

The Republic of Kenya
Athi Water Services Board

Pilot Survey for Disseminating
SME's Technologies for
Community-based Water Treatment &
Supply System Using Solar Energy

Summary Report

September, 2016

Japan International Cooperation Agency (JICA)

Wellthy Corporation

1. Background

In the Republic of Kenya (hereinafter referred to as “Kenya”), only 61% of all population has access to clean drinking water source (2011). Due to the population growth, it is expected that the amount of water resource per capita will decrease to 235m³/year by 2025 and thus, reserving clean water is the utmost issue. Those in the rural areas have no choice but to spend a few hours to gain domestic water from unhygienic puddles or surface water, causing waterborne diseases. On the other hand, urban areas are also facing water shortage because of rapid population growth. Water Service Providers (hereinafter referred to as “WSP”) who supply treated water from surface water sources are having problems in water treatment of highly turbid water in rainy seasons. As a result, it is becoming difficult for them to provide stable supply of safe and clean water. Therefore, as one of its developmental strategies, the government of Kenya aims to improve the water supply rate and to achieve the equal access to water sources.

However, the commercial electric power as the necessary infrastructure for water supply system is also severely restricted and water supply is frequently interrupted due to power shortage. The percentage of electrification in the rural area was 10% as of 2009, and even if the goals set for the Rural Electrification Master Plan (2009-2018) were fully achieved, it is predicted that the rate will barely reach 40%.

It was indeed revealed in the result of the Project Formulation Survey conducted by Wellthy Corporation (hereafter “Wellthy”) in 2013 that, as a means to solve rural electrification and water issues simultaneously, the business of utilizing water treatment and supply system operated by solar power was in high demand. In fact, Athi and Tanathi Water Services Boards (AWSB and TaWSB), whose jurisdictions cover districts around Nairobi, have expressed their desire to utilize the proposed product and technology to improve the water supply rates in rural areas.

2. Outline of the Pilot Survey for Disseminating SME’s Technologies

(1) Purpose

The purpose of this Survey is 1) to utilize a membrane filtration system (hereinafter referred to as “the System”) to remove impurities such as turbidity from river water that are not properly treated by the existing water works in Ruiru, a neighboring town of Nairobi, and to supply clean water for the target area, 2) to technically verify the applicability of the System in Kenya and 3) to develop and verify a business model of disseminating the System in Kenya.

(2) Activities

- Conduct a pilot survey on the technical performance of the System to verify that it can contribute to solving the development issues and to execution of the development policies in Kenya.
- Transfer the concept and technology on maintenance of the System to local staff, including those from the Counterpart Organizations, through training and seminars.
- Identify and survey other potential sites for installation of the System by organizing dissemination activities for local partners such as Water Services Boards (WSBs), private enterprises, NGOs,

community based organizations etc.

(3) Information of Product / Technology to be provided

The proposed product is Community-based Water Treatment & Supply System Using Solar Energy.

By combining pressurized membrane filtration technology and pre-treatment process, it removes impurities, virus, bacteria, chlorine-resistant protozoan pathogens, iron, and manganese effectively. Compared to the conventional water treatment system, the System is space-saving and its operation is fully automated except for refilling of chemicals.

As for the power supply, if combined with a solar power generator, it is possible to operate for certain hours without sunlight owing to its high performance battery. However, since the selected pilot survey site is an electrified area, the System only uses the solar power generator for lighting during the night time. The System is also equipped with a remote monitoring device so that it enables us to monitor the operation data and water quality on real time basis.

In terms of its operation and maintenance, it is automatically operated with no one attending to the System except for the regular monthly maintenance. The technology necessary for the continuous operation and maintenance is easy enough to be transferred. Thus, it is considered suitable for dissemination in Kenya.

(4) Counterpart Organizations

- Ministry of Environment, Water and Natural Resources (MEWNR)
- Athi Water Services Board (AWSB)
- Ruiru-Juja Water and Sewerage Company Ltd (RUJWASCO)

(5) Target Area and Beneficiaries

The target area is Murera / Sisal area of Ruiru Town, Kenya. The beneficiaries are the residents of Murera / Sisal area.

(6) Duration of the Pilot Survey

From October, 2013 to September, 2016 (35 months as shown in the Project Schedule below)

Duration Activities	FY2013			FY2014						FY2015						FY2016																								
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9				
Activity 1) Conducting a pilot test																																								
Detailed survey at pilot site (measuring, water sampling etc)		■		■	■		■	■			■	■																												
Baseline survey on water supply (HH survey, leakage survey, etc)	□	□	□				■	■																																
Water quality analysis			□	□	□		□			□	□																													
Meeting with local C/P regarding pilot test		■		■	■		■	■				■																												
Design, fabricate, test operate & commissioning of pilot system							□ Designing			□ Fabrication & Inspection																														
Packing, shipping, customs clearance & local transport												□ Documentation	□	□	□																									
Installation, commissioning at site																			■ Civil works	■ Insallation																				
Implementation of the pilot test																																								
Evaluation of the pilot test and technical transfer																																							□ Impact assessment	□ Evaluation
Activity 2) Technology transfer and training																																								
Training on water treatment technologies and on O&M in Japan																																								
Training on water treatment technologies and on O&M at site																																								
Activity 3) Dissemination activities																																								
Identification and collaboration with local partners				■									■																											
Disemminating activities (site surveys, workshops and etc)				■																																				
Others																																								
Meeting with JICA/ reporting	□					□																																		

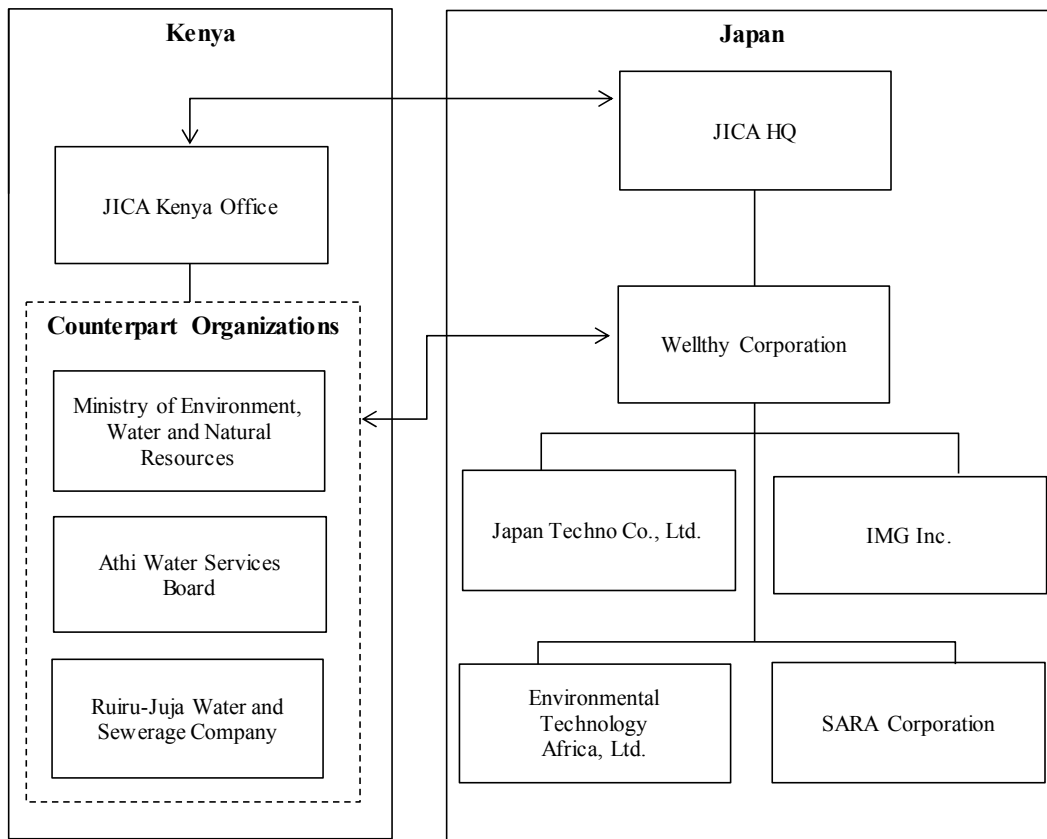
Legend : ■ Work in Kenya □ Work in Japan

(8) Manning Schedule

Duties	Name	Company	FY2013			FY2014												FY2015												FY2016					M/D					
			10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	Payable	Voluntary
In Kenya	Project Manager	Hiroaki Todoriki	Wellthy Corp.																																			35	16	
	Draw up business plan/ Overall construction	Takaetsu Fukuda	Wellthy Corp.		9		10																															9	19	
	Pilot system: Construction/ Civil Eng.	Kazunori Sato	Wellthy Corp.		9																																	31	18	
	Pilot system: Maintenance/ Commissioning	Rei Koreki	Wellthy Corp.																																			21	14	
	Pilot system: Supervise construction	Naoki Yasuda	Wellthy Corp.		13		7		7		8		13		19																							11	185	
	Site survey/ Disemmination activity 1 (Water treat. Technology)	Emi Sahara	Wellthy Corp.		13		10		7		8		11		11		8		24																			0	73	
	Chief Advisor: Water source development/ Community water supply	Makoto Yamamoto	Japan Techno		8		2		7																													17	-	
	Supervise construction & supply plan	Toshiki Horie	Japan Techno																																			56	2	
	Business model development	Rui Hiwatashi	IMG																																			6	-	
	Develop and manage local partners 1	Mio Takagi	IMG		7		2																															22	-	
Develop and manage local partners 2	Natsuno Shinagawa	IMG																																			6	-		
Identify and survey potential sites	Atsushi Kato	IMG																																			60	-		
																																						274		
In Japan / Domestic work	Project Manager	Hiroaki Todoriki	Wellthy Corp.																																			16	77	
	Pilot system: Design	Futoshi Fujiwara	Wellthy Corp.		1		1		1																														7	0
	Pilot system: Maintenance/ Commissioning	Rei Koreki	Wellthy Corp.																																				7	0
	Pilot system: Supervise construction	Naoki Yasuda	Wellthy Corp.		4		4		4																														0	59
	Site survey/ Disemmination activity 1 (Water treat. Technology)	Emi Sahara	Wellthy Corp.																																			0	5	
	Chief Advisor: Water source development/ Community water supply	Makoto Yamamoto	Japan Techno																																			21	-	
	Form Disemmination plan (business scheme)	Shigeyoshi Kagawa	Japan Techno																																			3	-	
	Business model development	Rui Hiwatashi	IMG																																				23	-
	Develop and manage local partners 1	Mio Takagi	IMG		4		5		6		2																												50	-
	Identify and survey potential sites	Atsushi Kato	IMG																																				1	-
	Solar energy technology	Masahiro Sakurai	SARA Corp.																																				5	-
	Local Liason	Takeo Tokunari	Environmental Technology Africa																																			35	5	
Local Liason	Rose Akinyi	Environmental Technology Africa																																				6		
	Reports																																					174		

Legend Work in Kenya Work in Japan Voluntary work in either country

(9) Implementation Structure



3. Achievements of the Survey

(1) Outputs and Outcomes of the Survey

During the Survey, Wellthy supplied water to approximately 400 households in Ruiru town in order to verify the technical application of the pressurized membrane filtration system to surface water treatment and to disseminate the System in Kenya. Wellthy also conducted technical training on operation and maintenance to the local staff and held seminars to introduce the technology of the System to the participants in order to assess the potentiality of disseminating the System in Kenya both from technical and business point of view. As a result of the Survey, Wellthy confirmed that technically, the System exhibited a good treatment performance since the quality of treated water from the System met the drinking water standards of Kenya, in spite of high aluminum content and seasonal variation of turbidity in raw water. Also for the dissemination activities, Wellthy found that the System had a potential in Kenya, but that the localization of fabrication and utilization of finance schemes were necessary in order to lessen the financial burdens of the customers in order to disseminate the System.

The following are the details of achievements made during the Survey.

i. Operation of the System

Since its installation in June 2015, the System has been operating well, except when there were power supply problems. The quality of the supplied water is good. Both color and turbidity are below the standards and E.Coli is not detected.

ii. Discussion with the Counterpart Organizations

In June 2014, Wellthy came to an agreement to implement the pilot survey at the Ruiru site with RUJWASCO, the WSP in charge of the area, after comparing several potential sites for the pilot survey. In June 2015, Wellthy held an inauguration ceremony and officially started supplying water to the target area. After a year of pilot operation, Wellthy handed-over the System to the Kenyan side according to the agreement with the Counterpart Organizations.

iii. Operation and Maintenance (O&M)

Wellthy conducted necessary technical training to local staff who are now capable of conducting daily, monthly and emergency inspections including trouble shooting. It is possible for them to conduct trouble shooting as their levels of inspection skills improved after repeating the work over and over under the instructions of Wellthy's staff at site or sometimes remotely.

iv. Impact Assessment

In January 2016, Wellthy conducted an impact assessment survey in the target area to evaluate the impacts of water supply by the System. As a result, 98% of the households answered that there was no problem in the supplied water quality, which was an increase by 8% from the baseline survey. Also, it was found that many of the interviewees drank supplied water directly without disinfection. Furthermore, as a direct impact of implementation of the water supply by the System, more than 30% answered that the water quality had improved and about 80% answered that the time and costs for getting safe and clean water had reduced.

v. Localization of Manufacturing

In order to reduce the cost of the System, Wellthy considered procuring some alternative materials in Kenya and surveyed the prices of pipes and fittings, power cables, tanks, pumps and chemicals. Wellthy found that the cost reduction could only be possible by procuring tanks and chemicals locally. Especially, as for the chemicals, if Calcium Hypochlorite is used continuously instead of Sodium Hypochlorite solution, 44% of the O&M costs can be reduced. On the other hand, it was also found that procuring pumps locally does not lead to a significant cost reduction. Wellthy also gathered information about the local suppliers of solar power generator and the procurement costs in order to examine the potential of utilizing the solar energy as an alternative power source for the System.

vi. Dissemination Activities

In June 2015, Wellthy held a technical seminar to introduce and publicize the technology of the System, inviting stakeholders such as the counterpart organizations, county governments and WSPs. Other dissemination activities included attending and giving presentations at WASPA meetings where WSPs from all over the country participated, and surveying potential private customers such as hotels and factories. As a result of surveying a total of 54 companies and organizations regarding their water use situations and water treatment needs, Wellthy found that there was a need for high quality and stable water supply from water bottling companies that use groundwater as the water source and from real estate developers who target middle to high income customers.

(2) Self-reliant and Continual Activities to be Conducted by Counterpart Organization

It was agreed among the Counterpart Organizations that the System would be operated and maintained by RUJWSCO, with the support of AWSB after completion of the pilot survey. As explained above, O&M work had been transferred to local staff including those from the counterpart organizations. Wellthy will also keep supporting the O&M of the System via the remote monitoring system and with its local staff who was also trained to conduct inspection work and trouble shooting.

4. Future Prospects

(1) Impact and Effect on the Relevant Development Issues through Business Development of the Product / Technology in the Surveyed Country

As explained above, it was confirmed in the Survey that the System and its water treatment technology brought impacts on the relevant development issues of Kenya, in terms of improving access to safe and clean water.

Wellthy believe that there are three water supply business markets in Kenya that private companies can be involved: 1) small-scale water supply targeting the low income population, 2) decentralized water supply, which is similar to this Survey and 3) large-scale water supply targeting water treatment works. In its business plan, there are three business models to be considered as listed below. Among these, Wellthy will pursue the business model (A), which is a package of selling the water treatment system and treated water as bulk sale, with a long-term contract from 5 to 10 years so that Wellthy will be able to continue the business in a long run, reducing the financial burden of the customers at the same time.

- (A) Recovering the initial costs and O&M costs through a long-term bulk water sales and/or water treatment services;
- (B) Selling the water treatment system (equipment only); and
- (C) Providing maintenance services of the water treatment system.

If the business model (A) above cannot be realized, Wellthy will consider model (B) and (C) for projects such as Official Development Assistance (ODA), and will promote the O&M service business

for such development projects to be conducted by the private sector.

(2) Lessons Learned and Recommendations through the Survey

First of all, from the fact that major the operational troubles of the System were caused by external factors such as power supply fluctuation, Wellthy learned from the Pilot Survey that it is important to design the product that matches the local conditions. For example, special measures were necessary to cope with the power supply fluctuation, for example installing an automatic voltage regulator, and devising an appropriate mixing and injection system for chlorine chemical. Another aspect of operation of the System that Wellthy learned is that the use of the remote monitoring system was highly effective to achieve stable operation of the System and also to smoothly transfer the O&M technology to the local staff.

Second, Wellthy learned that it was important to share values and establish relationship of mutual trust with the Counterpart Organizations. Water is one of the valuable resources in Kenya, especially because of water scarcity in the country and thus, in some areas, people seem to have negative feelings about the water supply business to be conducted by a foreign company while trusting Japanese company and its technology. For this reason, Wellthy was forced to change the pilot site in the Survey when the local residents of the initial pilot site, Mataara, refused to collaborate with the proposed project.

Finally, Wellthy learned that there needed to be a certain amount of time in order for the outcome of the activities to be visible when introducing a new concept and a new business. Unlike when introducing an alternative good or technology with improved quality made by a Japanese company, when introducing a totally new concept just as Wellthy did in this Survey, a pilot needs to be conducted first, followed by introduction of the results and then finally comes the business activity. Therefore, Wellthy recommend there should be at least one year for dissemination activities after completing the pilot phase, so that more detailed outcomes can be produced in the Survey.

END

Attachment: Outline of the Survey