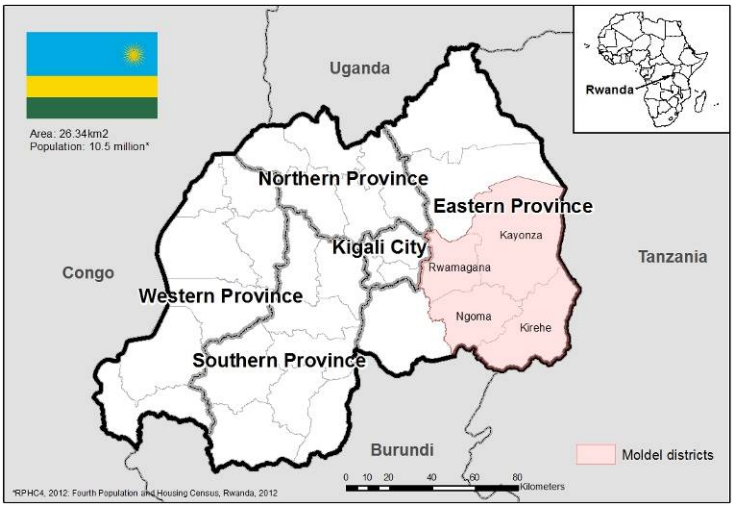
Project for Strengthening Operation and Maintenance of Rural Water Supply Systems in Rwanda

June 2018



Project Area（4 model district in Eastern Province）

1. Background of the Project and Issues

1.1 Background of the Project

The government of Rwanda (hereinafter referred to as "GoR") has set the mid- to long-term national development programme "VISION 2020" and set the target to provide full coverage of safe drinking water to all its population by 2020. Afterwards, the GoR brought forward the said period in the Second Economic Development and Poverty Reduction Strategy (EDPRS 2) to 2017/2018 to set as top priority in the national target. The national average rate of access to improved drinking water source was 83.7% as of 2014 according to the Fourth Integrated Household Living Conditions Survey 2013/14 (EICV4). But it is considered that the actual rate of access to safe water is much less than the statistical data. It was estimated in 2015 that only 63.8% of the total numbers of water supply systems were functioning. One of the reasons why the rate of functioning is very low is the weakness of framework for the operation and maintenance (hereinafter referred to as "O&M") of water supply facilities.

The GoR transferred ownership of the rural water supply facilities, including the responsibility for O&M of these, to the districts in 1987. With the introduction of Public-Private Partnership (hereinafter referred to as "PPP") in 2004, the O&M system of the rural water supply facilities has shifted from community-based management (hereinafter referred to as "CBM") to the delegated water management by Private Operators (hereinafter referred to as "POs").

However, since the lack of capabilities of POs and budget for the rehabilitation for rural water supply facilities, there have been a lot of cases where rural water supply services were stopped without proper rehabilitations once facilities and/or equipment such as public taps and pumps, etc. were damaged. Moreover, the districts lacked the technical and managerial capacities for the supervising of the PO's.

Under this circumstances, the GoR has established the Department of the Rural Water Supply and Sanitation Services (hereinafter referred to as "RWSS") in the Water and Sanitation Corporation ("WASAC") in 2014 to ensure the sustainable framework for rural water supply services and has strengthened the support system for the rural water supply project by the districts.

However, further strengthening of the WASAC/RWSS, and strengthening of the districts and POs in organizational, technical and financial aspects are an urgent issue in order to achieve a safe water supply to all populations at an early stage; ensuring that policy directions for improving the sustainability of rural water supply services will be steadily implemented and functionality rate of the water supply facilities will be improved.

1.2 Key Challenges in the Management of the Water Supply Services for Rural Water Supply

Specific issues and problems to be addressed in the management of rural water supply services were identified based on the results of the baseline survey conducted in 2015.

Challenge 1: Weaknesses of the current O&M framework for rural water supply

Challenge 1-1 : The role of each actor in the O&M framework was not clearly stated.

In Rwanda, since the introduction of the delegated contract management under PPP in 2004, organizational restructuring has been done repeatedly. In April 2015 when the "Project for Strengthening Operation and Maintenance of Rural Water Supply Systems in Rwanda (the Project)" was started, a general framework for delegated contract management by the district and POs under the technical assistance of WASAC/RWSS was being determined. However, there is no national guideline which summarizes the specific roles and functions of each actor related to rural water supply services so that the recognition of this management model was not disseminated at the same level nationwide.

Challenge 1-2 : Selection method of POs with high transparency was not established.

Regardless of the type of water supply facilities including difficulty of management, various organization such as individuals, cooperatives, associations, companies were working for the O&M of the rural water supply facilities in the districts. A transparent method for procurement of POs was not established. Also, selection of POs in the low profitable areas has become difficult.

Challenge 1-3 : Poor contract management

(1) Unclear responsibilities for facilities maintenance including major rehabilitation and replacement

Since the responsibility for facilities maintenance especially major repair and/or replacement was not clearly defined, immediate repair was not implemented during facility breakdown.

(2) Inappropriate delegated contract period

The contract period was widely set up from 1 year to 5 years. If the contract period is short, POs may be subject to risk that profit cannot be secured. This might be a barrier to entry for new PO's.

(3) Standardization of daily monitoring system

Service levels were not being monitored in the delegated contract because the monitoring items of the water supply services and their standards were not stipulated. Also, feedback and evaluations to PO's were not consistently implemented by the districts. Due to that, management data was not systematically accumulated.

Challenge 1-4 : Insufficient management of financial resources for maintenance and repair of facilities

(1) Calculation method for royalties was unstructured.

Since the method of calculating the royalties for the delegated contract differs depending on contracts, it was uncertain and unfair to the PO's. Moreover, management of royalties was complicated because it was individualized for each contract with the PO.

(2) Inadequate management of royalties by districts

There was only one management account for the revenues and expenditures of districts, so the royalties for the water supply services were mixed with other revenues from other sectors. As a result, the royalties became a general revenue source, and many cases were expended for other purposes within the one fiscal year. So the budget from royalty fees was not utilized adequately for water and sanitation services by a district.

Challenge 2: Undeveloped practical water quality management framework for rural water supply services

(1) Undeveloped practical water quality management framework for rural water supply

Drinking water quality standards have been set uniformly by the Rwanda Standards Board (RSB), regardless of urban or rural water supply. However, at the present moment, most POs do not have the capacity to directly analyze the water quality and evaluate its safety. Also, from the viewpoint of securing the reliability of water quality analysis, it is necessary to build a practical framework for water quality management of the rural water supply.

(2) Insufficient water quality management skills by PO's

Coliform bacteria which is harmful to human health was detected in 36 (detection rate: 52%) of the water samples collected at 69 water supply systems in the four model districts.

While, residual free chlorine was detected only from 2 water samples (detection rate: 12%) out of 17 samples having chlorine disinfection facilities.

Challenge 3: Insufficient practical abilities to manage the water supply facilities appropriately by the districts, PO's and Water Users Committees (WUC's)

Practical abilities for the management of the water supply facilities by the districts, PO's and the Water Users Committees (WUC's), which mainly take the initiative for management of point water sources such as boreholes with hand pumps and improved springs at the community level, were insufficient. Moreover, a framework for sustainable human resource development was not established systematically.

Challenge 4: Lack of water supply facilities information such as inventory data and water supply maps

Inventory data, which include specifications of the facilities and equipment, position data, etc. and mapping data for the pipe network was not developed. Also, basic data like as-built drawings was not owned by the district. For this reason, public investment plans including budget and financial plans were not formulated properly to include new facilities, rehabilitation, replacement of existing facilities and equipment, or expansion of the water supply systems.

Challenge 5: Undeveloped data sharing and management system between central and local level

Data management by WASAC/RWSS is not fully systematized within the organization unless each officer individually managed it. Thus, various valuable data, reports, drawings, etc. created by many projects were not used efficiently and effectively.

Challenge 6: Necessary equipment for water supply services was not installed in the existing water supply facilities.

(1) Lack of the water meters and/or flow meters

Water meters (flow meters) necessary for water distribution measurement were not installed at 66 water supply systems (92% of the total) out of 69 in the four model districts.

(2) Lack of disinfection facilities for chlorination

Disinfection facilities for chlorination were not installed at 53 water supply systems (75% of the total) out of 69 in the four model districts.

2. Approach to Solution

2.1 Outline of the Project

(1) Overview of the Project Framework

The outline of the implementation of this Project is as follows.

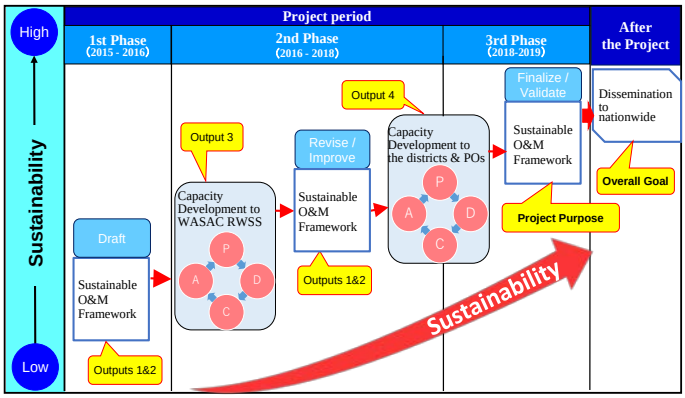


Figure 1：Overview of the Project Framework

Table 1：Framework of the Project

Overall Goal：Sustainable framework for the operation and maintenance of rural water supply systems is implemented in Rwanda.
Project Purpose：Sustainable framework for the operation and maintenance of rural water supply systems in Rwanda is established.
Output 1: Effective and sustainable institutional framework for the operation and maintenance of rural water supply systems is developed.
Output 2: National guidelines and manuals necessary for operation and maintenance of rural water supply systems are developed.
Output 3：The capacity of WASAC-RWSS to support the Districts in their operation and maintenance of rural water supply systems is developed.
Output 4：The proposed operation and maintenance framework is improved through testing in the four model districts from the Eastern Province.

(2) Implementation structure of the Project

This Project has established three forums; the Steering Committee (SC), the Project Implementation Committee (PIC), and the District Forums (DFs) in the four model districts for the implementation of the Project.

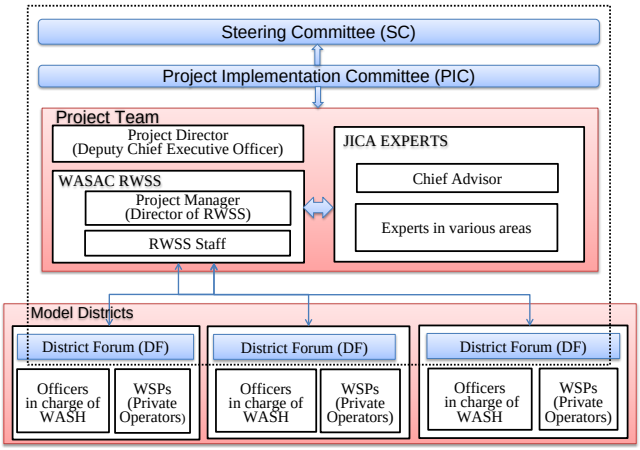


Figure 2：Implementation structure of the Project

2.2 Approach to Solutions of Key Challenges

The Project is implementing activities with the following approaches to solve issues identified above.

Approach 1: Elaboration of current O&M framework for the rural water supply facilities

1.1 Elaboration of mandates of each actor in the O&M framework for rural water supply facilities

(1) Document tree of the important documents related to rural water supply services

The policy directions of rural water supply services in Rwanda are indicated in the National Water Policy revised in December 2016. Specific documents such as the regulation on water services licensing and regulations on minimum required service level for water service provision, were developed by Rwanda Utilities Regulatory Authority (RURA). Therefore, the Project concentrated on developing "National Guidelines" which cover the sustainable O&M framework for rural water supply facilities including the policy directions and existing regulations in the existing documents mentioned above. In addition, the Project also decided to develop a "Technical Support Manual for the Rural Water Supply Project" which includes the roles of each actor and activities in all project cycles. The document tree of existing and developing documents by the Project is shown below.

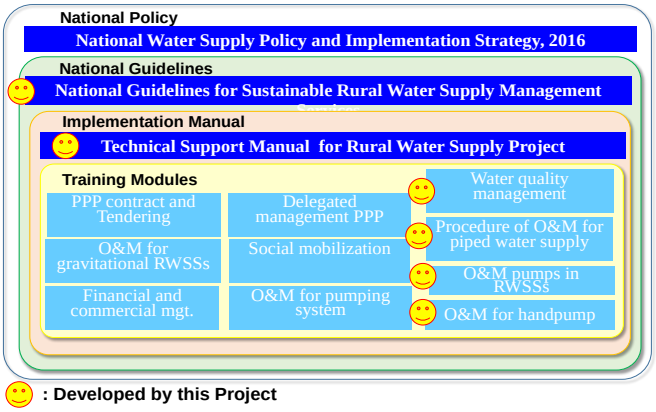


Figure 3：Document tree of the important documents related to rural water supply services

(2) Development of the "National Guidelines for Sustainable Rural Water Supply Services (RWSS)"

Based on the position and purpose in the document tree mentioned above, "the National Guidelines" were composed of the following contents:

Table 2：Contents of the "National Guidelines"

➢ Policy and Legal Framework
➢ Institutional Framework for Water and Sanitation Sector
➢ O&M Framework for Rural Water Supply
➢ Planning for O&M
➢ Public-Private Partnership (PPP) Approach in Water Services
➢ Water Quality Management
➢ Monitoring and Evaluation (M&E)

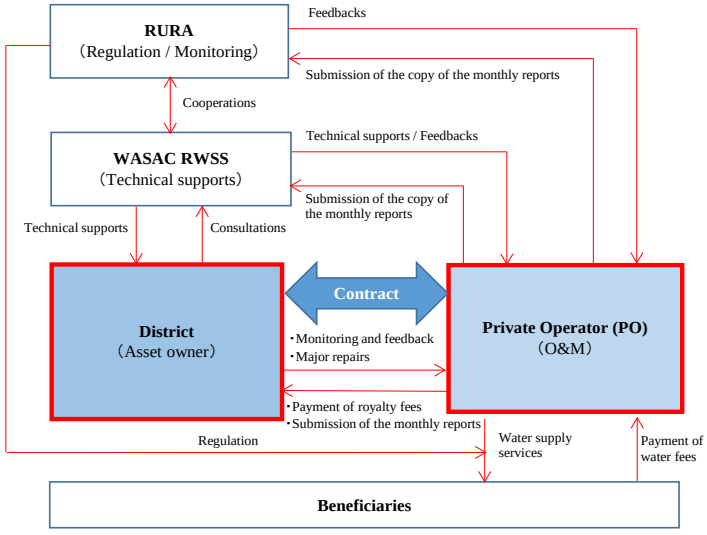


Figure 4：Roles of the main actors for O&M framework for rural water supply systems under PPP

(3) Development of the "Technical Support Manual for the Rural Water Supply Project"

The contents of the "Technical Support Manual for the Rural Water Supply Project" was organized based on the business

cycles currently being implemented in Rwanda. For this reason, extracting the necessary tasks, and responsible and/or supporting organizations in the project cycles were done by the joint task teams organized with C/P and JICA experts. Overview of the manual contents is shown below.

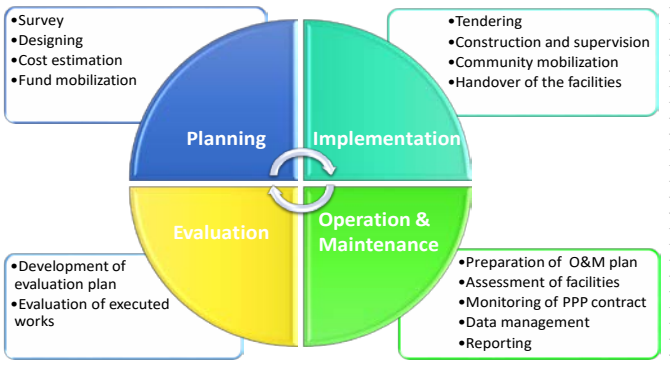


Figure 5：Contents of the "Technical Support Manual for the Rural Water Supply Project"

1.2 Enhance methods for selecting professional PO's

The Rwanda side led the efforts to improve the selection system for professional PO's. Thus, the Project focused on the finalization of the model tender document. The outline of the efforts for this issue is shown in the table below.

Table 3：Outline of efforts to improve the selection system of professional PO's

Contents	Implemented by	
	Rwanda	Project
Establishing water services licensing system of professional PO's	✓	
Setting of attractive business areas for rural water supply services (clustering)	✓	
Finalization of the model tender document	✓	✓

(1) Finalization of the Model Tender Document for selecting professional PO's

The Project and C/P reviewed the draft model tender document (French version) which was developed under the support of the Water and Sanitation Program (WSP) in 2013. The contents were improved to align with the current Rwanda procurement process. At the same time, an English-language version of this document was also developed. However, further revision is necessary in the future to adapt to the e-procurement system which was established by Rwanda Public Procurement Authority (RPPS) in 2017.

1.3 Exhaustive strengthening of contract management

(1) Finalization of Model Delegated Contract

The model delegated contract (French version) was drafted with the support of WSP in 2013, as was the model tender document mentioned above. In 2016, this contract was reviewed by WASAC and RURA and new articles, such as the involvement of WASAC as a Witness, mandatory to the water quality management by PO's etc. were entered into the contract. However, since new notices such as the standard rate of tariff's and royalties for the rural water supply services under PPP were instructed by RURA in January 2017. It was necessary to revise the model contract to reflect these notices. The Project, therefore, supported this work. The main provisions of the finalized model contract are as shown in the table below.

Table 4：Key Articles in the model delegated contract

Article 1. Object of the contract: The PO has a responsibility for managing the water supply systems, improved springs and borehole with hand pump recorded in the sectors in which the state transferred the property to the District
Article 4. Daily management of contract: The daily management of this contract will be ensured by the engineer in charge of water and sanitation infrastructures in the District, with assistance of the unit in charge of the delegated management of water services (Delegated Water Management) within rural water services department of WASAC
Article 5. Reference Documents for the Contract: License by RURA、Water tariff (as fixed by RURA), etc.
Article 14.1. Compliance with laws and regulations governing the provision of water services: The Private Operator must comply with the laws N0 01 / RURA / 2013 suggesting the minimum service level required for the provision of water services and No. 002 / RB / WAT-EWS / RURA / 015 23/09/2015 governing water distribution services in Rwanda developed by RURA
Article 11. Duration of Contract: a period of five (5) years
Article 19. Duties of the Private Operator for reporting: The Private Operator is required to prepare and send the following operating reports to the District with a copy to WASAC and RURA.
Article 21. Obligations of the District: Manage renewal and extension funds in accordance with its purpose and procedures defined in Title VI in the interest of the population. In particular, account for the royalties should be opened in the national bank of Rwanda
Article 24.2. Renewal and extension funds: The District manages the renewal and extension funds to cover the infrastructure renewal, reinforcements or large scale extensions of water infrastructures to improve the service and/or to expand access to new users, bank charges and operating costs of the District WASH Board.

Source: Model delegated contract, WASAC, March 2017

(2) Development of monthly report format for daily monitoring by the PO's

The monthly report format was finalized with C/P and RURA in 2017 to standardize a series of tasks for PO's on the recording and storage of daily management status of the facilities. The monitoring items, feedback and submission process of the monthly report is as follows.

Table 5：Monitoring items in the monthly report

General data： List of water supply facilities with status, List of staff of PO, List of purchased material and equipment
Technical data： Operation record（production volume, water purification amount, Water distribution）, Water quality record, Repair record
Commercial data： Water supply rate, number of customers, accounted-for water, non-revenue water, number of customers for billing, number of defaulter, number of complaints
Financial data： Revenue, expenditure, direct profit, net income

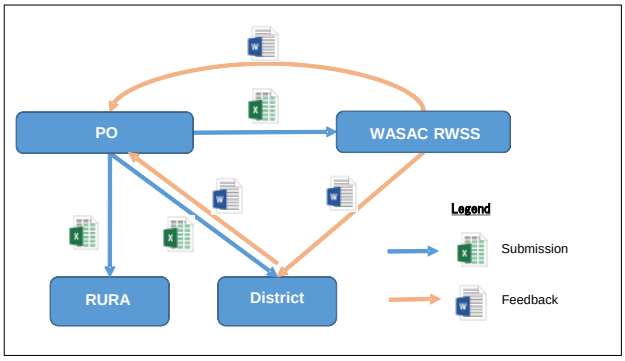


Figure 6：Process of submission and feedback of monthly reports

1.4 Ensure maintenance funds for major problems and management methods for these funds

The Rwanda side led the effort to secure financial resources and management methods for these funds. Thus, the Project focused on the monitoring activity of whether the royalty fees are properly used, or not, by the water supply services of the districts.

Table 6：Outline of the efforts to secure financial resources and management methods for these funds

Contents	Implemented by	
	Rwanda	Project
Open bank account only for water and sanitation services by each district	✓	
Standardization of calculation method of the royalty fees	✓	
Monitoring of the financial management of the royalty fees	✓	✓

Approach 2: Develop a practical water quality management framework for rural water supply services

(1) Develop a practical water quality management framework for rural water supply services

The Project, with C/P, decided to build a practical water quality management framework based on the following three principles and to carry out a feasibility study to measure the practical framework against the current environment in rural water supply systems.

Table 7：Three principles of practical water quality management framework for rural water supply.

Reliable：Water quality analysis shall be carried out by independent third parties at least twice a year.
Realistic：Setting the minimum parameters (14 parameters) for the water quality monitoring
Responsible：Cost for the water quality analysis shall be covered by the water fees from the users.

The water quality monitoring process including the roles of the main actors in this framework are as shown in Figure 7 below.

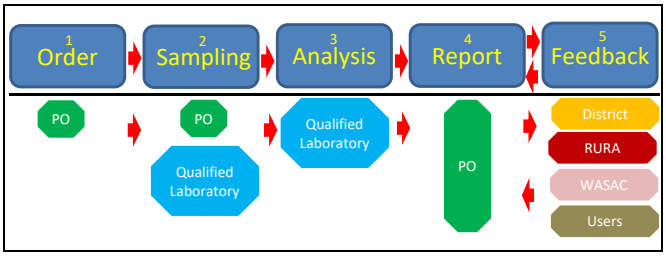


Figure 7：Process of the water quality monitoring

(2) Enhance management capacity for residual free chlorine by PO's

Training courses were created to strengthen capacity of trainer's skills by C/P and to develop the practical skills of the daily water quality monitoring conducted by the districts and PO's. Training modules were developed, especially in relation to the management of residual free chlorine, which is important in the day-to-day water quality monitoring.

Approach 3: Improvement of the water supply facilities management capacities of WASAC RWSS, the districts as asset owners, WATSAN officers as asset managers, and POs to be more practical

(1) Enhance support systems for implementation capacity of the districts and POs by WASAC/RWSS

Capacity development (CD) for the C/P adopted three methodologies such as, individual training, on the job training (OJT) and, co-working with JICA experts, so that both aspects of knowledge and skills for technical support to the districts and PO's were strengthened.

Table 8：Methodologies of the CD for C/P

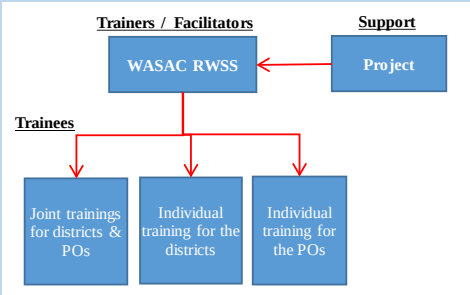
Abilities	Contents
Expertise	To master the knowledge necessary for implementing all cycles (planning, implementation, O&M, evaluation) of the rural water supply project.
	The process of document development was adopted as part of the technology transfer to C/P. JICA experts transferred know-how and necessary knowledge related to document development through joint working for strengthening C/P's capabilities.
Teaching	WASAC RWSS needs to be trained periodically as

Abilities	Contents
skills	national trainers and/or facilitators to sustain the capacity building for the district officers and PO's in the current conditions. For this reason, all training of instructors in the Project was facilitated by the C/P to improve lecturer skills by repeated opportunities for lecturing experiences.

(2) Enhance practical ability for contract management by the districts and PO's

In order to promote the contract management model by PPP, it is essential to strengthen the management capacity of the districts and PO's. The Project focused on improving their practical skills through various training.

Table 9 : Implementation structure to enhance the practical abilities of the districts and PO's

Required capacity	Enhance practical ability for the contract management
Implementation structure	

(3) Develop training modules and materials

In the Water Sector of Rwanda, six training modules for the CD's of the districts and PO's were already developed through the FEPEAR support project (December 2015) funded by the EU. This Project, therefore, focused on the development of training materials by prioritized areas that need to be strengthened by the districts and PO's, without duplication of the existing modules. Based on the characteristics of the training contents, the training materials were developed in various formats, such as text, and/or digital materials like video manuals through YouTube.

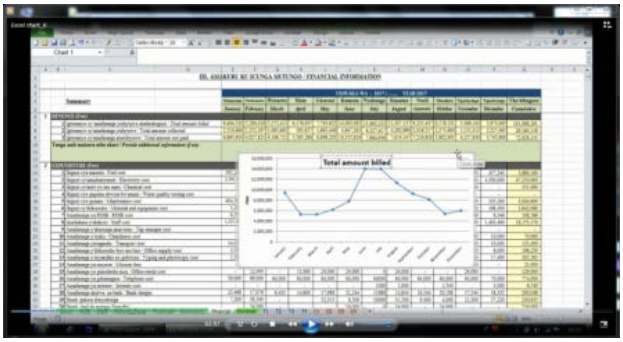


Figure 8 : Screenshot of video manual for creating graphs by MS-Excel using monthly report data for the districts and POs

Approach 4: Develop an inventory data of water supply facilities and water supply mappings

(1) Develop an inventory data of water supply systems

Development of an inventory data for water supply facilities needs to be rolling out nationwide through WASAC RWSS. The Project examined various approaches with minimum cost for data development. As a result, a Project Assistant had responsibility for field data collection through cooperation with the PO's and created a data profiling of water supply facilities. An outline of the attributed items in inventory data is shown in the table below.

Table 10 : Outline of the attributed items in inventory data

Target facilities	Water source, Public tap, Water kiosk, Reservoir tank, Pumping station, Washout chamber, Air valve chamber, Valve chamber, Starting chamber, Collection chamber, Break pressure, Pipeline
Attribute data	Functionality (Fully functional/Partially functional/Abandoned), Construction year, Year of rehabilitation, materials, specifications of the facilities, type of the facility, No. of users, Location data
Outputs	・GIS mapping of the water supply systems ・Inventory data of water supply facilities by MS-Excel

(2) Expand user access to water supply mapping data via the internet

Developed mapping data needs to include conditions such as easy access, easy operation and low operation cost, in order to disseminate and use data widely by end users like districts and PO's on a daily basis. In an attempt to do this, Web-GIS map was developed using open GIS software and Amazon's cloud service as trail version in 2017.

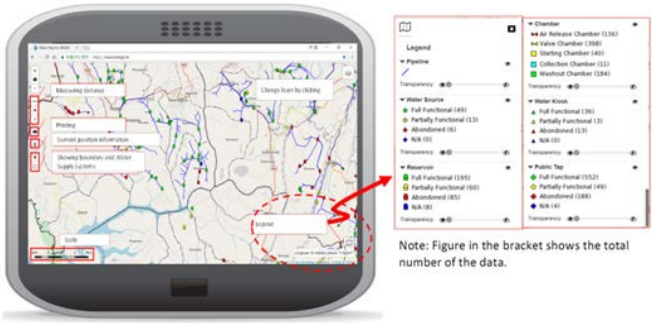


Figure 9 : System image for the trial version on smartphone

(3) Develop an O&M manual for each water supply system

In 2016, a guide document for O&M of water supply systems, including daily monitoring, asset management and future plan for the replacement of facilities etc., was finalized by SusWAS

project, funded by the EU. This O&M manual is effective not only for checking and managing daily facilities, but also for mid- and long-term planning for repair and replacement of facilities. The Project with C/P decided to undertake the development of the O&M manual for 70 water supply systems, which are being managed by PO's in the four model Districts, using inventory data developed by the Project.

Table 11：Contents of the O&M manual

➢ Introduction
➢ General information
➢ Description of water supply system
➢ Assets
➢ Service quality
➢ Operations
➢ Maintenance
➢ Non-revenue water (NRW)
➢ Operating cost
➢ Reporting
➢ Monitoring

(4) Develop the database for point water sources

Since about 50% of households still utilize point water sources like boreholes with hand pumps and improved springs in rural areas of Rwanda, improvement of the O&M framework for point water sources were also required. For this reason, the Project developed a database for point water sources using baseline data and upgraded the aforementioned Web-GIS map to add the operational status for point water sources in the model districts.

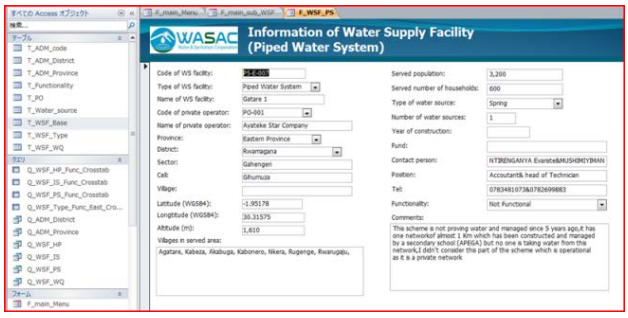


Figure 10：Screenshot of database for point water sources in the four model districts

Approach 5: Develop data sharing and management system

Regarding data management and sharing methods within the organization, it is common for each staff member to access the shared server for data saving, and to periodically back up data by the server administrators. However, the disadvantage of this method is the initial cost of purchasing the server and maintenance costs once the server is in place. Additional costs would include antivirus measures and regular backup.

As a means for solving this issue, the Project introduced to C/P a data sharing method of an online storage service (cloud service) provided by Google. It was decided to use this storage service experimentally in the Delegated Water Management (DWM) Unit, RWSS of WASAC in 2017.

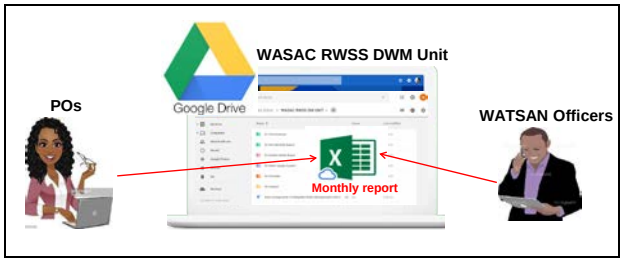


Figure 11：Image picture for data sharing by Google drive

Approach 6: Promote installation of the necessary equipment like water meters and disinfection facilities for O&M of existing water supply systems

Implement pilot construction for the installation of water meters and disinfection facilities by chlorination in the four model districts

Pilot works were carried out to simply and economically install water meters and disinfection facilities by chlorination at each model site in 2017. The aim of this pilot was to promote the necessary actions for installation of water meters and disinfection facilities for all water supply systems by WATSAN officers with support of WASAC/RWSS. WATSAN officers and C/P were expected to understand a series of installation processes through this pilot. Specific activities are shown in the Table below.

Table 12：Specific activities for the pilot construction

No.	Specific activities
1	Selection of the pilot sites (total eight sites)
2	Design and Cost estimation for the installation of the water meters and disinfection facilities
3	Procumbent works (Selection of the construction company and procurement of the equipment)
4	Construction work
5	Study tour of the constriction work for the districts, POs and WASAC branch offices
6	Consolidation of the all the documents of the series of design and cost estimation

3. Result of Approaches

Result 1: Elaboration of current O&M framework for the rural water supply

The situation concerning the contract management of the rural water supply systems in Rwanda has undergone a big change since the beginning of this Project in 2015. The current status of major elements in the O&M framework are as follows.

- **Annual downtime of the water supply systems:** The annual downtime of water supply systems managed by PO's in the four model district has been reduced from 28.7 days/system/year in 2015 to **20.0 days/system/year in 2018**.

- **No. of water supply systems managed by delegated contract:** **70 water supply systems** in four model districts are managed under delegated contract by the PO's now. (Note: In 2015 there were no PO's with licenses and 55 water supply systems were managed by PO's that had not licensed.)

- **Selection of professional PO's:** Only the PO's who have a license approved by RURA are able to provide O&M of water supply systems under delegated contract now. In 2015, there were 21 PO's to provide O&M services but this has been reduced to **5 POs with license in 2018**.

- **Adoption of the model contract:** **Ngoma and Kirehe Districts** in the four model districts are applying model contracts. (Note: No model contracts were available to Districts in 2015.)

- **Submission of monthly reports by PO's:** The submission rate of the monthly reports from PO's to the districts has been **achieved 100%** in the four model districts (national average is 50 to 70%).

- **Feedback on monthly reports by WASAC/RWSS:** Feedbacks on the monthly reports have been cascaded **to PO's by WASAC/RWSS**.

- **Status of opening bank accounts for the management of the water services:** **A bank account** for each model district **was established** at the National Bank of Rwanda with the assistance of WASAC/RWSS by October 2017.

- **Status of the payment of royalty fees:** The total amount of royalty fees paid by POs to the four model districts during the 6 months from July to December 2017 **is estimated about 3,310,000 Yen (25.5 million RWF / 29,300 US$).**

- **Fee collection rate from users:** The average water fees collection rate from April to December 2017 was **improved to 93%** from 81% at the baseline (2015) in the four model districts.

- **Status of funding for curative and preventive maintenance:** Responsibility for minor repairs of facilities is borne by the PO's in the delegated contract. **Responsibility for the major repairs is borne by the districts using royalty fees and other resources.** However, it takes time for budgetary measures to be approved by the district so, in many cases, PO's take over repair costs of the facilities and these are offset future royalty fees.

Result 2: Develop a practical water quality management framework for rural water supply services

(1) Develop a practical water quality management framework for rural water supply services

A series of work on water quality sampling, analysis, reporting and feedback was visualized through the feasibility study conducted by this Project in February 2018, from which further challenges became clear. In addition, the Project is still under examination of water monitoring costs. The Project's aim is for early finalization of the water quality management framework after discussions with RURA and other relevant institutions based on the results of the feasibility study.

(2) Enhance management capacity for monitoring of residual free chlorine by PO's

Management capacity for the residual free chlorine by POs have been improved after the trainings provided by the Project. Specifically, the detection rate of residual free chlorine in the water supply systems which was equipped with disinfection facilities in model districts has been greatly improved to 76% in 2017 from 12% at baseline in 2015 through capacity development activities of the Project.

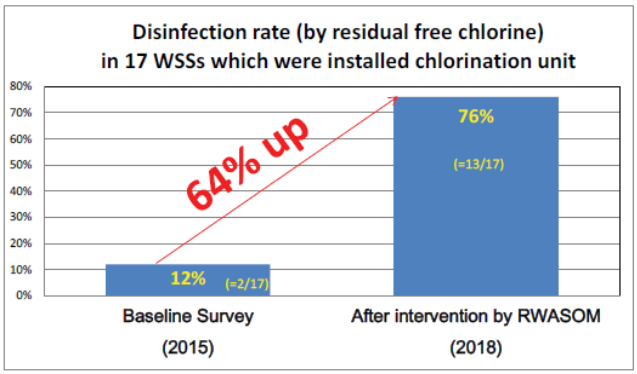


Figure 12 : Changes in disinfection management ability after trainings by the Project


Photo 1: Training on water quality management (left side), water sampling in the feasibility study on water quality management (right side)

Result 3: Improvement of the water supply facilities management capacities of WASAC RWSS, the districts as asset owners, WATSAN officers as asset managers, and POs to be more practical

(1) Enhance support system for the implementation capacity by WASAC/RWSS

The Project has held several trainings on the selected 11 themes based on the results of the capacity assessment for C/P. Approximately 98% of the participants evaluated that they were satisfied with the contents of the trainings.

Theme of the trainings	Cumulative number of the participants
11 themes	96 participants

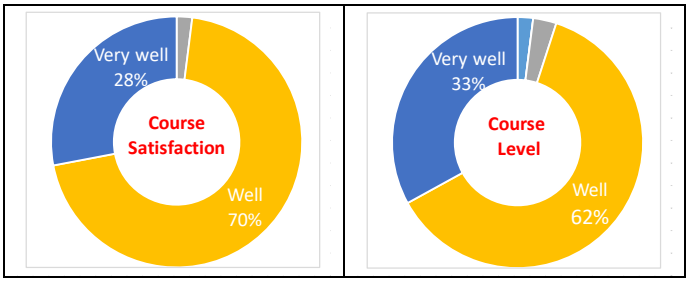


Figure 13 : Results on training satisfaction of participants from WASAC/RWSS

(2) Enhance practical ability for contract management by the districts and PO's

The Project has held several trainings on the selected 13 themes for the strengthening of the practical abilities of the districts and PO's. Approximately 89% of the participants evaluated that they were satisfied with the contents of the trainings. In the training activities for the model districts and PO's organized by the Project, participation rate of C/P as a trainer and facilitator was 95%.

Theme of the trainings	Cumulative number of the participants	Participation rate in training activities by the C/Ps
13 themes	384 participants	95%

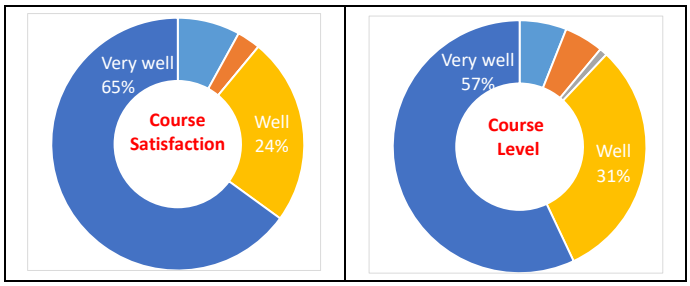


Figure 14 : Results on training satisfaction from participants from model districts and PO's

Photo 2 C/P conducted the training for the districts and POs staff

Result 4: Develop the inventory data of water supply facilities and water supply mappings

WASAC/RWSS has begun to create concept notes for government and development partners to apply the same approaches from this Project for the development of inventory data of the water supply systems nationwide.

- **Status of the development of water supply mapping data**: GIS maps and inventory data have been **developed for 100% of water supply systems** (70 systems) managed by the PO's under delegated contract in the four model districts.
- **Access to the Web-GIS map for the water supply systems**: **Anyone**, who can connect to the internet, **can access the Web-GIS map** for the water supply systems in the four model districts as a trial version.
- **Status of development of an O&M manual for each water supply system**: The creation of an O&M manual for the seventy water supply systems managed by the PO's has been started, and **six manuals have been completed by March 2018** (improvement ratio of the manual development: about 9%).

Result 5: Develop data sharing and management system

The DWM Unit of WASAC/RWSS has facilitated online storage services through Google Drive for data storage and data sharing of monthly reports updated by PO's. This has led to their business improvement, such as smooth data access and data sharing among the members.

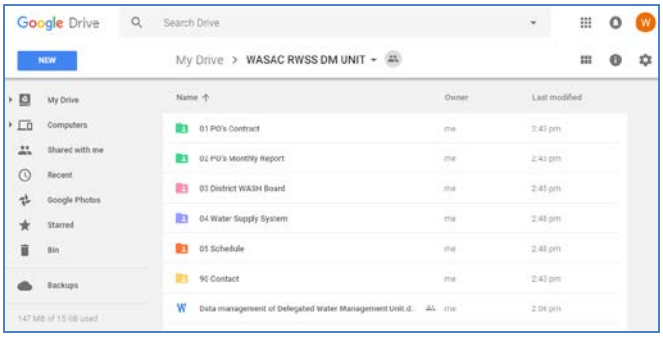


Figure 15：Screenshot of the Google drive of DWM Unit, WASAC/RWSS

Results 6: Promote installation of the necessary equipment, like water meters and disinfection facilities, for the O&M of existing water supply systems

As a result of promoting the installation of necessary equipment to all water supply systems to C/P and model districts, WASAC/RWSS investigated a number of the necessary water meters in the existing water supply facilities throughout the country, in 2017. In addition, due to low installation costs of disinfection facilities by chlorination through the pilot constructions, the ripple effect has been that both C/P and model districts show active motivation for dissemination of installation of equipment to all water supply systems in the model districts.

Photo 3 The disinfection facility installed by the pilot construction (left), a water meter (right)

4. Creative solution and Lessons learned

4.1 Project Management

（1）Organizing specialized team in collaborated with the JICA Experts and the C/P

WASAC RWSS has the four Units; O&M, Resources mobilization, Community mobilization, Delegated water management. In conducting the Project activities, each expert and Unit of the C/P have organized the four teams according to their expertise corresponding to activities. The effects are: 1) each C/P can perform within their level of expertise, and they feel rewarded by their activities to carry out works for each specialized field, 2) since all the units share their work, all C/P's have responsibilities for Project activities so that the effect of implementing the Project is increased, 3) professional members in specialized areas can efficiently carry out activities.

（2）Encouraging the C/P's initiative in meetings

As a measure to foster ownership by C/P's, they are continuing to perform as a facilitator or presenter in the various meetings in the course of the Project, such as Steering Committees (SC), Project Implementation Committees (PIC) and District Forums (DF), as they have since the beginning of the Project. C/P's have improved ownership for the Project, which contributes to sustainable development of the Project.

（3）Utilization of mailing list

C/P's are always busy due to daily operations and response to urgent tasks and it is difficult to implement regular meetings with the JICA experts team. The Project, therefore, has utilized the spare time of C/P's to share various information and discuss and make decisions. In addition, the Project has shared activity schedules and progress by e-mail every Monday to the C/P so that the activities of the Project can always be grasped. From the 2nd phase, the Project has further expanded the mailing list to WATSAN Officers and PO's in the model districts, WASAC branch managers in Rwamagana and Ngoma and JICA volunteers, and a good relationship with them has been fostered.

（4）Accumulation of knowledge for JICA Experts and C/P

In order to carry out activities efficiently within limited resources, progress and decisions by each expert are shared with other experts and the C/P Team in a timely manner, and all teams need to work in the same direction.

To support this effort, the Project has created a document database which functions as a bulletin board and is regularly updated with information and knowledge (especially decision making process and background) from each expert. This information is used as material for reflecting on activities at the various turning points.

4.2 Technical Aspect

（1）Utilization of applicable ICT Technology for Sustainability

This Project aims to disseminate nationwide the O&M framework which has been established through field tests in

the four model districts. However due to limitations on resources and the presence of various actors, it is necessary to satisfy low cost, simple and, as easy-to-understand, popular techniques as possible. The Project is trying to apply highly versatile technology such as free cloud storage and open source software (OSS) to develop the data management platform and Web-GIS maps for the water supply networks.

（2）Utilization of good practices for the management of water services by local governments in Japan

C/P training program was created with the aim of getting hints and awareness of problem solving techniques to issues that C/P are facing in Rwanda. Such techniques could be learned from the advanced cases and applicable technologies of water supply services and maintenance by the local governments of Japan, leading to better action planning. The following cases are identified best practices which could be implemented in Rwanda:

- Small hydropower generation harnessing unutilized energy in water facilities like residual water pressure, worked on by the Saitama City Waterworks Bureau.
- Consensus-building approach by local residents who are representatives of small water distribution areas (called "Water Supply Supporters") and have provided the feedbacks and suggestions for the strategies and plans related to the water supply services to the Yahaba-Town Waterworks Bureau in Iwate Prefecture on behalf of the beneficiaries.

4.3 Communication （Obtaining, sharing and dissemination of information）

（1）Involvement of stakeholders in the water sector

Since this Project aims to establish a sustainable O&M framework nationwide, the latest policies and strategies of the water sector can be obtained in a timely manner. The deliverables developed by this Project must be widely disseminated to stakeholders. The project is strengthening efforts to spread the Project outcomes nationwide through close communication with JICA Rwanda Office.

（2）Collaboration with JICA volunteers

The Project covers a wide area from the capital city, Kigali, (WASAC headquarters) to the four model districts in Eastern Province. However, within the limited resources of the Project, it is difficult to timely and accurately obtain information such as site conditions of the water supply systems, and point water sources and, business situations of the districts officials and communities. JICA volunteers (member of the Japan Overseas Cooperation Volunteers) are implementing grassroots activities in the target areas so that they are familiar with the latest situations on the sites, districts and communities. The Project regularly holds meetings with JICA volunteers to exchange opinions and challenges faced at ground-level, to test the outputs and deliverables developed by the Project and, to obtain their feedback. The Project has strengthened collaboration with JICA volunteers who are valuable advisors at grassroots level.

（Project duration： From April 20, 2015 to December31, 2019）

References：

1. Rwanda National Water Supply Policy Implementation Strategy; Ministry of Infrastructure; December 2016
2. Progress Report (No.1) on the Project for Strengthening Operation and Maintenance of Rural Water Supply in Rwanda; JICA / WASAC RWSS /Kokusai Kogyo Co., Ltd.; March 2016
3. Progress Report (No.2) on the Project for Strengthening Operation and Maintenance of Rural Water Supply in Rwanda; JICA / WASAC RWSS /Kokusai Kogyo Co., Ltd.; April 2018