluation Study

2.1 External Evaluator[1]

Yukiko Sueyoshi, Global Link Management Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: October, 2015 – November, 2016

Duration of the Field Study: February 11, 2016 – February 22, 2016

May 30, 2016 – June 6, 2016

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

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance to the Development Plan of Kenya

"Vision 2030," a national strategy of Kenya at the time of the planning, contained a section on Water and Sanitation, stating "Kenya is a nation with scarce water resources, and a high-quality water supply is essential for economic and social development. Vision 2030 aims to provide a safe water and improve sanitation for everyone in Kenya." "The National Water

[1] This ex-post evaluation was carried out by referring to views of an expert on water service (former staff of Bureau of Waterworks Tokyo Metropolitan Government), referring as to 'External Adviser' in this evaluation report. Selection of the expert was done by the external evaluator.

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

[3] ③: High, ②:Fair, ①:Low

Resources Management Strategy 2007-2009", Kenya's water sector strategy, also described measures to ensure fair access to water resources and sustainable and efficient water usage in order to eradicate poverty through provision of sufficient water for drinking and industry.

At the time of the ex-post evaluation, there were no changes to "Vision 2030." According to the "Second Medium Term Plan 2013-2017," the medium-term plan under the above vision, people who were receiving piped water supply services was still only 27.9%[4] of the national population. Also, the plan set a goal to improve and expand water facilities as one of the policy objectives. The Kenyan water sector's strategy is currently under revision following an amendment to the Water Act.

Therefore, the project's purpose to improve water supply services has been consistent with Kenya's development policies from the planning to the ex-post evaluation.

3.1.2 Relevance to the Development Needs of Kenya

At the time of the planning, the population in the target areas of this project, Embu and the surrounding areas (the Gachoka district and part of the Nembure district), was estimated to be around 171,000 (as of 2009). Among them, only around 69,000 people (41% of the population) living near some arterial roads had water supply. Reasons for this low water supply rate included insufficient volume of raw water, capacity shortages at existing water treatment plants, inadequate distribution pipe networks, and aging of distribution pipe networks built over 40 years ago. Water demand in Embu city was expected to grow due to increase of the population moving from rural areas. Therefore, it was an urgent issue to ensure a safe and steady water supply.

By the time of the ex-post evaluation, the target area of this project had become a part of Embu County due to a restructuring of political jurisdictions in 2013. In 2014, the water supply rate of Embu County was estimated to be about 45% and many people were still using untreated water from sources such as ponds and rivers[5]. The completion of this project saw a major improvement in services in EWASCO's water supply area (see 3.3 Effectiveness for details). By the time of the ex-post evaluation, EWASCO's water supply area had been expanded from 933km^2 at the time of the planning to about 1,200km^2. With the expected population growth in coming years, it is important that new water resources be secured and the water supply facilities be expanded.

As seen above, the project has been consistent with the need of the target area from the planning to the ex-post evaluation.

[4] The number was calculated based on the 2009 Kenya Population and Housing Census.

[5] Source: EMBU COUNTY INTEGRATED DEVELOPMENT PLAN 2013-2018 (April,2014)

3.1.3 Relevance to Japan's ODA Policy

At the time of the planning, the "Country Assistance Program for Kenya," Japan's aid policy formulated in 2000, addressed the development of water supply and sewage facilities under "Environmental Protection," which was one of the key assistance areas. The Japanese government also stated assistance for "effective management of water resources" and "access to safe water and sanitation facilities" at the Forth Tokyo International Conference on African Development (TICAD[6] IV) in 2008. Therefore, it was confirmed that the project was consistent with Japan's aid policy and its foreign policy.

3.1.4 Relevance to Appropriateness of Project Planning Approach

As stated in "1.1 Background," the development of water supply and sewage facilities was the initial request from the Kenyan government. Upon assessing priorities of the cooperation components during the preparatory study, it was determined that the development of water supply facilities was the highest-priority. A plan was made in which the Japanese side would expand the water treatment plants and the Kenyan side would develop the distribution pipe network. Then, it was agreed that the Kenyan government would cover 300 million shillings (around 360 million yen)[7]. According to the Kenyan officers, this amount of Kenyan government was not too high and was agreed to be feasible. Therefore, there were no issues in the processes such as the selection of the project scope and the agreement on the cost to be covered by the Kenyan government.

However, the work to extend distribution pipes was delayed significantly. It was expected to complete by 2012 at the planning, but actual completion was May 2016 during the time of the ex-post evaluation. The Japanese and Kenyan officers mentioned that this was caused by a delay in budget allocation by the Kenyan government resulting from policy changes, including an amendment to the Kenyan Constitution to promote decentralization[8] in 2010, revision of the Water Act and water sector reform, and a restructuring of political jurisdictions in 2013.

In light of the above, the project was highly relevant to Kenyan development plan and needs, as well as Japan's ODA policy. Therefore its relevance is high.

[6] TICAD stands for Tokyo International Conference on African Development. It is an international conference on development in Africa.

[7] The shilling is Kenya's currency. One shilling is equivalent to around 1.2 yen (as of October 2009).

[8] A new constitution was approved in August 2010 after a national referendum, with the purpose of alleviating tensions between ethnic groups in Kenya and promoting democratization. Under the old constitution, Kenya was divided into eight provinces that were managed by a central government. The new constitution saw Kenya re-divided into 47 counties, with authority redistributed to governors elected by the citizens of each region. The new government system commenced in March 2013, with around 15% of the central government's revenue allocated to county governments (from the 2014 Report on the ODA Investigation of World Nations: Kenya).

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Under the project, the Japanese government mainly provided support for the rehabilitation and construction of existing intake facilities, water treatment plants, and water distribution facilities. For the water treatment facilities, the new Mukangu Water Treatment Plant 2 (capacity: 11,000m^3 per day) and a clear water reservoir (3,000m^3) were added to the existing Mukangu Water Treatment Plant 1 (capacity: 10,000m^3 per day). A raw water transmission main running to the reservoir was also constructed. For the water distribution facilities, a new clear water reservoir (6,000m^3) was added to the existing Kangaru Reservoir, and the procurement[9] and construction[10] of distribution pipes (60.3km and 10.8km respectively) were planned.

Other equipment such as water quality examination equipment, water meter calibrators, and three-ton trucks were also procured, and soft components were put in place to improve the facilities' operation and maintenance techniques. It was agreed that the Kenyan side would construct distribution pipes procured by the Japanese side and extend distribution pipes to the project target areas (the project target area was indicated by the shaded areas in Figure 1).

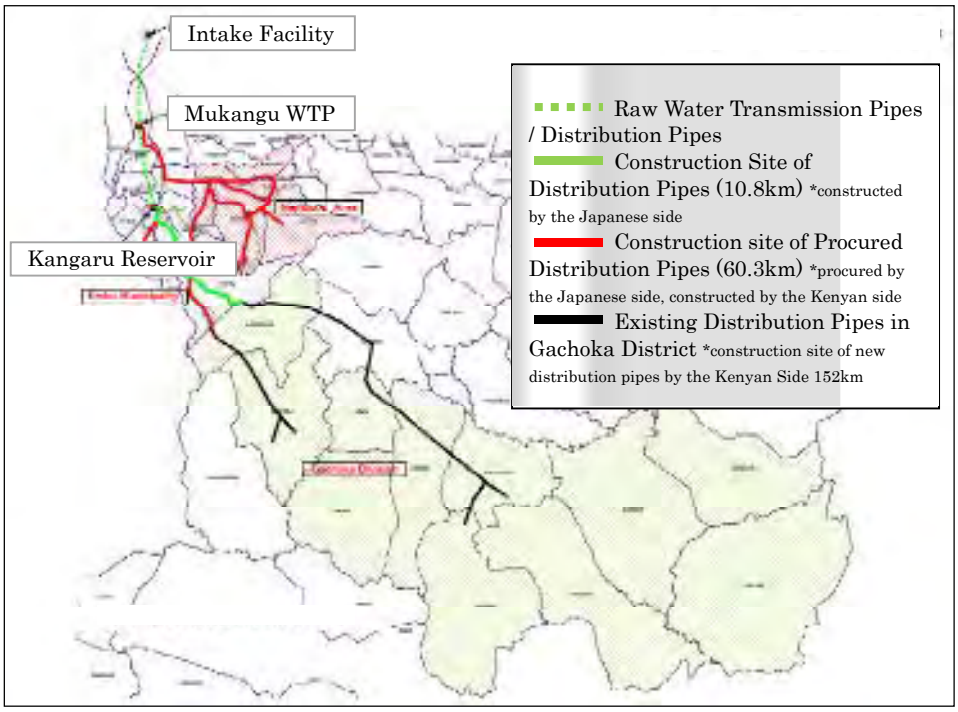


Figure 1 The Project Target Area and Outputs

<Japanese Side>

Table 1 shows the Japanese outputs. The rehabilitation of intake facilities, the construction of

[9] These pipes were to be procured by the Japanese contingent and laid by the Kenyan contingent.
[10] These pipes were to be both procured and laid by the Japanese contingent.

new water treatment and distribution facilities, the procurement of equipment and soft components were done by the Japanese side. While minor changes were made to some parts of the outputs, all were carried out almost as planned.

Table 1 Planned and Actual Outputs of Japanese Side

【Rehabilitation】	Planned	Actual
Intake Facilities (one site)	Rehabilitation of Intake Weir and Mouth Installation of Fine Screen Spill Way, Spill Way and Grid Chambers	As Planned
【New Construction】	Planned	Actual
Raw Water Transmission Main	Extension of Raw Water Transmission Main (5.9km)	Changed (construction route of raw water transmission main)
Mukangu Water Treatment Plant (WTP)	WTP Unit 11,000m^3/day (distribution chambers, receiving tank, grid chambers, rapid filters tanks, elevated tank, sludge lagoon, etc.)	As Planned
Clear Water Transmission Pipe	Construction of Water Transmission Pipe（5.2km）	As Planned
Clear Water reservoirs	Ground-based 6,000 m^3(In Kangaru Reservoir Site) Ground-based 3,000 m^3 (In Mukangu WTP)	Changed (Additional construction of water transmission and bypass pipes)
Distribution Pipes	Construction of Distribution Pipes (10.8km)	Changed (size of pipes)
【Procurement】	Planned	Actual
Distribution Pipes	Distribution Pipes (60.3km)	Changed (from Japanese pipes to Kenyan pipes)
Calibrator of Water Meter	Calibrator of Water Meter (one unit)	As Planned
Water Analysis Apparatus	Water Analysis Apparatus (one unit)	As Planned
Three Ton Truck	Three Ton Truck (one unit)	As Planned
Portable Super-sonic Flow Meter	Portable Super-sonic Flow Meter	As Planned
【Soft components】	Planned	Actual
Training for Operation and Maintenance of WTP	Two Months	As Planned
Training for Water Quality Control of WTP		

Sources: Document provided by JICA, Questionnaire Survey to EWASCO

<Kenyan Side>

Table 2 shows the Kenyan outputs. All of the Kenyan outputs were completed despite delays in some outputs. At the time of the planning, it was agreed that the Kenyan side would extend the distribution pipes by 152 km[11]. Only 122 km was reported in the first field survey of the ex-post evaluation (February 2016), but it was confirmed that 176 km was completed by the

[11] At the time of the planning, there were 152km of distribution pipes in Gachoka. These were constructed over 40 years ago and had begun to deteriorate, causing frequent leakages. The water treatment plant also produced insufficient water, and the water was supplied around two days per week. Therefore, it was planned that new distribution pipes in Gachoka was constructed by the Kenyan side.

time of the second field survey (June 2016). Further extension work is still underway in the project target area, with 21 km currently under construction and another 46 km under the plan.

Table 2 Planned and Actual Outputs of the Kenyan Side

Planned	Actual
Land Acquisition	Completed as planned
Installation of Fence	Delayed due to budget limitation, but completed in February 2013.
Installation of Power Feeder Line	Completed as planned
Construction of Access Road to the Site	Completed as planned
Installation of Distribution Pipes (60.3km)	It was planned that the pipes were procured by the Japanese side and installed by the Kenyan side. The construction was delayed due to budget limitation, but completed in 2013. A part of section (about 10 km) had not been utilized because extension work was not completed, however, water service was started in May 2016 after the water supply test.
Extension of Distribution Pipes (152 km)	Construction was delayed due to budget limitation. To meet the residents requests for extension of distribution pipes, total of 176 km pipes were installed (exceed the planed 152km) and extension works were continuing in the target area at the time of ex-post evaluation. A part of construction section (about 6km) out of 176km was removed due to road construction, however, it was reinstalled by using EWASCO's budget in March 2016.
Demolition of Kangaru Facilities	Completed as planned
Installation of Drainage Pipes at Mukangu WTP 2	Completed as planned
Rehabilitation of Mukangu WTP 1	Delayed due to budget limitation, but completed

Sources：Document provided by JICA, Questionnaire Survey to EWASCO

3.2.2 Project Inputs

3.2.2.1 Project Cost

As seen in Table 3, the Japanese side's project cost was within the plan (89% of the plan). The main reason for this was that there was no necessity to utilize the contingency budget[12] that was prepared during the planning. The Kenyan side's project cost, meanwhile, exceeded the plan (104% of the plan), mainly due to high inflation rates that caused increases of equipment prices in Kenya[13]. The total cost of the project was within the plan (90% of the plan).

As seen above, the project cost was within the plan.

[12] It is difficult to make plans based on the matters and conditions anticipated at the time of the exchange of notes, as unforeseen circumstances may occur. A fixed proportion of the project budget is therefore allocated as a line of credit in case extra expenses occur. According to documentation from JICA, 11% of the project's budget was allocated as a contingency budget.

[13] During the course of the project, the Kenyan inflation rate rose from 4% in 2010 to 14% in 2011, and was still at 9% in 2012.

Table 3 Planned and Actual Project Cost (at the time of ex-post evaluation)

	Planned	Actual
Japan	2,560 million yen	2,285 million yen
Kenya	307 million yen [14]	322 million yen [15]
Total Cost	2,867 million yen	2,607 million yen

Sources：Document provided by JICA, Questionnaire Survey to EWASCO

3.2.2.2 Project Period

The Japanese outputs were completed within the planned project period (97% of the plan). It was anticipated that the Kenyan outputs would also finish their work within the project period, but the extension of distribution pipes was significantly delayed and was completed in May 2016, the time of the ex-post evaluation (237% of the planned period). The Kenyan construction was delayed because the budget for the construction that was agreed on at the time of planning was not allocated during the project period. This was caused by government policy changes, including an amendment to the Kenyan Constitution to promote decentralization in 2010, changes to the Water Act and a restructuring of political jurisdictions in 2013. Under these circumstances, EWASCO secured funds from aid agencies, financial institutions and local government agencies. The extension of distribution pipes that was agreed on for this project was completed, and further extension work was underway at the time of the ex-post evaluation.

Table 4 Planned and Actual Project Period

	Planned	Actual
Japan	2010, June - 2012, December (31 months)	2010, September - 2013, February (30 months)
Kenya	2010, June – 2012, October (29 months)	2010, September – 2016, May (69 months)

Note: Planned and actual project period of Japanese side is from 'start date of a design study (preparatory study)' to 'completion date of soft component'. Also, planned and actual project period of Kenyan side is from 'start date of a design study (preparatory study)' to 'completion date of construction'.
Sources：Questionnaire Survey to EWASCO, Document provided by JICA

In light of the above, the project cost was within the plan, but the actual project period was far longer than planned, therefore, efficiency of the project is fair.

3.3 Effectiveness[16] (Rating: ③)

3.3.1 Quantitative Effects(Operation and Effect Indicators)

The following quantitative effect indicators were set in the ex-ante evaluation: an increase of

[14] About 250 million Kenyan Shilling. 1 Kenyan Shilling=about 1.2 yen(Sources: document from JICA)
[15] About 322million Kenyan Shilling. 1 Kenyan Shilling =about 1.0 yen(Sources: Questionnaire Survey to EWASCO)
[16] Sub-rating for Effectiveness is determined with consideration of Impact.

water supplied population from 69,000 people (2009) to 168,000 people (2015)[17], an increase of water supplied households from 17,750 households (2009) to about 40,000 households (2015)[18] and an increase of water distribution amount[19] from 10,000m^3 per day (2009) to 21,000m^3 per day (2015). However, it was not possible to obtain accurate data on population and households receiving water supply, as EWASCO did not ascertain the number of users per water service connections at the time of the ex-post evaluation. The water supply area was expanded and restructuring of political jurisdictions was made. As a result of these changes, despite attempts to calculate these indicators during the ex-post evaluation, it was determined that the target and actual indicators could not be properly compared because the definitions of these indicators were changed. Therefore, (1) the number of water service connections is used as a substitute indicator for water supplied population and households as this indicator shows the number of EWASCO customers. The target number of water service connections was calculated as follows: First, the average number of water users per connections[20] was calculated to be 8.7 based on the information on the documents prepared at the time of the planning. Then, the target figure of water supplied population for 2015 was recalculated using the actual average-population-growth rate. Finally, this new target figure was divided by the average number of users per connections (8.7) to make a new target of 18,850[21]. In addition, (2) Water Distribution Volume and Facility Usage Rate of the water treatment plant were added to determine the effectiveness of this project. Moreover, (3) Water Supply and Sewage Charge Revenue, (4) Non-Revenue Water Ratio and (5) Water Supply Hours before and after the project were compared for reference[22].

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[17] The target population to receive a water supply was calculated as 87% of the projected population for 2015 (193,000), a ratio agreed on during the planning stage (193,000 people x 0.87 = 167,910).

[18] The target number of households to receive a water supply was calculated as the target population to receive a water supply divided by 4.2, the average number of people in a local household at the time (167,910 people ÷ 4.2 people in a household = 39,978 households).

[19] Distributed water volume (volume of water leaving treatment plants) = revenue water (supplied water: revenue-earning water) + non-revenue water (leakages, stolen water, etc.)
A target water supply volume of 21,000m^3 per day was set in the ex-ante evaluation. On the other hand, according to the preparatory study report, the intake volume was 23,000m^3 per day and the planned distribution volume was about 21,000m^3 (maximum rated volume of the water treatment plants) for the target year after taking production losses into account. This is used as the "distribution volume" for the purposes of this report.

[20] Number of people receiving a water supply at the time of the planning stage (69,000) ÷ number of water service connections at the time of the planning stage (7,910) = average number of users of each connection(8.7)

[21] At the time of the planning stage, the annual average population growth rate (for the target area of the project) was 1.9%. The actual average population growth rate for Embu County was 1.5%. The target number of people to receive a water supply was recalculated accordingly, producing a new target of 164,000. The target number of water service connections to be connected was then recalculated as follows: Target number of people to receive a water supply (164,000) ÷ average number of users of each connection (8.7) = target number of water service connections to be connected (18,850).

[22] While these were not set as indices in the ex-ante evaluation for this project, they were added as reference information as it was determined that they were important for determining the effects of the project. Estimated figures for the target year (2015) were calculated from documentation at the time of planning. These were then used as targets for comparing the outcome with the situation at the time of the planning stage.

(1) Number of Water Service Connections

Table 5 shows changes in the number of water service connections. The number of water service connections was broken down into households, businesses, public organizations and water kiosks. While this project expected to increase the number of connections by 10,940 (18,850 in the target year - 7,910 in the baseline year), the actual figure saw an increase of 11,560 by 2015 and met the target(105% of the planned). Official documentation from EWASCO indicated an average number of 8 users per water meter[23] at the time of the ex-post evaluation. If this figure (8 users per water meter) is applied to obtain the number of water meters, the target figure is amended to be 20,500[24]. In which case, this project expected to increase the number of connected water meters by 12,590 (20,500 in the target year - 7,910 in the baseline year), but actually, only 11,560 new meters were added by 2015, making the achievement rate a little over 90% (91% of the planned).

According to EWASCO, the number of connected water meters has increased steadily since the project completion, owing to the smooth operation of the water treatment plant built by the project, secure supply of sufficient water, and continuous efforts to extend distribution pipes by EWASCO.

Table 5 Changes in Connected Water Meters

	Baseline	Target	Actual	Actual	Actual
	2009	2015	2013	2014	2015
	Planned Year	2 Years After the Project Completion	Year of the Project Completion	1 Year After the Project Completion	2 Years After the Project Completion
Household	N.A.	N.A.	14,000	16,100	18,200
Business	N.A.	N.A.	650	700	750
Public Organization	N.A.	N.A.	400	450	480
Water KIOSK	N.A.	N.A.	30	30	40
Total Number of Connections	7,910	18,850	15,080	17,280	19,470
Increased Number After the Project (Total - Baseline)	-	**10,940**	**7,170**	**9,370**	**11,560**

Source: Data provided by EWASCO

Note: 'Year of the Project Completion' is 2013 when the WTP was fully operated. (Actual completion year of Japanese construction was in December 2012) Kenyan construction had been continued since 2013 and finished in 2016.

A beneficiary survey [25] was conducted during the ex-post evaluation to investigate how

[23] Managing Director Report to the 7th EWASCO Annual General Meeting

[24] Target number of people receiving a water supply (164,000) ÷ number of users of each connection(8) = target number of water meters to be connected (20,500)

[25] For the beneficiary survey, the steps are following: 1) divide the project target area into the residential area of Embu city, business area of Embu city, Nembure district and Gachoka district, 2) to identify about 200 samples, stratified sampling was conducted based on the number of water service connections in each area. For the selection of visited sites, all meter sections were visited in order to avoid bias of regional characteristics (if there were many

water resources had changed before and after the project. As shown in Figure 2, only 57% of residents used tap water before the project, and the others used wells or other water resources (mainly rivers and marshes). By the end of the project, the number of tap water users had increased to 95%. The only residents still using wells were those living in the mountains at the edge of EWASCO's water supply area.

Source: Beneficiary survey
Note: n=207

Figure 2 Changes in Water Sources of Residents

As seen above, the increase in water treatment capacity provided by the Japanese side and the extension of the distribution pipes by EWASCO resulted in an increase in the number of connected water meters that largely met the target. At the time of the ex-post evaluation, further pipeline extensions were underway in and around the target area, indicating that further expansion of the project effects can be expected. The beneficiary survey also showed that the number of population using tap water had increased from around 60% before the project to around 90% afterward.

In conclusion, the number of water meters largely met the target.

(2) Water Distribution Volume and Facility Usage Rate

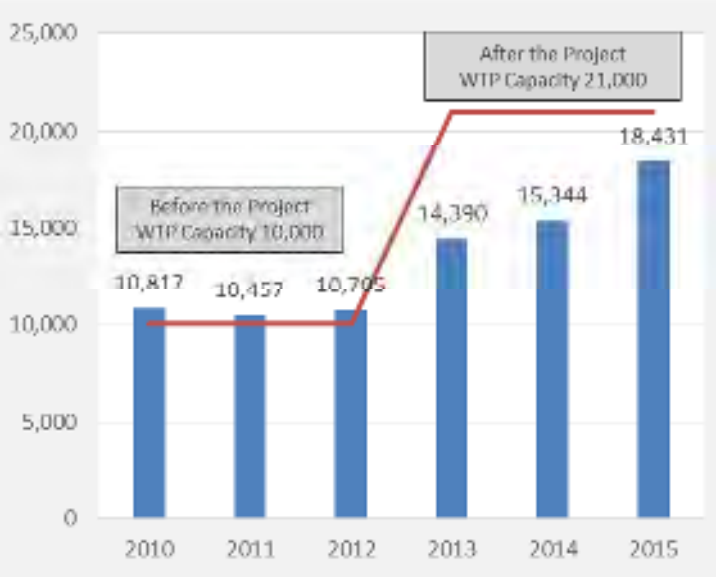
The water treatment plant capacity was 10,000m^3 per day before the project, and then expanded to 21,000m^3 per day after the project. Figure 3 shows EWASCO's average annual water distribution volume. The water volume has been increasing since the time the water treatment plant constructed by the project became fully operational in 2013.

The water treatment plant was overloaded before the project because its utilization rate was

meter sections in the area, every three sections were visited). Then, local research assistants visited every other houses and asked a person in the house in each meter section. Survey method was an interview-based questionnaire, the sample size was 207, and response rate was 100% (male: 47%, female: 53%/Embu: 50.2%, Nembure: 10%, Gachoka: 37%/households: 64%, businesses: 18%, public organizations: 9%, water kiosks: 5%, no water service connections: 4%). The residents who were not receiving water service from EWASCO were included in the respondent.

over 100% of its capacity. By 2015, this figure had fallen to a reasonable rate of 88%[26]. EWASCO is continuing to extend distribution pipes and replace aging pipes to meet the high demand for water, but it is expected that the current facility capacity will not be sufficient to meet future demand. Thus, EWASCO currently focuses on securing new water resources and reducing non-revenue water. According to the interview to Embu County Government officers, the population in the water supply area and the population actually receiving water services were not accurately assessed at present, and medium- and long-term demand could not be predicted, making it difficult to formulate a future plan for expansion of water supply facilities.

Unit: ㎥/day



Source: Data provided by EWASCO
Note: WTP was completed in December 2012, and fully operated after 2013.

Figure 3 Changes in Average of Annual Water Production Amount

In light of the above, while the capacity of the water treatment plant built by the project will need to be expanded to accommodate growing population, the facilities have been operating with a reasonable utilization rate in the upper range of 80% at the time of the ex-post evaluation.

(3) Water Supply and Sewage Revenue (Reference)

According to the document at the time of the planning, water supply and sewage revenue was 93.849 million shillings in 2010, and an estimated revenue in 2015 was 271.604 million shillings calculated based on the target water supply volume.[27] On the other hand, the actual

[26] Facility Usage Rate(%)=Annual Water Production Amount÷Water Treatment Capacity×100
[27] Source: Documentation provided by JICA

revenue in 2015 was 235.274 million shillings (89% of the target). According to EWASCO, "The water charge collection rate[28] was only 71% at the time of the ex-post evaluation (February 2016). This is because while public organizations have large amounts of water charge, their payment was delayed in many cases due to budget allocation issues. However, most payments were made in the end. The annual charge collection rate was 95% in 2015 and 96% in 2016 (up to May)[29]." EWASCO has thorough penalties for missed or late payments – which mainly come from households – and this has improved the collection rate. Also, the water charges were increased at the time of the ex-post evaluation in March 2016.[30] It is expected that these countermeasures will help to increase water revenue in future.

Table 6 Planned and Actual Water and Sewage Revenue of EWASCO

Unit: Thousand Kenyan Shillings

	Baseline	Target	Actual	Actual	Actual
	2009	2015	2013	2014	2015
	Planned Year	2 Years After the Project Completion	Year of the Project Completion	1 Year After the Project Completion	2 Years After the Project Completion
Water Supply and Sewage Revenue	89,294	271,604	158,685	208,230	235,274

Sources：Document provided by JICA, Data provided by EWASCO

In light of the above, EWASCO's revenues from water supply and sewage charges increased continuously since the completion of the project, and the actual revenue was around 90% of the planned revenue anticipated during the planning stage. Water charges also increased and collecting operations improved by the time of the ex-post evaluation. As a result, the revenue is expected to continue increasing in future.

(4) Non-Revenue Water Rate (Reference)

Table 7 Changes in Non-Revenue Water Ratio

	Baseline	Target	Actual	Actual	Actual
	2009	2015	2013	2014	2015
	Planned Year	2 Years After the Project Completion	Year of the Project Completion	1 Year After the Project Completion	2 Years After the Project Completion
Non-Revenue Water Ratio (%)	56	25	33	49	40

Source: Data provided by EWASCO

[28] The ratio of water charges that were actually paid.
[29] The national average was 93% (source: A Performance Review of Kenya's Water Services Sector 2013 – 2014, Water Services Regulatory Board)
[30] The unit price of water differs depending on the number of cubic meters used, but in general, water charges for households increased and those for businesses and public organizations decreased. For example, the price of the minimum unit, 20m^3, increased from 200 to 220 shillings, while the maximum unit, 300m^3, decreased from 26,850 to 23,238 shillings.

According to the document at the time of the planning[31], EWASCO's non-revenue water rate was 56% then, and it was expected to reduce to 25%[32] after the construction of new distribution pipes by EWASCO. The rate was 33% in 2013 at the completion of the project, but it increased to 49% in 2014. This is because the increase of water leakage caused by high water pressure. After the project completion, EWASCO upgraded their water pipes, then the non-revenue water rate reduced to 40% in 2015. While this was below Kenya's 2015 national average of 42%, it was far above the 25% expected during the planning. It indicates that there was room for improvement for non-revenue water reduction.

According to the interview to EWASCO officers, the main causes of non-revenue water in the surrounding areas of Embu city were:

1) Bursting of distribution pipes due to an inappropriate adjustment of water pressure in areas with a higher elevation than other areas
2) A rise in illegal connections for irrigation during water shortages in the dry season
3) Leakages from aging water pipes
4) Measurement errors due to meter malfunctions

Under the project, equipment for reducing non-revenue water (flow meters and water meter examination equipment) was provided and pressure regulation tanks to adjust the water pressure were installed. Also, JICA's technical assistance 'Project for Management of Non-Revenue Water' was implemented to provide support in reducing non-revenue water. However, this assistance did not plan sufficiently in reducing non-revenue ratio throughout the target area of the project as its main purpose was to strengthen measures against non-revenue water on a national level. It was expected that EWASCO make efforts in reducing non-revenue water by themselves. External advisors pointed out that when expanding water supply facilities, it was important to include measures for reducing non-revenue water in the plan to enable a steady water supply service and help to improve the operations of the water company.

(5) Water Supply Hours[33] (Reference)

As shown in Table 8, water supply hours from the water treatment plant were less than 20 hours per day before the project. From the project completion in 2013, water was provided continuously 24 hours per day. This is because sufficient water was secured in the supply area

[31] Source: Documentation provided by JICA

[32] At the time of the planning stage, the revenue water rate of EWASCO's 63 km of existing distribution pipes was 44 %. The project aimed to add another 71 km of distribution pipes and increase the revenue water rate to 100%. Calculation results indicated a revenue water rate of around 75% in the target year (63x0.44+71x1.0)/134 = 0.74), meaning that the non-revenue water rate was 25%.

[33] Technically, "water supply hours" refers only to the hours during which users receive water, while "water distribution hours" refers to the hours during which water is distributed from the water treatment plant. However, "water supply hours" is used to refer to both in this report as this is how the term was used in documentation during the planning stage of this project.

and because new clear water reservoirs were built by the project. Around 9,000 m^2 of clear water reservoirs were added in addition to the existing about 2,400 m^2, making it possible to secure around 12 hours of clear water.

Also, the project provided soft components on operation of water facilities including treatment plant management. The officers learned how to operate each facility and troubleshooting techniques. By the time of the ex-post evaluation, the officers had mastered these operations and were properly operating, maintaining and managing facilities such as the water treatment plants. This enabled 24-hour water supply.

Table 8 Water Supply Hours from Mukangu WTP

Unit：Hours/day

	Baseline	Target	Actual	Actual	Actual
	2009	2015	2013	2014	2015
	Planned Year	2 Years After the Project Completion	Year of the Project Completion	1 Year After the Project Completion	2 Years After the Project Completion
Water Supply Hours	>20	N.A.	24	24	24

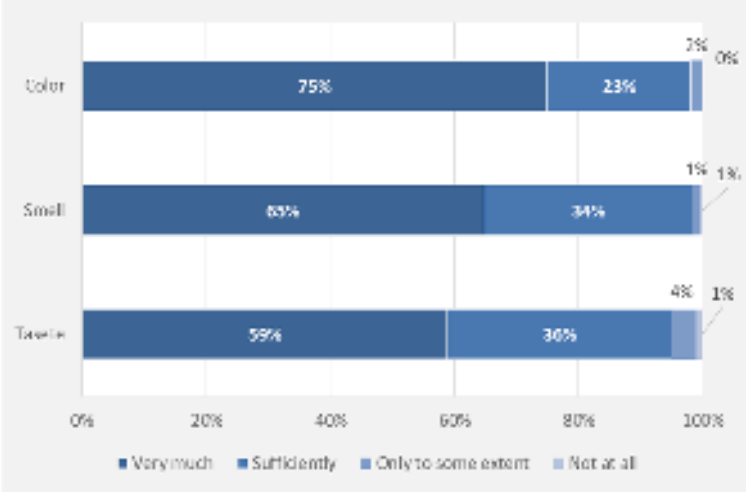
Source: Data provided by EWASCO

The beneficiary survey also confirmed the supply hours at the water user level before and after the project. As a result, the most common answer for supply hours per day before the project was “less than 6 hours” (35%). After the project, the most common answer was “24 hours” (72%). Residents living near the edges of the water supply area tended to reply that they only received water for around 20 hours per day due to low water pressure or water being cut off temporarily, but a significant improvement was seen overall.

3.3.2 Quantitative Effects(Another Effects)

Another effect confirmed by this evaluation was the improvement in water quality. Every month, water quality at three locations, namely, an intake plant, a treatment plant and water supplies at the edge of the area is tested in a laboratory set up in the treatment plant. According to EWASCO, only the water temperature, turbidity and residual chlorine had been measured before the project due to limited water quality examination equipment. However, the water quality analysis equipment and soft components provided by the project enabled water quality monitoring in line with the Kenyan water quality standards. At the time of the ex-post evaluation, the document review of water quality monitoring reports for the past year was done and confirmed that all water quality inspection items had met each standard. According to the water quality inspection at the time of the project planning, escherichia coli was found in the water serviced areas. However, those pathogenic bacteria such as escherichia coli, salmonella, and staphylococcus aureus were not found at the time of November 2015. Figure

4 shows the change in water quality according to the results of the beneficiary survey. When asked about improvements in the color, odor and taste of the water after the project, over 90% of respondents said that they had seen a “significant improvement” or “sufficient improvement”. These results make it clear that water quality has improved.



Source: Beneficiary survey

Note: n=198 (Removed 9 person who don’t receive the water service of EWASCO from total respondents)
The data in the figure is rounded off

Figure 4　Improvement of Water Quality

In light of the above, it can be concluded that planned effects were largely achieved, therefore, the effectiveness of the project is high.

3.4 Impacts

3.4.1 Intended Impacts

1) Reducing the labor of fetching water

According to the document at the time of the planning, fetching water was heavy burden especially on women and children. In the beneficiary survey, 45% of the respondents receiving water supply services from EWASCO (n=198) said that they had to fetch water before the project. The tendency of the response was same in men and women but different among the regions. Especially, more residents fetched water in the areas outside Embu city. After the project completion, the number of respondents who had to fetch water had fallen to 10%. At the time of the ex-post evaluation, there were around 40 water kiosks in mountainous areas where it was difficult to connect a meter for each household. For these households, villagers now walk from their homes to the water kiosks to fetch water. According to the villages visited during the field survey, positive changes such as ‘not having to walk as far as before to fetch water’, ‘being able to obtain more water’, and ‘no

longer needing to fetch water from a river or marsh' were reported.

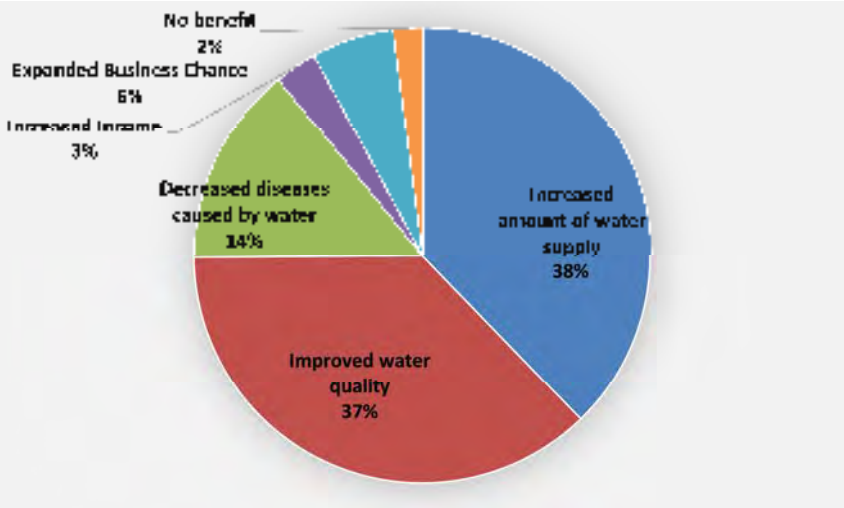
This indicates that the project contributed to reducing the labor of fetching water.

2) Reduction of water-borne diseases

Before the project, many residents were dependent on unsanitary water sources such as streams and puddles of rainwater for their domestic water, which caused water-borne diseases. In the beneficiary survey, 66% of respondents said that 'they were affected by water-borne diseases before the project.' While the tendency of the responses was same in men and women, there were obvious regional differences in the results that indicated that the frequency of water-borne diseases was greater among users at the edge of EWASCO's water supply area who used the water kiosks. After the project completion, only 6% answered that 'they were affected by water-borne diseases'. While factors other than the project also contributed to the decrease in water-borne diseases, such as changes in sanitation and nutritional situation, the supply of safe water that meets water quality standards (as described in 3.3.2 Improvement in Water Quality) was one of the major factors.

3) Benefits of This Project

As shown in Figure 5, the most common responses to the question, "What are the benefits of this project?" were "A greater volume of water" (38%) and "An improvement in water quality" (37%). The tendency of the response was same in men and women. The regional results indicated that people living at the edge of the water supply area tended to answer "A decrease in water-borne diseases". Also, the results for each customer type, the businesses and public organizations tended to answer "An improvement in income" and "An increase in business opportunities". Specific positive effects were noticed, including "no longer needing to purchase water" and "a larger number of guests at hotels and students as a result of the new running water".



Source: Beneficiary survey

Note: Ratio to the total respond

Figure 5 Benefits of the Project (Multiple Answers)

3.4.2 Other Impacts

Sludge and wastewater from the water treatment plant are sun-dried in the water treatment plant before being transported within EWASCO's facilities or to a public treatment plant for proper treatment. The increase of water supply volume has also urged EWASCO to expand its sewage treatment facilities. Expansion of the facilities and network is currently ongoing with support from the World Bank. Thus, no negative impacts on the natural environment had been reported at the time of the ex-post evaluation. Also, land was acquired to build water treatment facilities for the project, but the land owners agreed to the acquisition after being given new lands and houses, so the acquisition was done without a problem.

In light of the above, it can be concluded that planned effects were largely achieved, therefore, the effectiveness and impact of the project are high.

A stream that used to be used as a water source

Citizens using a communal water meter in a mountainous area

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

There has been no change in the Kenyan water sector's operational structure from the time of the planning. The MWI makes political decisions and supervises eight Water Service Boards (WSB) in each of eight zones in the country. However, the decentralization that took place from 2013 led to the formation of counties as new administrative zones. The Water Act was revised according to the new system, making this a transition period for Kenya's water sector. Under the new Water Act, water service providers are supervised by their county, but no clear conclusion has been reached about how assets are to be transferred or how profits are to be shared. Despite of the transition period, EWASCO has built a good relationship with the Embu County government, and the county budget has been used such as constructing distribution pipes. Therefore, there are no concerns in institutional aspect.

As shown in Table 9, EWASCO had 77 employees at the time of the planning. It was pointed out that this number would need to be increased to around 100 because of the expansion of the water supply facilities as a result of the project. At the time of the ex-post evaluation, there were 110 employees. EWASCO hired a management consultant to create a more efficient organizational structure. In addition, operational reforms such as reducing non-revenue water and improving water charge collection system are taking place in order to improve their business structure.

As seen above, there are no issues in the institutional aspects of operations and maintenance.

Table 9 Staff Number of EWASCO

Unit: Person

Assignment	2009 Actual	2015 Proposal	2015 Actual
Manager	14	15	8
General Affairs and Financial Division	19	23	39
Water Treatment Division	7	18	14
Distribution Division	30	35	40
Sewerage Division	6	8	8
Planning Division	1	3	1
Total	77	102	110

Sources：Data provided by EWASCO

Note: 'Proposed number in 2015' was estimated by Japanese Consultants at the time of planning.

3.5.2 Technical Aspects of Operation and Maintenance

At the time of the ex-post evaluation, EWASCO was supplying water 24 hours a day and there were no major technical issues relating to the operation or maintenance of the water

distribution facilities. Sixteen staff are still working at EWASCO out of the 17 staff who received technical training as part of the soft components of the project and this technical knowledge are shared within the organization by training new staff. Operational management record files were also introduced during the soft components. Information such as the volume of distributed water, water distribution hours, amount of power generated, and the results of water quality examinations are recorded every day. Quarterly reports are also produced. In the event of an issue in the facilities or equipment, employees refer to the manual to handle the situation and can contact the Kenyan manufacturer if necessary. No serious problems have occurred thus far.

EWASCO carries out the following training once a year:

1) In-house training carried out by an external instructor, mainly for water treatment plant staff
2) Short training in which EWASCO staff is sent to the water laboratory in Nairobi

In addition, Senior Volunteer who was experienced in water treatment plant maintenance has been sent by JICA to EWASCO since 2014.

Regarding to the water quality management, in addition to the soft components of the project, Japan Overseas Cooperation Volunteer has been sent to give technical trainings to EWASCO staff on how to use the examination equipment provided by the project. At the time of the ex-post evaluation, safe water that met national water quality standards was being supplied 24 hours a day, indicating that the necessary operational management knowledge is in place throughout the organization.

EWASCO recognizes the reduction of non-revenue water as a serious organizational challenge, and a non-revenue water unit was established in 2011. A pilot project for JICA's 'Project for Management of Non-Revenue Water' in Kenya (2010-2014) was carried out in EWASCO's water supply area, and the non-revenue water rate was reduced to 25% through. various activities such as preparing the data necessary for carrying out measures against non-revenue water, building a framework, detection of leaks and prevention of water theft. At the time of the ex-post evaluation, the staff who were involved in the above non-revenue project were still working in the units, and the effects of the pilot project had been expanded to another two districts[34].

As above, there are no technical issues in operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

Table 10 shows EWASCO's annual income for the last five years (2011-2015). Since the completion of the project in 2013, EWASCO's 'Water Supply and Sewage Revenue' and

[34] Two of EWASCO's 75 water meter districts.

'Water and Sewage Related Income[35]' have increased, and there has been a major improvement in total revenue as a whole. However, various costs have also increased, including 'labor costs' resulting from the hiring of new employees to accommodate the expansion of the water supply area, 'operation and production costs for the maintenance' of the expanded water supply facilities and fundraising costs for recent activities such as the development of the sewage system, and extension of distribution pipes and repayment of loans from institutions such as banks for the replacement of aging pipes. EWASCO was in deficit in 2013 and 2014 but turned a profit in 2015. The main reason for EWASCO's return to a positive figure was an increase in water charges, but 'other income' also increased through new customers requesting to be connected to the services and sales of pipes to communities.

According to an accounting auditor from EWASCO, the project not only increased the volume of water but also brought in additional revenue through water charges, helping to stabilize EWASCO's finances. To supply the greater volume of water produced as a result of this project to more residents, EWASCO has been extending distribution pipes and renovating aging facilities with funds procured from banks and overseas aid agencies. Higher 'fundraising cost' was recorded for 2015 as EWASCO paid back all of its bank loans. This EWASCO's investment in facilities has brought more customers, and even more revenue is expected in future. Therefore, EWASCO's financial situation can be considered stable.

Table 10 Balance of Payment of EWASCO

Unit: Kenyan Shillings

Items	2011	2012	2013	2014	2015
Water Supply and Sewage Revenue	136,303,891	138,349,551	158,685,485	208,230,398	235,274,938
Water and Sewage Related Income	2,826,021	3,021,965	2,643,733	6,623,116	8,220,171
Other Income	7,556,552	13,284,055	6,406,765	2,233,614	11,134,815
Total Revenues	**146,686,464**	**154,655,571**	**167,735,983**	**217,087,128**	**254,629,924**
Administration Costs	12,234,484	15,583,309	16,005,775	21,004,717	22,397,893
Staff and Board Costs	56,832,884	67,332,616	75,499,926	85,075,188	101,076,506
Operation and Maintenance Cost (O&M)	78,092,726	56,380,060	81,048,447	124,819,958	117,392,329
Fundraising Cost	390,301	463,996	1,843,436	2,410,860	8,195,980
Total Expenses	**147,550,395**	**139,759,981**	**174,397,584**	**233,310,723**	**249,062,708**
Balance	**-863,931**	**14,895,590**	**-6,661,601**	**-16,223,595**	**5,567,216**

Sources: Data provided by EWASCO

EWASCO's non-revenue water rate for 2015 was 40% - slightly below the national average of 42% but higher than the non-revenue rate that was anticipated at the time of the planning, indicating that more efforts were needed to secure revenue water that would be charged. In

[35] including service charge from new connection of water supply and sewage

EWASCO's water supply area, there is a high demand for more water, and it is expected that EWASCO's water supply facilities will need to be further expanded in future. However, there are no clear prospects about how to secure funds for this work. Therefore, it is important to tackle with reducing non-revenue water to stabilize EWASCO's finances.

In sum, while EWASCO's overall financial situation is stable, further improvement of its finances is needed.

3.5.4 Current Status of Operation and Maintenance

At the time of the ex-post evaluation, the water intake facilities, water treatment plants and water distribution facilities were observed. All of the facilities built by the project were operating appropriately; water was being supplied continuously 24 hours a day, water meeting water quality standards was being produced, and no issues were observed. No serious problems such as a long period of the water supply disruption have occurred so far, and issues in the facilities and equipment are handled by referring to the manual. Thus, overall situation for operation and maintenance is appropriate.

In light of the above, no major problems have been observed in the institutional and technical aspects of the operation and maintenance system, but there is room for improvement in the financial aspect. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was conducted in Embu city and the surrounding areas of Kenya to supply safe water stably to the residents by expanding a water treatment plant and by constructing water distribution pipes. The relevance of the project is high, because the project was consistent with the development policy of Kenya and needs of the target area both at times of the project planning and the ex-post evaluation and with Japan's assistance policy at the time of planning. The efficiency is fair as the project outputs were completed almost as planned and the project cost was within the plan, although the project period was far longer than the plan because construction of distribution pipes by the Kenyan side was delayed. Implementation of the project brought positive effects including increase of water service connections, water revenue, and water supply amount as well as improvement of water supply hours. In addition, some positive impacts such as reduction of water borne diseases and water fetching labor were observed. Therefore, effectiveness and impact of the project are high. The facilities and the equipment were maintained as appropriate and no major issues were observed in the institutional and technical aspects of Embu Water and Sanitation Company (EWASCO). On the other hand, some issues remain to be improved in the financial aspect, thus the sustainability is deemed fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

Recommendations for EWASCO

Strengthening of countermeasures for non-revenue water: EWASCO's water supply area (especially outside of Embu City) has large differences in elevations, and therefore water pipe bursts due to high water pressure is an issue. Additionally, night time water theft from irrigation areas, water leaks from supply pipes and increasing measurement errors from aging water meters are all causes of non-revenue water. There is a need for a comprehensive investment, such as increasing manpower for non-revenue water units and replacing equipment (water pressure adjustment: installation of reduction valves and renewal of aging water supply pipes and faulty meters) in order to deal with these issues. In addition, it is also important for crackdowns on water theft during the dry season to be strengthened, and enlightenment activities should be implemented for the residents in areas where water theft is commonplace.

Recommendations to the County

Creation of a county-level master plan for water supply sectors concerning the new construction and extension of water supply facilities: It is important to continue implementing new construction and extension of all water supply facilities to deal with the increasing population that requires a water supply. For this reason, it is essential to accurately understand the current situation and issues of water supply sectors (calculation of the water distribution demand from the population of the water supply area and calculation of the amount of water shortage based on this figure). Then, efforts should be made towards drafting of a master plan to ensure stable water supplies in the future by appointing external staff, and seeking assistance from foreign donors.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

In projects where there is a large component on the recipient side, it is essential to examine funding sources other than government budgets at the project planning.

In this project, the Kenyan side agreed to the equivalent of approximately 360 million yen of the financial burden, and to complete distribution pipe extension work which was important part of the project effects. After the project started, changes to the administrative system due to

decentralization occurred resulting in delays to the budget allocation, which caused delays in particular to the distribution pipe extension work which was part of the Kenyan outputs. However, EWASCO did not simply wait for approval of the budget that was promised by the government at the time of the planning. Instead, they searched for additional funding sources from Kenyan banks or loan schemes operated by international aid agencies, and requested budgets within the county in order to secure funds to complete the project successfully.

From this, for the grant aid project, in cases where there is a large component on the recipient side, and the component was important part of the project effect, it is necessary to examine the recipient's ability carefully at the project planning. Also, alternative financing schemes such as from international aid agencies or domestic banks should be considered to prepare for the delayed disbursement of the government budget. It is also effective to search local government agencies that may be the funding sources and to share details of the project with them.

For projects in countries undergoing decentralization, create a monitoring plan during the planning stage and strengthen monitoring during project implementation

After the project started, constitutional reforms promoting decentralization were implemented, and government agencies were reorganized after the project was completed. In addition, the implementation system for the water sector was also restructured. As a result of these changes, the government's budget allocation was delayed and the project period largely exceeded the planned period.

For projects implemented in countries where decentralization is progressing, it is essential to fully research the risks that may be caused by decentralization, such as restructuring of administrative systems or jurisdictions, changes to budgetary lines, and the personnel transfer at the time of project planning. It is also preferable to prepare and agree a monitoring plan that defines the responsible implementation agency and frequency of monitoring with the recipient government. Furthermore, if there are changes to the administration system due to decentralization during the project implementation, detailed monitoring will become particularly important. Especially when the implementing agency or schedule for the component on the recipient side would be changed, it is important to strengthen monitoring activities and obtain agreement documents to ensure the project completion according to the plan. If the project implementation by the recipient side which was important part of the project effects is expected to be delayed, it will also be important to revise the target year of project effect indicators.

Burkina Faso

FY2015 Ex-Post Evaluation of Japanese Grant Aid Project

"Project for Rural Water Supply in the Regions of Central Plateau and South Central"

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

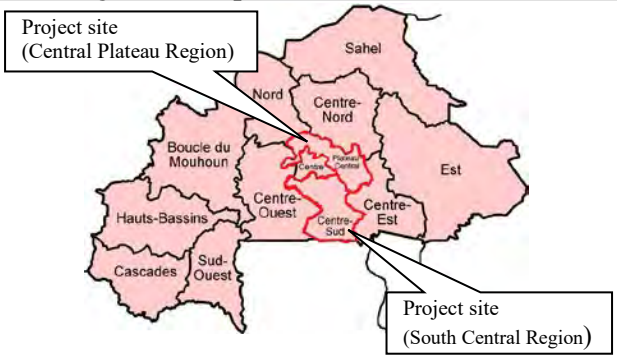
0. Summary

The project was implemented for the purpose of contributing to the improvement of the livelihood environment of the residents in the target areas in Burkina Faso, namely, three provinces in Central Plateau Region[1] and three provinces in South Central Region, through reliable access to safe drinking water by constructing deep wells with hand-pump facilities and developing the operation and maintenance system of the facilities.

The project was consistent with the development policies and development needs of Burkina Faso both at the time of project planning and ex-post evaluation. The Japan's ODA policy for Burkina Faso at the time of planning also matched the objective of the project. Therefore, its relevance is high. Although the project cost was within the plan, the project period became longer than planned. Therefore, the efficiency is fair. The target for the population supplied with water by the project that was set at the time of planning was achieved, and the operation rate of constructed deep wells with hand-pump facilities is high. In addition, the amount of water used by the users has increased, and water-borne diseases have been reduced by improving the water quality and the awareness of hygiene. It was also confirmed that women's working hours and children's school hours have been increased through the reduction of water fetching labor. Therefore, the effectiveness and impact of the project are high. There are some problems in the system and the financial condition of the operation and maintenance; thus, sustainability of the project effect is fair.

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

1. Project Description



Project Location

Constructed Deep Well with Hand-pump Hacility

[1] In this report, the term 'region' is used for 'région' in French. Burkina Faso's administrative divisions consist of regions, provinces, communes, and villages. There is a quartier as a lower settlement unit than village. It is a settlement that is basically made up of relatives and kin. In this report, the term 'rural society,' not 'village' is used in case of referring to a community society.

1.1 Background

The majority of the area of Burkina Faso consists of a savannah zone, which is a semi-arid area that suffers from chronic water shortage because annual rainfall is low between 500mm and 1,400mm. Average annual rainfall in the project target areas is 675mm in Central Plateau Region and 900mm in South Central Region[2]. About 82% of the population live in rural areas[3], and the residents used waters from the rivers and puddles for drinking. The people were in a poor hygienic environment because they could not ensure the supply of safe drinking water. Thus, the incidents of water-borne disease were high. In addition, women and children were forced to engage in severe labor of fetching water.

The Government of Japan considered the importance of cooperation in the water sector in Burkina Faso, and implemented a series of Grant Aid projects such as "Water Resources and Rural Facility Office Equipment Maintenance Project (1982)", "Groundwater Supply Project (1992)", and "Project for Clean Water Supply for the Eradication of Guinea-Worm (1998)". These projects were intended to benefit the Burkina Faso people by providing support for ensuring the supply of safe water. The water supply rate of the target areas of the project, namely, Central Plateau and South Central Regions was relatively high out of the 13 regions in the country. However, the water supply rate for each rural area was varied, and there were many rural areas where sufficient water supply facilities were not in place for the population. Under such circumstances, the grant aid assistance for a drinking water supply project in Central Plateau and South Central Regions was requested to the Government of Japan by the Government of Burkina Faso in August 2005.

1.2 Project Outline

The objective of the project is to ensure reliable access to safe drinking water by constructing water supply facilities and developing the operation and maintenance system of the water supply facilities, thereby contributing to the improvement of livelihood environment of the residents in the target areas[4]; three provinces (Ganzourgou, Kourwéogo, Oubritenga) in Central Plateau Region and three provinces (Bazéga, Nahouri, Zoundwéogo) in South Central Region in Burkina Faso.

E/N Grant Limit or G/A Grant Amount / Actual Grant Amount	67 million yen / 64 million yen (Detailed Design) 1,459 million yen / 905 million yen (Project)
Exchange of Notes Date (/Grant Agreement Date)	February, 2009 (/ February, 2009) (Detailed Design) June, 2009 (/ June, 2009) (Project)

[2] JICA Implementation Review Study Report 2009

[3] Burkina Faso has 351 communes in 45 provinces. The 351 communes are divided into 302 rural areas and 49 urban areas.

[4] Central Plateau Region has three provinces, namely, Ganzourgou (8 communes), Kourwéogo (5 communes), and Oubritenga (7 communes) Provinces. South Central Region has three provinces, namely, Bazéga (7 communes), Nahouri (5 communes), and Zoundwéogo (7 communes) Provinces.

Implementing Agency[5]	General Directorate of Drinking Water, Ministry of Water and Sanitation
Project Completion Date	August 2012
Main Contractor	Koken Boring Machine Co., Ltd.
Main Consultant	Japan Techno Co., Ltd.
Basic Design	March 2007 to January 2008
Implementation Review Study	July 2008 to January 2009
Detailed Design	February 2009 to February 2010
Related Projects	Technical Cooperation Project - Project for Enhancement of Water Supply Facilities Management and Hygiene and Sanitation in Rural Areas Phase II (2015-2018) - Project for Enhancement of Water Supply Infrastructure Management and Hygiene and Sanitation in the Region of Central Plateau (2009-2013) Grant aid - Project for Rural Water Supply in the Regions of Central Plateau and South Central Phase II (2012-2016) - Project for Clean Water Supply for the Eradication of Guinea-Worm (1998-2001)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuo Sumita, Global Link Management, Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: October 2015 to February 2017

Duration of the Field Study: March 12 to April 1, 2016 and May 28 to June 4, 2016

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance (Rating: ③[7])

3.1.1 Relevance to the Development Plan of Burkina Faso

At the time of project planning, the Government of Burkina Faso set "ensuring access to basic social services for the poor" as the most important issue in the "Poverty Reduction Strategy Paper (Cadre Stratégique de Lutte contre la Pauvreté, developed in 2002 and revised in 2004) (CSLP)" to improve poor people's access to safe drinking water. In addition, the government developed the "National Program for Water Supply and Sanitation by 2015 (Programme National d'Approvisionnement en Eau Potable et d'Assainissement à l'horizon 2015, PN-AEPA

[5] Implementing agency of the project at the time of the Implementation Review Study (Jul. 2008 – Jan. 2009) was the General Directorate of Water Resources, Ministry of Agriculture, Hydrology and Water Resources. However, there were four times of reorganization of ministries and the General Directorate was restructured in May 2016, the General Directorate of Drinking Water, Ministry of Water and Sanitation became the implementing agency.

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

[7] ③: High, ②: Fair, ①: Low

2015)" in 2006 to conform to the CSLP. In this program, the target was set to improve the water access rate[8] of rural areas from 60% (2005) to 80% (2015)[9]. In order to achieve the target, it was estimated that construction of simple water supply facilities at 519 locations and 10,745 hand-pump facilities would be necessary.

National development policy at the time of ex-post evaluation is a "Strategy for Growth and Sustainable Development (Stratégie de Croissance Accélérée et de Développement Durable, SCADD)" which was formulated in 2010. In this policy, "water and sanitation" are stated as priority areas. In addition, "National Program for Water Supply by 2030 (Programme National d'Approvisionnement en Eau Potable à l'Horizon 2030, PN-AEP 2030)", which sets the target to achieve 100% access to safe drinking water in rural areas was formulated in 2015 as the strategy of water supply and sanitation sector.

As seen above, the project aiming to improve reliable access to safe drinking water is consistent with the national development policies of Burkina Faso from the project planning stage to the ex-post evaluation.

3.1.2 Relevance to the Development Needs of Burkina Faso

Many people in the rural areas of Burkina Faso had poor access to hygienic drinking water and they depended on unhygienic water such as surface water of rivers and shallow wells. Thus, occurrence of water-borne diseases had been a problem at the time of project planning. Also, women and children were forced to engage in severe labor of fetching water for long hours every day. This situation needed to be improved. According to the "PN-AEPA 2015", for the project target areas of Central Plateau and South Central Regions, 1,000 new hand-pump water supply facilities (Central Plateau: 607 facilities, South Central: 393 facilities) and 47 locations of simple water supply facilities (Central Plateau: 26 locations, South Central: 21 locations) were necessary. In 2009, before the project started, the access rate to safe drinking water in rural areas was 69.9% in Central Plateau Region and 70.9% in South Central Region[10].

The access rate to safe drinking water at the time of ex-post evaluation (2015) in the project target areas was 79.4% in Central Plateau Region and 82.9% in South Central Region[11]. Both regions showed improvement compared with before the project implementation, and the access rate exceeded the 76% that was the national goal set for access to safe drinking water in rural areas in the "PN-AEPA 2015". However, newly established PN-AEP 2030 aims to improve the access rate to safe drinking water in rural areas to 100% by 2030. Therefore, there is a need to

[8] Water access rate is the percentage of population that can ensure 20 liters of water per capita per day within 1 km or within a round trip of 30 minutes. (WHO: Guidelines for Drinking-water Quality, Fourth Edition, p. 84, 2011)

[9] At the time of development of PN-AEPA, it had been planned that the water access rate will be improved from 60% to 80%, however, it was modified after 2009 from 52% to 72% by a review of access rates on the basis of the most recent demographic data reflecting the census data of 2006.

[10] PN-AEPA 2015 RAPPORT BILAN ANNUEL, Février 2016

[11] PN-AEPA 2015 RAPPORT BILAN ANNUEL, Février 2016

keep improving access to safe drinking water in the target areas of the project.

In light of the above, the needs to improve access to safe drinking water in the target areas of the project are high both at times of project planning and ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

Basic policies and priority areas of ODA to Burkina Faso at the time of project planning was "to focus on basic human needs cooperation centered around education, water and health sectors which directly contribute to the improvement of people's life, and food aid/assistance for underprivileged farmers in view of extreme poverty in Burkina Faso"[12]. In addition, "access to social services" was stated as an assistance priority area, and "water and sanitation environmental improvement program" was listed as the cooperation program in the "Rolling Plan for Burkina Faso" (April 2009). Therefore, the project was consistent with the Japanese assistance policy.

In the light of the above, the project has been relevant to the development policies and development needs of Burkina Faso at times of project planning and ex-post evaluation as well as Japan's ODA policy at the time of project planning. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The 299 deep wells with hand-pump facilities were constructed out of the target value of 300. Of the 299 facilities, 295 were new deep wells with hand-pump and four hand-pumps were installed on existing deep wells. Although it was planned to install five hand-pumps on the existing deep wells, the Burkina Faso side constructed Level II water supply facilities[13] at one of the five wells on their own. Thus, the total number of existing deep wells on which hand-pumps were installed became four instead of five.

Table 1 Planned and Actual Contents of Facility Construction Unit: Facility

Facilities content		Planned	Actual
Construction of deep wells with hand-pump facilities	Newly constructed deep wells	295	295
	Hand-pump installation and construction of peripheral facilities at the existing deep wells	5	4
Total		300	299

Note: In the project, hand-pump pedestal, well enclosure, drainage for drinking water of livestock, and seepage pits were included in hand-pump peripheral facilities.
Source: JICA Implementation Review Study Report and Documents provided by JICA

[12] Japan's ODA Data by Country, Ministry of Foreign Affairs of Japan (2008)
[13] Level II water supply facility is a pipe water supply facility to use a communal water faucet. Level I water supply facility refers to a deep well with hand-pump facilities constructed in the project.

All the activities for the project's capacity building (hereinafter referred to as "soft component") programs, activities 1 to 10 in Table 2 were conducted as planned. The activities 1 to 5 were carried out before the construction of wells. The 388 sites included 300 sites where facility construction had been planned and 88 sites that would be alternative sites in case of problems in terms of water quantity or water quality during well construction. The activities 6 to 10 were supposed to be carried out after construction to ensure successful wells, and were implemented for the Water Facility Site Committees (Comité de Point d'Eau, hereinafter referred to as the "CPE") of the total of 299 sites and for the repairers (Artisan Réparateur, hereinafter referred to as the "AR").

Table 2 Soft Component Program

1	Project description in communes at the start of the project and workshop preparation
2	Manual preparation (CPE training manual, hygiene guidance manual)
3	Workshop at communes
4	Raising the awareness of residents
5	Establishment of CPEs and conclusion of terms
6	Hygiene education
7	Accounting training
8	Training for ARs
9	Technical guidance relating to the operation and maintenance of facilities
10	Monitoring of CPE's management / follow-up

Source: Document provided by JICA

Table 3 Target Sites for Implementation of Soft Components

Region	Province	Target Commune	Target Sites	Facility Completed Sites
Central Plateau	Ganzourgou	8	92	79
	Kourwéogo	5	37	27
	Oubritenga	7	46	22
South Central	Bazéga	7	80	65
	Nahouri	5	77	61
	Zoundwéogo	7	56	45
Total	6 Provinces	39	388	299

Source: Document provided by JICA

The following were envisaged as items borne by the Burkina Faso side relating to outputs; 1) securing of land and land leveling, 2) maintenance and repair of the access road, 3) securing and leveling of the construction base, 4) securing of space such as a garage and yard, 5) providing materials and information, 6) effective management of procured materials and equipment and constructed facilities, and 7) other expenses (such as tariffs). These were carried out without problems.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost for the Japanese side was planned to be 1,526 million yen including both detailed design and construction costs. The actual cost was within the plan, which was 969 million yen, 64% against the plan. According to the interviews with the project consultant, the main reasons why the project cost became lower than planned were 1) affect from foreign exchange, and 2) competitive bidding of construction costs. For 1), although the exchange rate at the time of planning (EN/GA amount) was 162.06 yen per euro, the rate applied at the time of the detailed design was 142.18 yen per euro; and at the time of construction, it was 137.69 yen per euro due to stronger yen. The construction cost was 62%, which is significantly lower than the planned value by competition between the bid participating companies and also due to the impact of foreign exchange.

Table 4 Project Cost (Japanese Side)

	Plan (G/A)	Actual	Ratio to the plan
Total	1,526 million yen	969 million yen	64%
Detailed Design	67 million yen	64 million yen	96%
Project	1,459 million yen	905 million yen	62%
(Construction cost)	-	720 million yen	-
(Equipment cost)	-	0 yen	-
(Design and administrative cost)	-	184 million yen	-

Source: Document provided by JICA

The project cost borne by the Burkina Faso side is unknown, however, 1) counterpart personnel expenses, 2) fuel and maintenance costs of the vehicle for the counterpart, 3) activity expenses for the establishment of maintenance and management system to promote the new system called the REFORME (Réforme du système de gestion des infrastructures hydrauliques d'approvisionnement en eau potable en milieu rural et semi urbain) (for details, refer to 3.5.1 Institutional Aspects of Operation and Maintenance), 4) costs of water quality monitoring implemented twice a year for deep wells after construction, 5) office consumables costs, 6) notification fee of the Authorization to Pay, 7) bank commissions, were carried out as planned.

3.2.2.2 Project Period

The project period was scheduled for 38 months[14] from February 2009 to March 2012 including detailed design. The actual project period was 41.8 months from February 2009 to

[14] Ex-ante Evaluation Sheet was not created, but the project period was considered to be a 38-month period based on the process table in the "JICA Implementation Review Study 2009". The period begins from February 2009, the starting point of the detailed design to March 2012, completion of the soft component program.

August 2012, 110% of the original plan. The reason why the project period exceeded the plan was delays in the construction and soft component implementation associated with it. In the background of the construction delay, an evacuation advisory was issued to the Japanese by the Ministry of Foreign Affairs of Japan, because of the security deterioration due to political unrest (issued on April 29, 2011 and released on June 3, 2011). In addition, even before the evacuation advisory, a curfew instruction during the day had been issued to the Japanese and affected the construction schedule. It was the rainy season when evacuation advisory was released, so there was a problem in work resumption, and the construction and pump installation work was behind schedule. The implementation of the associated soft component activities was also delayed. However, even excluding the evacuation period, the project period would be 40.7 months, 107% of the plan.

From the above, although the project cost was within the plan, the project period was longer than planned. Therefore, efficiency of the project is fair.

3.3 Effectiveness[15] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicator)

The "water supplied population" had been set as a quantitative effect indicator of the project at the time of planning. In addition to this index, in order to check the operating status of the construction facilities in the project, it was decided to add as an indicator, the "operation rate of the water supply facilities," and both indicators were confirmed.

3.3.1.1 Population Supplied with Water

The goal of the project was to increase the population supplied with water by 90,000 at the time of facility completion. Changes in population supplied with water and completion year of each term[16] for the project are as shown in Tables 5 and 6. The baseline at the time of the feasibility study was 782,206 people based on the figure in 2007, and the target value was set at 872,206 people, an increase of 90,000 people from the baseline. However, after having checked the baseline against PN-AEPA 2015, this was the figure for 2005. Consequently, the population supplied with water in 2009 was used as the baseline for the ex-post evaluation because the completion of the first term of the project was 2010. Since the population supplied with water in 2009 in the rural areas in the target regions was 871,940, 961,940 people was set as the target value after adding 90,000 people to the population supplied with water in 2009. The actual population supplied with water in 2012 was 1,051,343 and when disregarding 31,500 people who are beneficiaries of the African Development Bank (AfDB) project implemented over the

[15] Sub-rating for Effectiveness is determined in consideration of Impact.
[16] The project was carried out in three terms to take into account the period when construction was interrupted due to the rainy season in Burkina Faso and Japanese fiscal year.

same period to increase the water supplied population in South Central Region, it is still 1,019,843 (actual value), exceeding the target by 6%[17]. It should be noted that the standard number of users per facility is 300[18] in Burkina Faso. It was confirmed that a water facility was utilized by 300 people or more by site survey and interviews in Burkina Faso, thus, an increase of 90,000 people or more served by the 299 water facilities of the project was confirmed.

Table 5 Number of Facilities Completed by the Project Unit: Facility

Completion	1st Term	2nd Term	3rd Term
	May-Jun. 2010	Mar.-Apr. 2011	Mar.-Jun. 2012
Central Plateau	66	62	0
South Central	0	71	100
Total	66	133	100

Source: Document provided by JICA

Table 6 Transition of Population Supplied with Water Unit: Person

Name of Indicators		Baseline	Target	Actual	Actual	Actual	Actual	Actual	Actual
		2009	2012	2010	2011	2012	2013	2014	2015
		Baseline Year	Project Completion			Project Completion	1 year after the Project Completion	2 years after the Project Completion	3 years after the Project Completion
				1st Term Completion	2nd Term Completion	3rd Term Completion			
Water Supplied Population	Central Plateau	442,448	Not set	454,804	478,357	523,532	537,103	549,490	561,899
	South Central	429,492	Not set	449,050	477,619	527,811	556,717	575,957	608,332
	Total-①	871,940	961,940	903,854	956,156	1,051,343	1,093,820	1,125,447	1,170,231
	Water supplied by AfDB -②[19]	—	—	—	—	31,500	—	—	—
	①－②	—	—	—	—	1,019,843	—	—	—

Source: Answers for the questionnaire and interviews of the Implementing Agency

3.3.1.2 Water Supply Facility Operation Rate[20]

The operation rate of 299 deep wells with hand-pump facilities constructed in the project is 98.3%. The operation status in each region is shown in Table 7.

[17] The population supplied with water served by a small number of water supply facilities constructed by village or quartier themselves and with assistance provided by NGOs was unknown.

[18] According to the water supply facility design criteria of the "PN-AEPA 2015," deep well with hand-pump facilities should target 300 people per facility, the distance of the facility should be within 1 km from the village center, and the water supply unit should be 20 liters per person per day. In addition, it is mentioned that water facilities have been constructed at a quartier level rather than a village level.

[19] The target region of the project that overlaps with that covered by the assistance by AfDB is South Central Region in 2012 only.

[20] According to the definition of operation of a water facility by Burkina Faso, the pumping amount should be 0.7m^3 per hour, and continuous non-working period should not be 12 months or more. Water quality testing was not carried out at the time of operation confirmation. With regard to water quality, the water quality guideline in line with WHO was applied and confirmed at the time of facility construction. It should be noted that the operation rate is the proportion of the sites in operation against the total number of facilities.

Table 7 Operational Status of the Deep Wells with Hand-pump Facilities Constructed by the Project (2015)

Region	No. of sites	No. of wells in operation	No. of wells out of operation	Operation rate
Central Plateau	128 (including 4 existing wells)	124	4	96.9%
South Central	171	170	1	99.4%
Total	299	294	5	98.3%

Source: Water Supply Sanitation Department, Regional Offices of Central Plateau and South Central

The operational status of the entire deep wells with hand-pump facilities in the two target regions of the project (also including facilities which were not constructed in the project) is as shown in Table 8. The operation rates of both regions were higher than 90%.

Table 8 Operational Status of the Entire Deep Wells with Hand-pump Facilities in the Two Target Regions (2015)

Region	No. of sites	No. of wells in operation	No. of wells out of operation	Operation rate
Central Plateau	3,968	3,615	353	91.1%
South Central	3,522	3,272	250	92.9%
Total	7,490	6,887	603	91.9%

Source: Water Supply Sanitation Department, Regional Offices of Central Plateau and South Central

Among the 299 deep wells with hand-pump facilities constructed in the project, site visits were conducted for a total of 92 facilities (30.8% of the total). There was a facility out of operation due to drought, but the total operation rate was 99% according to the pump check during the site survey and interviews with water users at the time of survey. The numbers of target sites chosen for the site survey were proportional to the numbers of constructed facilities in the project in the two regions as shown in Table 9.

Table 9 Number of Actually Visited Facilities

Region	Province	No. of Facilities		No. of Actually Visited Facilities	
Central Plateau	Ganzourgou	27	128 (43%)	13	39 (42%)
	Kourwéogo	22		12	
	Oubritenga	79		14	
South Central	Bazéga	65	171 (57%)	14	53 (58%)
	Nahouri	45		19	
	Zoundwéogo	61		20	
Total	6 provinces	299 (100%)		92 (100%)	

Source: Prepared by the external evaluator based on the site survey

Operation rate of deep wells with hand-pump facilities constructed in the project was 98.3%

(Table 7), which was higher than 91.9%, the operation rate of the entire deep wells with hand-pump facilities in the two target regions. Factors that enabled high operation rates are 1) selection of the appropriate management entity for facilities (deep wells), 2) selection of appropriate implementation sites, 3) establishment of spare parts supply system and organization of repairers[21], and 4) facility design and selection of equipment.

1) Selection of appropriate management entity for facilities (deep wells)

In accordance with "PN-AEPA2015" which was formulated in 2006, water users' associations (Association des Usagers de l'Eau, hereafter referred to as "AUE") were established, and maintenance was switched away from the previous system of maintenance based on well units by CPEs, to a revised system of maintenance of all the wells within a village called REFORME. (The REFORME was a new system introduced by "PN-AEPA2015". For details refer to 3.5.1 Institutional Aspects of Operation and Maintenance.) However, this revised system was not applied in the soft components, and for maintenance of each individual water supply facility constructed in the project, establishment and organization of a CPE on single well units was supported as in the previous system. As a result, ownership of the facilities by the users was cultivated, such as maintenance and hygiene management by the CPE, which greatly contributed to maintenance of the facilities.

2) Selection of appropriate implementation sites

From among the sites requested by the Burkina Faso side, the sites for construction were selected by scoring points for water supply rate, whether or not there was a good alternative source of water, the willingness of the residents to pay a water usage fee, the status of health and hygiene, the hydrogeological conditions, the capacity of the residents for maintenance, the impact on the construction process[22], etc. In this way, sites for implementation were selected that were sustainable from the maintenance point of view and with a likelihood of high operation rate.

3) Establishment of spare parts supply system and organizing repairers

There is at least one spare parts dealer for the installed pump models used by the project in each province of the two target regions. There are four dealers in Central Plateau Region and four other in South Central Region. In addition, in three provinces in Central Plateau Region, repairer union of each province that had been organized by a related project, "Project for Enhancement of Water Supply Infrastructure Management and Hygiene and Sanitation in the Region of Central Plateau" became the spare parts sales base. This system enables rapid spare parts supply. This repairer union has become a system that can quickly dispatch ARs if pump repair is necessary, and repair

[21] ARs who are licensed following a review by the regional office of the ministry are repairers (*maintenanciers*).
[22] Easy access to the villages for large vehicles and excavation machinery.

system has been improved by sharing information on the spare parts supply through the union.

4) Facility design and selection of equipment

Designs of deep wells with hand-pump facilities in Burkina Faso are diverse, and a standard model is not defined. In the project, hand-pump pedestal, well enclosure, drainage for drinking water of livestock, and seepage pits were included in hand-pump peripheral facilities. According to interviews with residents, it became possible to maintain a good hygienic environment of the facilities and to supply drinking water to livestock conveniently because peripheral facilities were procured in the project in addition to hand-pumps. It was confirmed that the added value of these facilities further increased ownership by the users. In addition, the model of hand-pump was DIAFA made in Burkina Faso. DIAFA is very familiar to ARs because this brand has been supplied in Burkina Faso for 20 years or more. Maintenance training sessions for ARs by Diacfa Inc. which is a manufacturing dealer of DIAFA were also incorporated as a part of soft component activities in the project. Furthermore, steel pipes which were generally used for lifting pipes in Burkina Faso were a cause for failure due to frequent corrosion. Therefore, PVC[23]/stainless steel conjugation tubes with excellent durability were used for the lifting pipes. This facility design and equipment selection contributed to the operation and maintenance, thereby enabling the high operation rates.

Spilled water from the pump flows to livestock watering hole through drainage

Gravel around the well to avoid a mud puddle and scouring, and hedge to avoid livestock animals (developed by the residents)

3.3.2 Qualitative Effects

3.3.2.1 Situation of Water Quality

According to the site survey, the water is being used as drinking water in all of the sites in operation. Abnormalities and problems relating to water quality were not reported. According to the beneficiary survey[24] which asked about turbidity, smell, and taste, 98% and more of the

[23] PVC: Polyvinyl Chloride

[24] The beneficiary survey was conducted from April 6 to 10, 2016 in Central Plateau and South Central Regions

respondents gave the answer that these characteristics had been improved compared with before the project implementation. It should be noted that 65% of respondents were using shallow wells as their water source before the project.

3.3.2.2 Reliable Water Supply

In the results of the site survey, shortage of pumping water was not reported and the amount of water required by water users was supplied. Although the site survey was conducted during the dry season when demand for water generally increases, the situation of water supply was good. Thus, it can be assumed that a reliable amount of water is supplied throughout the year. In addition, in the beneficiary survey, 75% and more of the respondents answered that "there was no water stoppage" when asked about frequency of water supply suspension after the project.

3.3.2.3 Changes Relating to Water Fetching

In the interviews with the water users conducted during the field survey, several positive answers were reported including "it has become easier since the water facility is closer than before" (distance shortened) and "compared with pond water, water fetching has become easier" (reduction of water fetching labor). In addition, 80% of the water users answered that "the time required to fetch water has decreased" in the beneficiary survey.

Table 10 Water Fetching Labour (Distance/Time)

	Shortened		Not shortened	
	Men	Women	Men	Women
Water fetching distance	94	144	4	7
	238 (95.6%)		11 (4.4%)	
Water fetching time	81	119	17	32
	200 (80.3%)		49 (19.7%)	

Source: Beneficiary survey of water users

3.3.2.4 Support for Women's Participation

The project consultant promoted participation of women in the soft component activities.

taking into account the ratio of facilities constructed in the project. A total of 10 sites (4 sites in Central Plateau Region, 6 sites in South Central Region) was sampled, and investigators carried out individual interviews with the water users (those who came to fetch water to the target site) and CPE members. The number of responses was 20 to 30 people per site with respect to water users, and the number of valid responses was 249 in total. In regard to CPE members, the number of responses from each site was 2 people and the number of valid responses was 20 in total. For water users, the age of respondents were as follows: 10s 9.2%, 20s 29.3%, 30s 23.3%, 40s 15.7%, 50s 14.5%, 60s 6.8%, 70s and older 1.2%. The respondents' gender was men 39.8% and women 60.2%. For CPE members, the ages of respondents were as follows: 20s 5%, 30s 30%, 40s 45%, 50s 15%, 60s 15%. The respondents' gender was men 85.0% and women 15.0%.

Specifically, measures were taken to increase the participation of women, such as encouraging the participation of women in each type of training, the appointment of women was actively recommended through the explanation meetings regarding the methods of selecting CPE members, the male-to-female ratios among the total resident participants were checked and discussed, the expression of women's opinions was encouraged in the awareness raising activities in the village, etc. However, it should be noted that male-to-female ratio of CPE members was not determined according to the project consultant and the implementing agency of the Burkina Faso side. The project consultant reported that, while a greater number of women takes charge of positions related with hygiene, men were more likely to be selected for positions that require reading and writing skills because the literacy rate of women tended to be lower than men (men 36.7%, women 21.0% in 2006)[25]. The male-to-female ratio of CPE members was 7 : 3 according to the result of a beneficiary survey, and women had entered as members in all of the CPEs.

3.4 Impacts

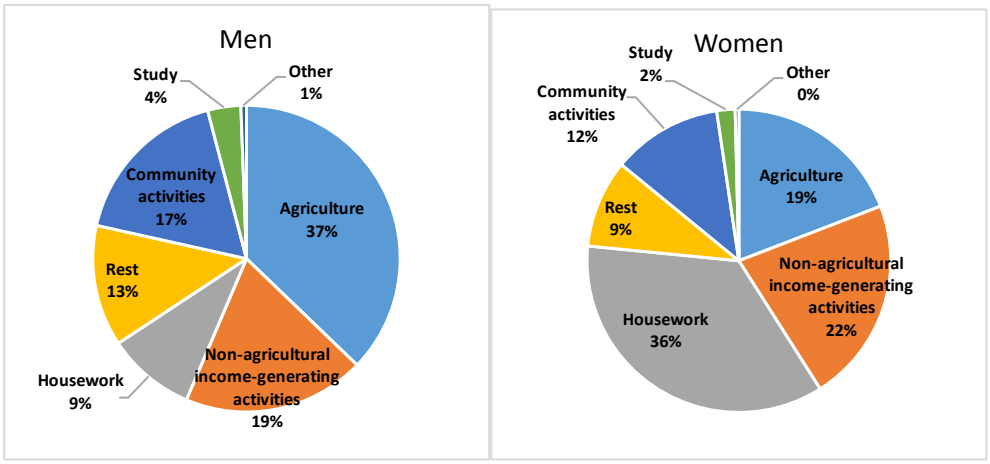
3.4.1 Intended Impacts

At the time of project planning, there was no indicator set to measure quantitative effects of the project impact. The following qualitative effects were postulated: 1) increase in school hours and working hours due to the reduction of water fetching labor, 2) reduction of water-borne diseases by safe water supply, and 3) dissemination of hygienic knowledge. At the time of ex-post evaluation, the following impacts have been confirmed.

3.4.1.1 Increase in Working Hours and School Hours Due to the Reduction of Water Fetching Labor

Men mainly used the time obtained by the shortened water fetching time for "agriculture" and "non-agricultural income generating activities", women used the time for "housework", and "non-agricultural income generating activities." It was therefore confirmed that other working hours increased as an impact of the project by reducing the water fetching labor.

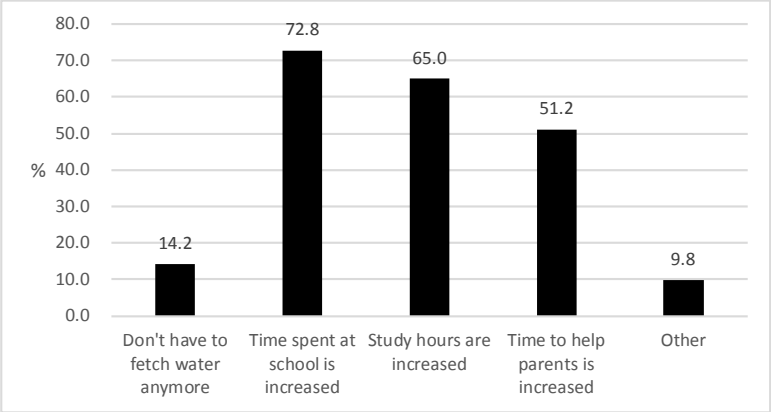
[25] Adult (2006) (15 years old or older) literacy rate: 28.3% (Men 36.7% Women 21.0%) Source: Tableau de bord de l'Education de Base Année scolaire 2011/2012, Ministère de l'Education Nationale et de l'Alphabétisation, Novembre 2012



Source: Beneficiary Survey (Multiple answers by 81 men and 119 women who answered "water fetching time was shortened")

Figure 1 Use of Time Obtained by Shortened Water Fetching Time (Men / Women)

For water users who responded that there has been an impact on everyday life of children, the following answers were confirmed (multiple answers allowed). 72.8% answered "time spent at school is increased", and 65.0% answered "study hours are increased." Therefore, increase in school hours for children is confirmed as an impact of the project.



Source: Beneficiary survey (246 samples responded that there had been an influence on everyday life of children)

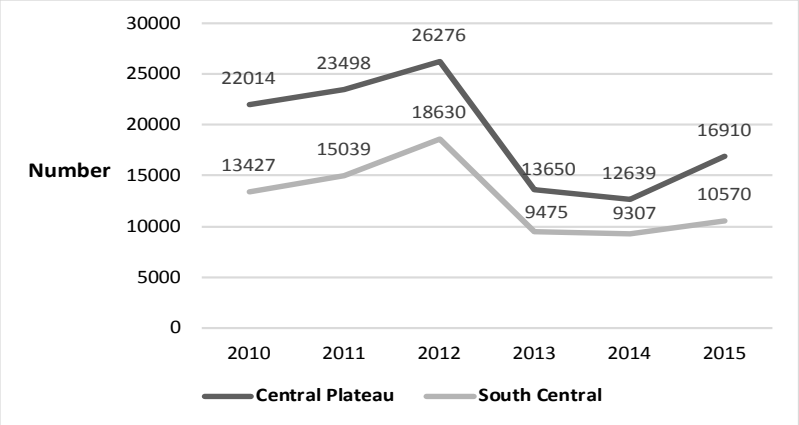
Figure 2 Influence on Everyday Life of Children

3.4.1.2 Dissemination of Hygienic Knowledge

In response to the question regarding change in awareness of hygiene and water use, 100% of the respondents replied that their awareness had "changed". The changes in actions associated with this awareness as determined from multiple responses included 78.7% "increase in bodily cleanliness", and "increase in number of times washing", followed by 64.7% "increase in hand washing". From this it has been confirmed that activities on hygiene have increased as a result of the change in awareness achieved by the soft components and the increase in water use.

3.4.1.3 Reduction of Water-borne Diseases by Safe Water Supply

According to the interview surveys with Water Supply Sanitation Departments of MEA Regional Offices, in the two target regions of the project water-borne diseases among water users at the target sites were decreased. In the beneficiary survey, 100% of the water users responded that "water-borne diseases are certainly decreased". According to the annual disease statistics in the two target regions by the Ministry of Health, diarrhea (without melena) was on the rise until 2012 at the time of the project completion and then decreased. After that, it slightly increased or decreased for the year 2013 to 2015.



Source: Annuaire Statistique 2010 -2015, Ministry of Health
Note: No data for 2009 as the Annuaire Statistique 2009 does not include the annual disease statistical data by region.

Figure 3 Annual Transition of Diarrhea in the Two Target Regions

In addition, cholera and guinea-worm disease have not been reported from 2010 to 2015 in the two target regions[26]. However, it was impossible to obtain quantitative indicators of diarrhea, cholera, and guinea-worm disease only for the water users at the target sites of the project. In terms of the reduction in the risk of water-borne diseases, it is considered that there was a certain effect by the supply of safe water in accordance with the water quality standards, selection of sites where residents' solidarity is strong, hygienic education by the soft component program, and activities related with hygiene in the technical cooperation project "Project for Enhancement of Water Supply Infrastructure Management and Hygiene and Sanitation in the Region of Central Plateau"[27]. However, it cannot be said with certainty that there has been a direct cause-and-effect relationship between the project and the reduction in the risk of water-borne diseases.

[26] Annuaire Statistique 2010 – 2015, Ministry of Health, Burkina Faso
[27] Project Purpose: Management of water supply facilities and hygiene behavior of local people in the target communes are improved.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

According to the questionnaire responses by the implementing agency, there was no negative impact on the environment, such as the occurrence of "lowering of groundwater level," "land subsidence in the vicinity of the project sites," or "salinization" in the construction of water supply facilities of the project.

3.4.2.2 Resettlement and Land Acquisition

According to the interviews with the implementing agency and the project consultant, land acquisition for the construction of water supply facilities has been carried out without any problem, with no resettlement of residents.

3.4.2.3 Reducing Negative Impacts by Construction

According to an interview with the project consultant, the construction was carried out with the cooperation of the residents of the villages to minimize traffic disturbance, entering farmland impacts on harvest of agricultural produce, etc., by access to the sites by construction vehicles during facility construction. There were no reported complaints from the residents.

In light of the above, it can be concluded that planned effects were largely achieved. Therefore, the effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

The implementing agency of the project was the General Directorate of Water Resources (Direction Générale des Ressources en Eau), Ministry of Agriculture, Hydrology and Water Resources at the time of project planning. However, there were reorganizations of ministries four times and restructuring of the General Directorate once, and it became the General Directorate of Drinking Water (Direction Générale de l'Eau Potable, hereinafter referred to as the "DGEP"), Ministry of Water and Sanitation at the time of ex-post evaluation. Although the implementing agency was changed, there was no change in the decision-making process for rural water supply, and there was no affect on the project. The main roles of the DGEP, each administrative agency, and related organizations involved in rural water supply were as shown in Table 11.

Table 11 Roles of Each Organization

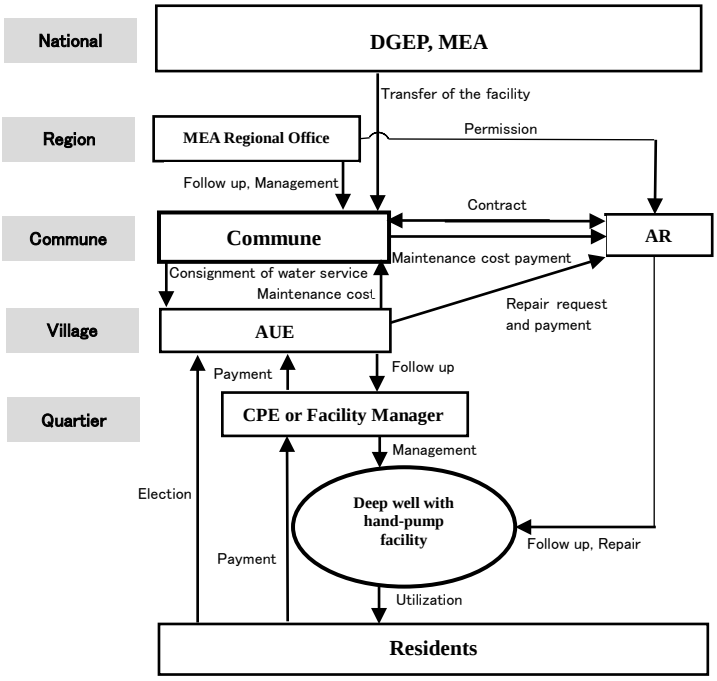
Organization	Main Role
a) DGEP, Ministry of Water and Sanitation	Planning and development of national policies and strategies relating to drinking water supply, and coordination of the establishment of facilities (such as budget securing, donor coordination) and follow-up of the strategy.
b) Water Supply Sanitation Department, Regional Office	Five people including one water conservancy technologist are deployed (the number of personnel for each target region at the time of ex-post evaluation). Development, management and database management of plans are implemented. Also, technical assistance is provided for communes which are the owners of water supply facilities.
c) Water Supply Sanitation Department, Provincial Office (*Not established for provinces in South Central Region)	Project management in the relevant provinces and technical assistance to the commune that is the owner of the water supply facilities are implemented.
d) Commune	The owner of the water supply facilities, and the implementing body of the water supply administration. Communes conduct monitoring of the facility, and conclude an agreement for maintenance and management work with AUEs established in each village.
e) AUE (Water users' association)	AUEs become organizations representing water supply facility users at the village level, and carry out the operation and maintenance of water supply facilities in the form of commissioned work by the commune. AUEs manage water fees collected from water users by the administrator of each well (individuals who have been appointed by the existing CPEs or AUEs), and dispatch ARs (repairers) at the time of failure of water facilities.
f) CPE (Water Facility Site Committee)	CPEs were established for each well and used to do the operation and maintenance of wells before the establishment of AUEs through the REFORME. CPEs also collect water usage fees. Continued existence of CPEs was not prohibited at the time of the ex-post evaluation.
g) Repairers (ARs who are licensed by the regional office of the Ministry of Water and Sanitation)	In the REFORME, repairers enter into contracts with communes to implement inspections twice a year for each well. Also, they are dispatched by AUEs to repair wells in the event of failure.

Source: Answers for the questionnaire and interviews of the Implementing Agency

According to the Burkina Faso side, one or two staff are located at the Water Supply Sanitation Department in each province in Central Plateau Region. On the other hand, there is no staff dispatched to the Water Supply Sanitation Department for the provinces in South Central Region, but the regional office has been supporting the communes.

The REFORME was introduced by "PN-AEPA2015" which was formulated in 2006, in which the system has been changed from the former system of maintenance in well units by CPEs, to a system of maintenance of all wells of a village by AUEs. As a result of the integrated management by the AUEs of the water usage fees for the wells of a village as a whole, the following effects were achieved: 1) the time required for raising the repair expenses when there was a well breakdown was sped up, 2) there was leveling of the water usage fees that previously varied for each well, and 3) a scheme was devised in which even when a well had a problem or was being repaired, it was possible to use another well (as a result of managing the wells in village units).

In accordance with a policy to delegate local authority powers, a government ordinance was proclaimed in the water supply and hygiene field to delegate authority to communes[28] in 2009, so the implementing body for water supply projects became the commune. Communes concluded agreements with the AUEs that were established in each village to commission maintenance. In the REFORME, the ARs are guaranteed a certain level of income from their contracts with the communes, and they continuously control multiple wells (maintenance twice a year and minor repairs). Also, when there is a breakdown, the licensed ARs are responsible for repairs based on a request from the AUE, and the AUE pays the AR the repair cost.



Source: Revision of a figure described in the JICA Implementation Review Study Report

Figure 5 Operation and Maintenance System by the REFORME (Level I)

For the spare parts supply system, in addition to spare parts dealers by the pump manufacturing dealers, the maintainer union in each province in Central Plateau Region has been functioning as a spare parts sales base which enables the rapid spare parts supply.

The REFORME is ongoing at the time of ex-post evaluation, and the operation and maintenance system varies by site. According to interviews with the CPE members or former CPE members at the time of site survey, there were several comments such as “dissatisfaction with the fact that much of the money collected by the AUE has been used for wells with high frequency of failure”, “distance and psychological barriers to the use of other wells (other

[28] Décret 2009-107/PRES/PM/MATD/MAHRH/MEF/MFPRE du 03 mars 2009 portant transfert des compétences et des ressources de l’Etat aux communes dans les domaines de l’approvisionnement en eau potable et de l’assainissement

quartiers' wells) that are not normally used at the time of well failure", "insufficient staffing in organizational setup of communes", and "lack of knowledge and experience relating to the organizational management in the commune". In 70% or more of the regions where the sites were surveyed, maintenance was carried out in well units by CPEs or their members even though AUEs had been established, so it is considered that the REFORME still has many problems. AUE members are composed of residents in villages and there are cases of former CPE members becoming members of AUEs, however, many AUE members are newly elected and capacity building is essential for them. It should be noted that, since the "Project for Enhancement of Water Supply Infrastructure Management and Hygiene and Sanitation in the Region of Central Plateau" (from June, 2009 to June, 2013), in the targeted Central Plateau Region, AUEs have been established in almost all villages in the region. South Central Region was added to Central Plateau Region as a target area of the "Project for Enhancement of Water Supply Facilities Management and Hygiene and Sanitation in Rural Areas Phase II" that was started in September 2015, however, AUEs have not yet been established in many villages of South Central Region. Even when an AUE establishment has been completed, there are many villages that are having problems such as AUEs not functioning, therefore the technical cooperation project activities will continue to be implemented for preparing the foundation for the REFORME to be disseminated throughout the country[29].

As stated above, it is considered that there are some issues regarding the facility operation and maintenance system, such as differences in the rate of progress in establishing the REFORME in each region, and obtaining the understanding of the residents towards the revised system.

3.5.2 Technical Aspects of Operation and Maintenance

In the REFORME, ARs will be in charge of each water supply facility, after entering into a maintenance contract with the respective communes. The number of ARs that obtained the authorization from the regional office of the Ministry of Water is 80 in Central Plateau Region and 63 in South Central Region. However, the number of ARs that have already made a contract with a commune for maintenance is only 35 in Central Plateau Region and only 13 in South Central Region[30]. It is necessary to promote the conclusion of contracts between communes and ARs. In the project, a 7-day package of training by the Diacfa, which is a manufacturing distributor of the installed pump, was implemented as a soft component activity for ARs to improve their maintenance and repair skills. Furthermore, as a soft component to CPEs, routines for maintenance methods and management of facilities were also introduced.

[29] Project Purpose: The establishment of the foundation for nationwide deployment of the REFORME by applying the techniques that were developed in the PROGEA 1st phase. *PROGEA is a name of the technical cooperation project.

[30] RAPPORT BILAN NATIONAL DU 1ER SEMESTRE 2016, Juillet 2016

As described above, both ARs and CPE members have sufficient skills to manage the facilities of the project.

In the technical aspects of operation and maintenance, although it is necessary to promote the conclusion of maintenance contracts between communes and ARs, no major problem is seen as the skill level of ARs is high and daily maintenance has been conducted by CPE members.

3.5.3 Financial Aspects of Operation and Maintenance

Table 12 shows the budget for the water sector (excluding the budget for the sanitation sector, and personnel expenses) of the Ministry of Water and Sanitation in charge of the Project.

Table 12 Government Budget relating to the Water Sector Unit: 1,000 FCFA[31]

Budget	2009	2010	2011	2012	2013	2014	2015
Government	6,047,000	6,348,152	4,877,235	7,591,856	9,069,187	8,721,185	3,375,481
From Development Partners*	16,338,947	24,189,603	31,567,395	39,877,559	33,790,621	28,173,457	20,913,704
Total	22,385,947	30,537,755	36,444,630	47,469,415	42,859,808	36,894,642	24,289,185

* Including the sector financial support and the budget for each project and program (funds as a loan program that is intended to enter the national treasury)

Source: General Affairs and Finance Section, Ministry of Water and Sanitation

The budget relating to the water sector for regional offices of the Ministry of Water and Sanitation and communes from the central government is shown in Table 13.

Table 13 Budget of Water Sector for Reginal Offices and Communes Unit: 1,000 FCFA

Budget	2009	2010	2011	2012	2013	2014	2015
From Central Government to Regional offices	442,730	3,080,000	8,483,750	11,764,654	13,026,369	10,753,695	8,645,804
From Central Government to Communes	200,000	804,000	2,125,440	2,106,000	2,212,000	2,300,000	666,667

Source: General Affairs and Finance Section, Ministry of Water and Sanitation

As shown in Table 12, 70% to 80% of the budget for the project of the water sector have been covered by the budget from development partners (international organizations such as the AfDB, bilateral aid agencies, etc.). In addition, as shown in Table 13, budget allocation from the central government to regions and communes has been also implemented on the basis of the project budget of development partners. The regional office of the Ministry of Water and Sanitation implements projects by selecting suppliers and consultants to outsource the projects such as facility construction and soft components. However, the budget is not credited to regional offices and the payment to these suppliers and consultants is made from the central government. The budget for communes (subsidy) has been used in the renovation of the

[31] FCFA is the currency of Burkina Faso. 1FCFA = around 0.18 Japanese Yen (as of June 2016)

existing level I and level II water supply facilities.

As mentioned above, the water sector in Burkina Faso is largely dependent on the funds of development partners. In addition, the operation and maintenance costs of existing rural water supply facilities are borne by water users. According to the results of site survey at the time of field study, the amounts collected as the water usage fee varied depending on the number of water users of the facility[32]. The site variations were also seen from facility to facility in setting usage fees, such as an additional charge for water use for livestock, an additional amount charged for users that use a large quantity of water for brewing alcoholic drinks, setting charges taking into consideration the status of the agricultural harvest of that year, etc. It should be noted that, according to the beneficiary survey for CPEs, the water usage fee collection rate was 85.9% on average. CPEs or facility managers collect water usage fees from water users of each facility, and pay the AUE the amount of money defined by the respective AUE. If there is a surplus generated, the money is managed by each facility and used for purposes such as maintenance and minor parts replacement. Although water usage fee is collected on a pay-as-you-go basis at some sites, most of the sites conduct a flat rate system because there is no function to measure the quantity of water used by each water user in the facility itself and there is no full-time caretaker at the facility.

In the financial aspects of the operation and maintenance, although no major problem is seen in the current water usage fee collection, it is determined that there are some challenges of financial sustainability. This is because of the high reliance on donor funds and weak financial and personnel systems in the communes, where many of them are still without a department in charge of water supply and sanitation even though they are the implementing body of the rural water supply.

3.5.4 Current Status of Operation and Maintenance

The condition of the facilities was favorable due to cleaning by water users (cleaning within the facilities and prohibition of entering with shoes on, etc.) and tidying up around the facilities (laying sand and gravel and providing hedges). In order to maintain a hygienic environment around the wells, a certain distance (8.5 m) is maintained for the livestock watering place so that livestock do not gather around the wells; thus, no problems regarding hygienic aspect due to livestock were observed. The seepage pits are also installed for final drainage, so that the wastewater seeps underground, and water does not accumulate around the facilities. Although it was not possible to check the inspection and repair records, the operation rates of the facilities are

[32] In the interviews during the site survey the most common reply was that the scale of the users is about 300 to 500 users, but some replies indicated 600 or more users. The amount of water usage fees collected varied at each well, the amount being charged in household units, or charged separately for men and women, etc. Common replies regarding the annual water fee in the case of a household was 1,000 FCFA or more, and when charged separately for men and women was 500 to 1,000 FCFA for men and 250 to 500 FCFA for women, etc.

high. Therefore, it is judged that appropriate operation and maintenance is being carried out.

In light of the above, although the current situation of operation and maintenance of the project is favorable, some minor problems have been observed in terms of the future system and the finance status. Therefore, the sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project was implemented for the purpose of contributing to the improvement of the livelihood environment of the residents in the target areas in Burkina Faso, namely, three provinces in Central Plateau Region and three provinces in South Central Region, through reliable access to safe drinking water by constructing deep wells with hand-pump facilities and developing the operation and maintenance system of the facilities.

The project was consistent with the development policies and development needs of Burkina Faso both at the time of project planning and ex-post evaluation. The Japan's ODA policy for Burkina Faso at the time of planning also matched the objective of the project. Therefore, its relevance is high. Although the project cost was within the plan, the project period became longer than planned. Therefore, the efficiency is fair. The target for the population supplied with water by the project that was set at the time of planning was achieved, and the operation rate of constructed deep wells with hand-pump facilities is high. In addition, the amount of water used by the users has increased, and water-borne diseases have been reduced by improving the water quality and the awareness of hygiene. It was also confirmed that women's working hours and children's school hours have been increased through the reduction of water fetching labor. Therefore, the effectiveness and impact of the project are high. There are some problems in the system and the financial condition of the operation and maintenance; thus, sustainability of the project effect is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

・Strengthening of staffing and budget allocation to communes, which will be a cornerstone of the REFORME progress

Capacity development plans such as strengthening of staffing and implementing trainings, etc. are an urgent task for the communes as an implementing body of rural water supply projects. Also, it is required to strengthen the allocation of budget to the communes so that personnel of the communes can listen to opinions of residents, visit the sites, and, if necessary, carry out surveys.

・Establishment and implementation of appropriate monitoring and evaluation in relation to AUEs by communes

It is important that the communes promote the REFORME by carrying out monitoring of activities of AUEs that are their contractors, checking the status of collection of water usage fees, dealing with problems such as villages that refuse maintenance activities of water supply facilities by AUEs. When necessary, it is also crucial that the communes visit villages and have discussions with AUEs or village residents, etc.

・Formulation of a communication and advocacy strategy for the REFORME

For the REFORME to be promoted further in the future, it is necessary that a communication strategy for raising the awareness of the residents be formulated in order to widely familiarize the actual water users with its significance and advantages. An advocacy strategy is also required for the leaders and those involved in the communes as implementing bodies of government, so that they will recognize the importance of water supply projects.

4.2.2 Recommendations to JICA

・Implementation of training programs in collaboration with the technical cooperation project relating to the REFORME promotion and facilitating cooperation with the Japan Overseas Cooperation Volunteers (JOCVs)

Along with the technical cooperation projects, implementation of human resource development at the target sites of the project will also contribute to sustainability of the facilities supported by the project. In particular, personnel development has not been carried out for communes, even though they are the implementing body for water supply projects in rural society so it is considered that training based on promotion of the REFORME should be implemented, such as strengthening of management capability, strengthening of mutual learning mechanisms between communes, etc. Also, Japan has been providing assistance in rural water supply not only to Burkina Faso but also to other neighboring countries. Therefore, implementation of a third-country training can be considered for the staff of DGEP and the regional offices as the implementing agency to obtain related knowledge and learn lessons from other countries[33] promoting the same operation and maintenance system. In addition, as stated in the recommendations to the implementing agency, monitoring is

[33] As an example of Tanzania, the formation of the independent residents' operation and maintenance organization from traditional authority such as the village council has been promoted, and water users associations and water user groups by community elections have been formed. In an example of Japanese grant aid project in Tanzania, there is an area where one water management committee implements the operation and maintenance of more than one well with hand-pump facilities. In an example in Senegal, for a level II water facility, operation and management is being implemented by a water management association of which internal regulations or articles of incorporation were created and reported to government agencies by elected committee members. (Source: "Challenges and Lessons Learned from the Operation and Maintenance of Rural Water Supply Facilities in Sub-Saharan Africa" JICA Project Research Report, 2010)

important for promoting the REFORME. However, the REFORME can also be supported by constructing a system (computer program) for collecting information and accumulating indicators, and, dispatching the Japan Overseas Cooperation Volunteers (JOCVs) to raise awareness of the residents on site in accordance with the communication and advocacy strategy. It is considered that this will have the results of contributing to the maintenance of the facilities supported by the project.

4.3 Lessons Learned

Importance of selecting appropriate implementation sites where favorable maintenance will be continued and the operation rate will be high in the future

The facilities supported in the project are well maintained and have high operation rates. This is because evaluation criteria were used in addition to water source and water quality surveys when the target sites were being short-listed from the candidate sites proposed by the Burkina Faso side. The evaluation criteria were the following 10 items; 1. Rate of water supply in the village, 2. Rate of water supply according to quartier, 3. Willingness to pay water usage fees, 4. Health and Hygiene, 5. Distance to water source, 6. Rural society's development priority (development demand from villages for water supply), 7. Operation and maintenance capacity (operation rates for existing hand-pumps), 8. Hydrogeological conditions, 9. Priority of the implementing agency, and 10. Influences on the construction process (access of large vehicles and excavating machinery to villages). Scores were allocated to each of these evaluation items for selecting the sites. Scores[34] were weighted down from evaluation item 1, so sites were selected in the order of severe difficulties in water supply (= necessity) or with willingness to pay water usage fees by residents. After the construction, residents would continue maintenance of the facility with ownership, so the operation rate would be high. It is considered that keeping maintenance after construction and operation rates in mind, the selection of the sites for implementation as such will lead to the effectiveness of the project. It is also considered that these evaluation items contribute to the implementation of projects in line with the objectives by taking into consideration the allocation of more points according to the objective of constructing the facility and policy and strategy.

Selection of appropriate management entity of facilities (wells) and capacity building

The facilities supported in the project are well maintained and have high operation rates. One

[34] Weighted scoring of each evaluation item is following: 1. Rate of water supply in the village (x10), 2. Rate of water supply according to quartier (x10), 3. Willingness to pay water usage fee (x7), 4. Health and Hygiene (x5), 5. Distance to water source (x5), 6. Rural society's development priority (x4), 7. Operation and maintenance capacity (x4), 8. Hydrogeological conditions (x3), 9. Priority of the implementing agency (x1), 10. Influences on the construction process (x1). Regarding the weighted scoring of "7. Operation and maintenance capacity", it has a slightly lighter scoring as there is a possibility of force majeure even if existing hand-pump is not running, such as well structure, water quality and aging of pumps which are not related with operation and maintenance by residents.

reason for this is considered to be the selection of management entity with a focus on the operation and maintenance system for the constructed water supply facility, and the implementation of the capacity building. In the capacity building of the project, the emphasis was placed on the maintenance of each well, and the establishment of CPEs and strengthening organizations was supported so that maintenance would be firmly implemented for each well. In relation to the maintenance of the rural area water supply facilities in the past, the status of maintenance varied for each well, and, many of the CPEs were dysfunctional, water usage fees were not collected, breakdowns were not dealt with, and there were insufficient awareness on issues on the maintenance system. This was because there was insufficient participation with ownership by the residents when forming the CPEs, and the necessary information and trainings were not provided to those involved, in particular the members of the CPEs. Therefore, in the capacity building, technical support was provided to create motivation in the organizations for operation and maintenance, and to strengthen the organizations when forming the CPEs. It is considered that appropriate selection of management entity and implementation of the capacity building have contributed to the stable operation and maintenance of the facilities.