Republic of Kenya
National Construction Authority

Collaboration Program with the Private Sector for Disseminating Japanese Technology for Micro Flush Toilet System for Watershed Management and Improvement of Water Environment in Urban Areas, Kenya

Final Report

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Japan International Cooperation Agency (JICA)

LIXIL Corporation

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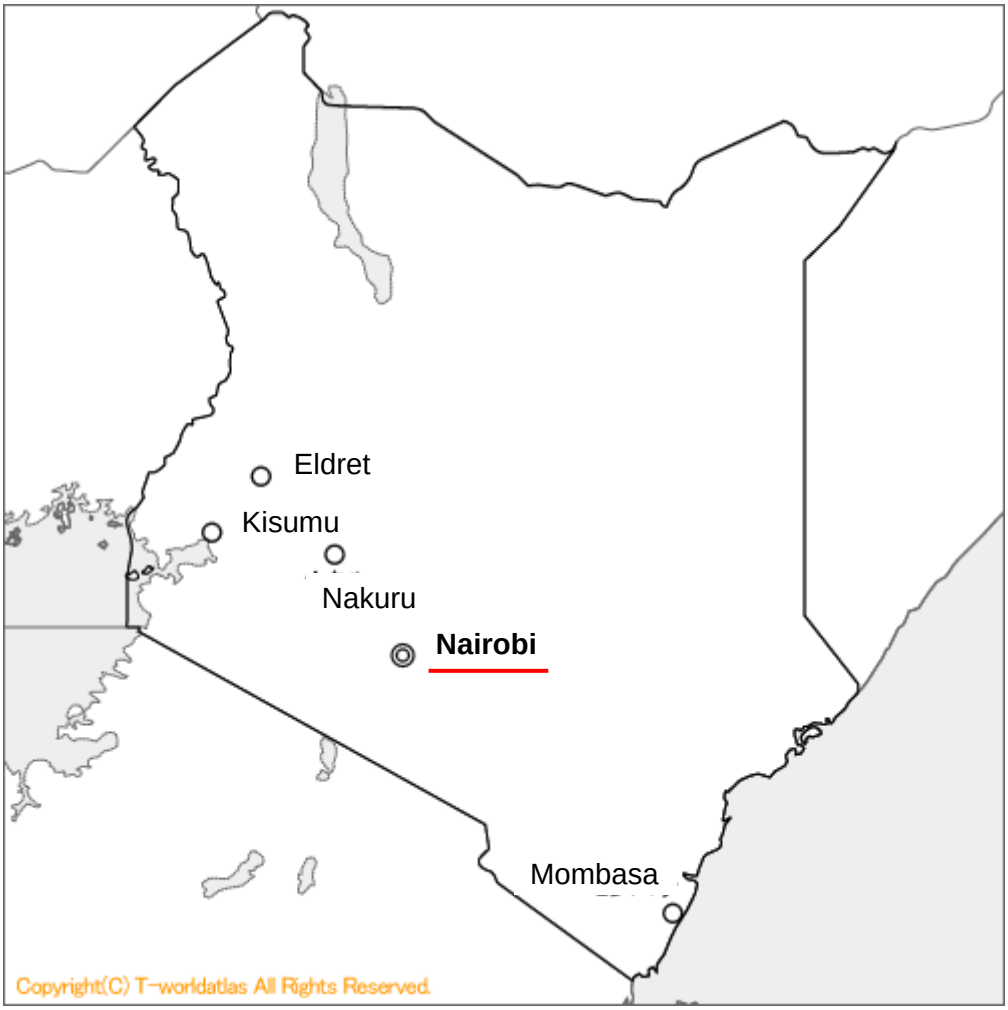


Source: SekaiChizu (http://www.sekaichizu.jp/)

ABBREVIATIONS

ABMT	Appropriate Building Material and Technology [Center]
ARSO	African Organization for Standardization
EMA	Eco Mark Africa
ESCO	Energy Service Company
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
JTC	Joint Technical Committee
KAM	Kenya Association of Manufacturers
KEBS	Kenya Bureau of Standards
KGBS	Kenya Green Building Society
KRA	Kenya Revenue Authority
ME	Mechanical Engineer
MFT(S)	Micro Flush Toilet (System)
MOP	Middle of Pyramid
MTIHUD	Ministry of Transport, Infrastructure, Housing and Urban Development
NCA	National Construction Authority
NEMA	National Environmental Management Authority
PPOA	Public Procurement Observation Authority
QS	Quantity Surveyor
TBD	To Be Discussed
WRMA	Water Resource Management Authority

1. Executive Summary

1.1 Outline

(1) Background

In Kenya, only 59% of population has safe supply of water and 39% can access improved sanitary facilities (in 2012). While population and urban areas are growing rapidly, usable water source and infrastructure is limited to respond to the increasing demand. There exist a number of water and sanitary issues to be solved in urban and rural areas. Creation of social infrastructure and urban environment for efficient water use is an urgent challenge to be tackled in the country.

(2) Technology to Be Promoted

The Micro Flush Toilet System (MFTS) is a hyper efficient water-saving toilet system, which can reduce the amount of flush water to one sixth compared with conventional toilet (i.e., flush toilet and septic tank).

(3) Objectives

This project is set out to

① to raise awareness of the MFTS through promotion and demonstration,
② to establish and strengthen sales channel of the product in Kenya,
③ to obtain approval and certification from related organizations in Kenya such as public administration, architects, developers, and construction companies,
④ to assist establishment of standard and specification for promotion of the MFTS, and
⑤ to adjust the product and its price to customers' needs and the local market environment.

(4) Tasks

This project undertakes following tasks.

(1) Pilot and demonstration for raising awareness of the MFTS
① Holding demonstration workshops
② Presenting benefits for users and development impact expected from promotion of the MFTS

(2) Examination on local marketing of the MFTS
① Collecting needs for improvement of the product
② Examination of price and marketing strategies

(3) Seminars and technical trainings on the MFTS

① Holding seminars on the MFTS to stakeholders

② Discussing conditions to establish standard and specification

③ Assisting documentation on technical standard and specification

(5) Achievements

Status of achievement of this project is as follows.

- Valuable feedbacks from major public and private organizations
- Major public and private organizations
- Identification of information and measures for improvement especially on plumbing and drainage
- Setting strategies for localization and pricing based on local survey
- Holding the general stakeholders meeting
- Launching discussion for establishment of promotion schemes among multiple organizations (remaining issue)
- Not established real certification and incentive schemes (remaining issue)

(6) Present Prospect of the Business

Customization design has been already under consideration, and investment decision will be made in the first half of 2017. Sales will be started from April 2018. Eco certification scheme will be established as a marketing tool, as soon as it is established.

(7) Basis of Business Decision

European companies are strong in market of conventional toilets for H-MOP, and GROHE DAWN, LIXIL's subsidiary, has been also penetrated into Kenyan market with toilets branded Vaal since 2015. Meanwhile, Chinese and Indian brands have strength in the targeted L-MOP market, and retail price ranges from 25-100 USD. However, there are no other products like the MFTS that can flush only with 1L of water, so it is assumed that differentiation would be possible.

(8) Challenges and Solutions for the Business

Although it is not crucial for usage, local plumbers are not skilled enough to handle special arrangement of piping for installation of the MFTS. Therefore, it is necessary to train skills for installation and maintenance of the system for wider promotion in the market. Meanwhile, NCA has a remarkable interest in improvement of construction technology, so training activities are mutually beneficial.

Although discussion for establishing schemes for certification and incentive has been opened among related organizations, further efforts have to be made in order to realize what can actually benefit the business. However, this is not an essential condition for launching the business, while NCA's initiative to handle the committee is respected for the time being. Necessary follow up can be made, and established scheme will be utilized.

(9) Plan for the Future Business

Although basic business model is same as that of suppliers of ordinary sanitary-ware, site demonstration will be fully utilized for promotion and awareness raising of technical features of the MFTS to customers. In addition, certification of eco products will be used for promotion in the future when it is established.

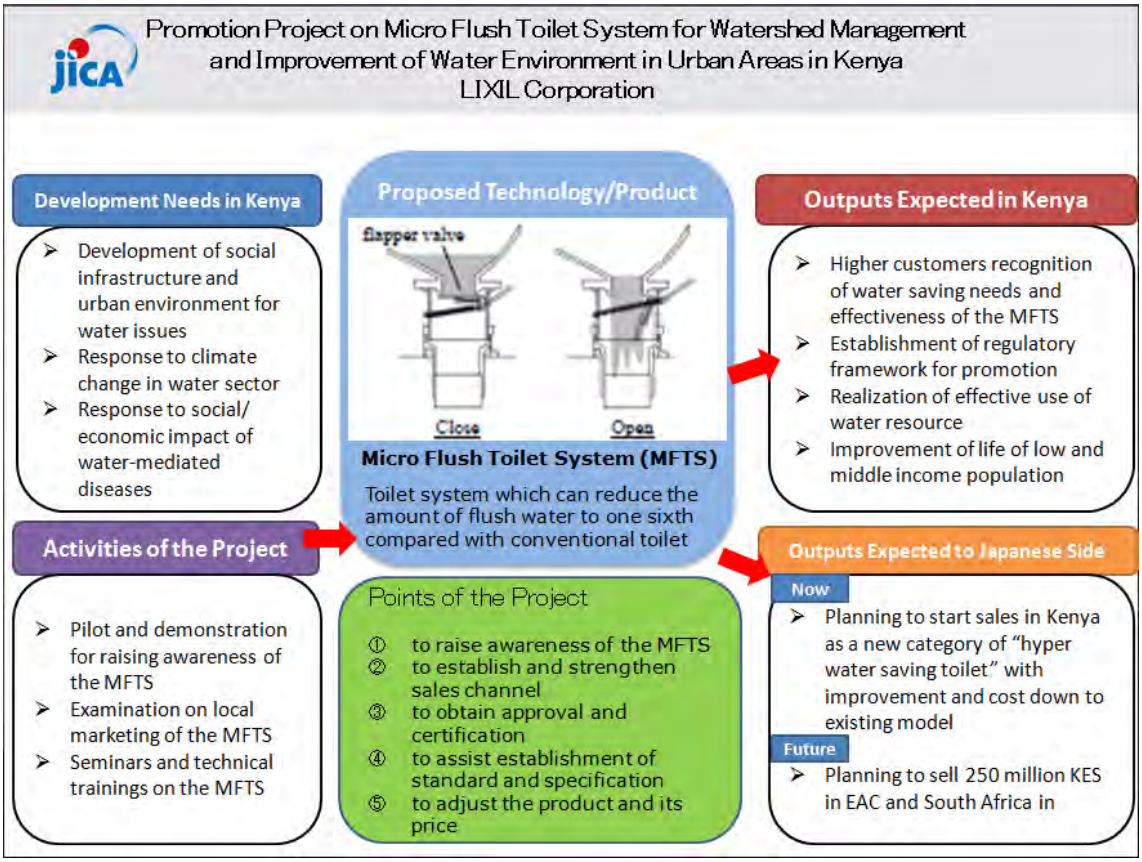
(10) Collaboration with ODA Projects

Collaboration can be considered with various schemes as shown below.

Project Scheme	Possibility of Collaboration
Project Formulation Survey / Promotion Project	To conduct transfer of Japanese technology and know-how on housing construction for saving energy/resource, sanitation, and safety to public organizations, business, and experts in Kenya. To assist research, development, and establishment of institutional foundation for standardizing design, construction technology, equipment/material for housing (Since these schemes target small and medium enterprises, LIXIL's involvement will be provision of the MFTS as a component technology for training and standardization to a project team to be led by smaller firm.)
Long-term Expert / Volunteer	To provide advice and assist institutional building for resource saving and standardization of building technology by transferring technologies and experience of Japan
Grant Aid	To apply for grassroots project to introduce the MFTS by county governments or non-profit organizations To add the MFTS in specification of grant facility construction projects
Loan	To add the MFTS in specification of loan facility construction projects
Technical Cooperation	To continue/expand project formulation survey or promotion project upon request

1.2 Diagram of the Project Outline

The following table illustrate outline of the project.



2. Background of the Project

2.1 Background

In Kenya, only 59% of population has safe supply of water and 39% can access improved sanitary facilities (in 2012[1]). While population and urban areas are growing rapidly, usable water source and infrastructure is limited to respond to the increasing demand. There exist a number of water and sanitary issues to be solved in urban and rural areas. Creation of social infrastructure and urban environment for efficient water use is an urgent challenge to be tackled in the country.

In addition, global climate change is another serious problem in Kenya, and risk of flood and drought is increasing in recent years. The government of Kenya has formulated national strategy to address the climate change. Water sector, which is one of the most important ones for national development, is required to consider measures against climate change. National Climate Change Action Plan 2013-2017 targets improvement of water services in urban and rural areas as a priority action plan of the water sector.

Under such circumstances, the Kenya Vision 2030 declares to address conservation of water resources and the environment as well as providing 20,000 new houses every year along with urban development. In the actual lives of the citizens, households have to install large water tanks and dig a borehole to deal with frequent cuts in the water supply. In the meantime, most of the toilets are conventional types which consume more than 6 litres of water for every flush. To make things worse, there are a substantial number of dysfunctional old toilets which need two to three times of flush to discharge excrement. In order to address these issues, it is highly relevant to examine social impacts of a hyper efficient water-saving toilet developed in Japan and promote the technology.

2.2 Technology to Be Promoted and Its Contribution to Development Agenda

2.2.1 Technology to Be Promoted

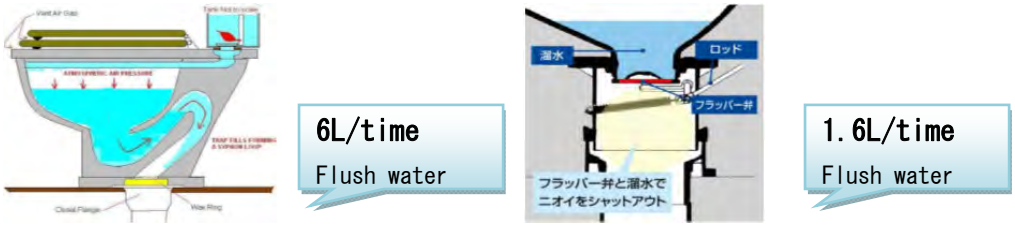
<System to Be Promoted> **Micro Flush Toilet System** (**MFTS**)

The Micro Flush Toilet System (MFTS) is a hyper efficient water-saving toilet system, which can reduce the amount of flush water to one sixth compared with conventional toilet (i.e., flush toilet and septic tank).

Instead of a water trap section designed in a conventional toilet, a flapper valve is equipped at

[1] Water.org: http://water.org/country/kenya/

the bottom of the bowl of the MFTS. While standby, the flapper is closed and stores 0.5-1.0 liter of water in the bowl (users can control the volume of water with a lever handle). After excretion, users turn the lever to open the flapper and flush about 0.4 liter of water to clean the bowl. Unlike the conventional products, the MFTS realizes minimization of the volume of flush water by adopting steep angle in plumbing to carry excrement away (Figure 1).



Conventional (Trap) Type Micro Flush (Flapper) Type

Figure 1 Structure of Conventional and Micro Flush Toilets

In the Kenyan market, there are no other water-saving toilets as efficient as the MFTS, while popular products of other companies consume 6 liter water. Hence, the MFTS is a quite innovative and leading technology in the market, and it can reduce a considerable amount of users' expenditure for water and drawing sludge from a septic tank by minimizing flush water (Table 1). Furthermore, the promotion of the MFTS can contribute to water resource conservation and improvement of the urban environment.

Table 1 Comparison of Economic Efficiency with Conventional Toilets

Water use per person	L/day	70
Water use per household (4 persons/household)	L/day	280
	m3/yr	102
Unit rate of water tariff	Ksh/m3	100
Annual amount of water tariff	Ksh/yr	10,220
Unit rate of clearing sewer water	Ksh/m3	1,207
Annual amount of drawing sludge	Ksh/yr	123,355
Annual cost for water and sludge	**Ksh/yr**	**133,575**
Annual water saving by MFTS	m3/yr	25.7
Annual cost saving for water	Ksh/yr	2,570
Annual cost saving for sludge	Ksh/yr	31,015
Cost savings for water and sludge	**Ksh/yr**	**33,585**
Saving ratio by MFTS	**%**	**25.1**

Note: Ksh＝Kenya Shilling
Source: LIXIL

The MFTS is an established technology and has been supplied for more than 20 years in Japan. Supply of the current model is over 10,000 units per year. LIXIL improve the product and lowers the cost to introduce to the Kenyan market as a new category of hyper water saving toilet. This project identified an appropriate selling price and a way to realize it through an assessment of price of other products. (See section 4.2.)

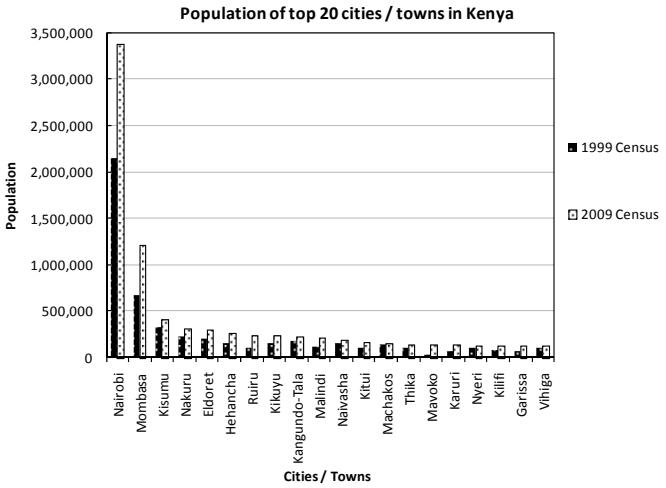
Safety of this technology is ensured through record of no serious accident and recall for past 20 years. Technically speaking, sealing ability of flapper valve under the bowl has been certified by the (former) Ministry of Construction of Japan.

2.2.2 Contribution to Development Agenda

This business is expected to realize following development impacts.

(1) Effective Use of Water Resource

Although Kenya suffers from chronic water shortage, use of flush toilets has increased along with concentration of population to cities and advancement of living standards. The MFTS enables to allocate the limited water resource effectively to drinking, agricultural, and industrial uses, by reducing the substantial volume of flush water. Efficient water resource management appears in priority sectors of country assistance policy by the Ministry of Foreign Affairs (of Japan).



Source: LIXIL

Figure 2 Concentration of Population to Major Cities in Kenya

(2) Reduction of Sewage Treatment Cost

In the case central treatment with sewage network connection, the MFTS can optimize plant capacity and mitigate load of pumps by reducing the volume of sewage water. On the other hand, in the case of decentralized treatment with septic tanks, users can reduce the number of drawing sludge, and it results in approximately 25% savings of expenditure. (See table 1.)

(3) Improvement of Urban Environment

It is also expected that less volume of flush water mitigates water contamination by reducing load on the sewage system. In addition, savings of energy for water use and greenhouse gas emission are expected as well. Country assistance policy by the Ministry of Foreign Affairs (of Japan) mentions enhancement of capacity to manage urban environment as a priority sector.

(4) Creation of Employment

Local employment will be created along with business expansion and local production of the product in the future.

(5) Estimation of Potential Development Impacts

Potential impacts of introducing the system to Mombasa city are estimated as shown in table 2. According to estimation result in the case when the MFTS is installed to 100,000 houses, it will save 2.5 million liters of tap water per year, which is equivalent to 11% of the total water supply in the city.

Table 2 Impact Estimation of the MFTS (Case of Mombasa)

Flush water of conventional toilets		L/time	6
Flush water of MFTS		L/time	1.6
Reduction of flush water		L/time	4.4
Use of toilet per household		time/day	16
Household with toilet		Household	10,000
Annual water saving		**t/yr**	**2,569,600**
Case of Mombasa	Annual supply of water	t/yr	23,280,860
	Annual consumption of electricity	kwh/yr	20,621,944
	Water saving by toilet	%	11.0
	Energy saving by toilet	**kwh/yr**	**2,276,125**
	Grid emmission factor	kgCO2/kwh	0.6672
	Green house gas reduction	**tCO2/yr**	**1.519**

Source: LIXIL

3. Outline of the Project

3.1 Objectives and Goals

3.1.1 Objectives of This Business

LIXIL aims at expanding global business as a core strategy of its mid-term plan published in May 2013. Africa is regarded as an important market of high economic growth to be explored in addition to existing markets.

This business can effectively assist solving water problems in Kenya. Also, success of the business is quite important to enhance LIXIL's presence in Kenya and thereby to disseminate LIXIL products to all over Africa.

As LIXIL's core value states that "the group's superior products and services contribute to improving people's comfort and lifestyles", solving water and sanitation issues is part of its social responsibility to be fulfilled. Also, as stated above, this business is expected to expand global sales to achieve the corporation's mid-term plan.

3.1.2 Goals in This Project (Contribution to Development Agenda)

In order to realize contribution to development agenda as stated in sub-section 2.2.2, it is aimed at making future customers more conscious about water saving and effectiveness of the MFTS as well as establishing institutional frameworks of related local organizations to support dissemination by the end of this project.

3.1.3 Objectives of This Project (Business Perspectives)

This project is set out to

⑥ to raise awareness of the MFTS through promotion and demonstration,
⑦ to establish and strengthen sales channel of the product in Kenya,
⑧ to obtain approval and certification from related organizations in Kenya such as public administration, architects, developers, and construction companies,
⑨ to assist establishment of standard and specification for promotion of the MFTS, and
⑩ to adjust the product and its price to customers' needs and the local market environment.

3.2 Implementation of the Project

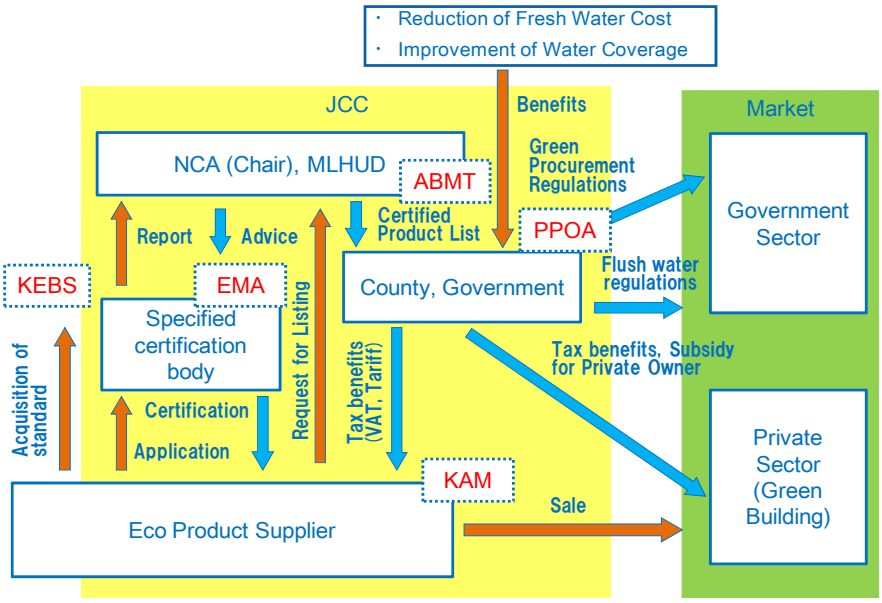
3.2.1 Schedule

Implementation of this project is scheduled from November 2015 to May 2017. This project

focuses on segments that are burdened with high water tariff among urban and suburban areas as potential targets of promotion. Therefore, target areas of this project are urban areas of Kenya (e.g., Nairobi) where water supply is installed.

3.2.2 Implementation Structure

This project involves relevant organizations in Kenya for making the MFTS a standardized and recommended product. JICA Kenya Office suggested formulating Joint Coordination Committee (JCC) and the project team coordinated with various organizations. Figure 3 illustrates the implementation structure of this promotion project. The project team coordinated with the National Construction Authority (NCA) as a candidate for the chair of the JCC and signed minutes of understanding (MOU) [2] for collaboration on 22nd February 2016.



Abbreviations: ABMT = Appropriate Building Material and Technology [Center], EMA = Eco Mark Africa, JCC = Joint Coordination Committee, KAM = Kenya Association of Manufacturers, KEBS = Kenya Bureau of Standard, MLHUD, Ministry of Land, Housing & Urban Development, NCA = National Construction Authority, PPOA = Public Procurement Oversight Authority

Figure 3 Implementation Structure of the Project

The project team and NCA discussed and identified organizations concerning activities of promotion and JCC. They were invited to General Meeting held at 25th October 2016 and found a necessity to form a technical committee. However, the meeting could not reach agreement on members and specific tasks of the committee. Thus, the project team had a follow up meeting with NCA and confirmed direction that NCA would lead the formation and facilitation of the

[2] Memorandum of understanding between National Construction Authority and LIXIL Corporation for the collaboration to develop system for certifying eco products which can be applied to buildings in Kenya and develop a certification scheme for the same.

JCC after completion of this promotion project.

Photo 1 Signing MOU with NCA (1)

Photo 2 Signing MOU with NCA (2)

3.2.3 Tasks

This project undertakes (1) pilot and demonstration for raising awareness of the MFTS, (2) examination on local marketing of the MFTS, and (3) seminars and technical trainings on the MFTS.

(1) Pilot and demonstration for raising awareness of the MFTS

① Holding demonstration workshops

② Presenting benefits for users and development impact expected from promotion of the MFTS

(2) Examination on local marketing of the MFTS

① Collecting needs for improvement of the product

② Examination of price and marketing strategies

(3) Seminars and technical trainings on the MFTS

① Holding seminars on the MFTS to stakeholders

② Discussing conditions to establish standard and specification

③ Assisting documentation on technical standard and specification

Expected outputs of these tasks are shown in table 3. This project does not procure equipment by contracted budget.

Table 3 Outline of Tasks and Outputs of the Project

#	Tasks in This Project	Schedule	Activities	Outputs (at the End of the Project)
		1st Field / 2nd Field / 3rd Field / 4th Field / 5th Field		
1-①	Holding demonstration workshops		・Preparation for demonstration workshops ・Coordination for demonstration	・Collection of opinions from targets of promotion including public organizations, private firms, end users, and other resource persons.
1-②	Presenting benefits for users and development impact		・Presenting benefits for users and development impact expected from promotion of the MFTS	・Awareness raising to local stakeholders on advantage in life cycle cost of the MFTS
2-①	Collecting needs for improvement of the product		・Collecting needs for improvement of the product	・Improvement for mass production through identification of points for localization
2-②	Examination of price and marketing strategies		・Examination of price and marketing strategies	・Planning of appropriate pricing and marketing strategy for business promotion
3-①	Holding seminars on the MFTS to stakeholders		・Holding seminars on the MFTS to stakeholders	・Improvement of construction quality for promoting the system
3-②	Discussing conditions to establish standard and specification		・Coordination with local stakeholders ・Discussing conditions to establish standard and specification	・Creation of advantageous environment for competition by making the product in specification of public housing
3-③	Assisting documentation on technical standard and specification		・Assisting documentation on technical standard and specification	・Implementation of documentation and procedures required for certification and standardization

4. Results of the Project Implementation

4.1 Outline

Activities conducted in 6 field trips are summarized in the table below. Detailed status of each task is described in the following sections.

Table 4 Outline of Activities in Major Field Trips

Trip	Timing	Major Activities
1st	November – December 2015	− Coordination for demonstration in public properties − Examination for localizing the MFTS − Examination of approaches for acquiring status of specified/ recommended product
2nd	January – February 2016	− Coordination for demonstration in public properties − Examination for localizing the MFTS − Examination/discussion for acquiring status of specified/ recommended product
3rd	April 2016	− Coordination for demonstration in public properties − Examination for localizing the MFTS − Discussion for acquiring status of specified/recommended product
4th	July 2016	− Coordination for demonstration in private properties − Examination for localizing the MFTS − Discussion for acquiring status of specified/recommended product (preparation for workshop)
5th	September 2016	− Coordination for demonstration in private properties − Discussion for acquiring status of specified/recommended product (preparation for workshop)
6th	October 2016	− Coordination for demonstration in private properties − Workshop and demonstration of the product to stakeholders

4.2 Pilot and Demonstration for Raising Awareness of the MFTS

MFTS is an innovative technology in Kenya, and wider and clearer presentation of its impacts is essential for penetrating into the market. This project conducted site surveys and demonstrations for monitoring actual products.

4.2.1 Public Properties

Once committed by top, faster implementation is expected at county level rather than national

level. Pilot sites can be utilized for demonstration and marketing of the product. However, extension of water supply tends to be more prioritized over water saving as a general trend in Kenya. Therefore, it should be effective to target areas where water coverage has been expanded to some extent and efficient use of limited water resource is more concerned.

As a candidate for demonstrations in public properties, the project team examined possibilities of a pilot project in Machakos County that suffers from serious water shortage and is eager to collaborate with Japanese firms. In the first and second field trips, the project team investigates candidate sites (i.e., public toilets at Mavoko Town Hall/ Mavoko Law Courts) and plan of the pilot and gained understanding and opinions toward the product from county stakeholders through visit to a site where the MFTS has been installed. Furthermore, the project team consulted with the county and planned to equip water meters at both the pilot sites and another public toilet site in order to compare amounts of flush water as a quantified impact of introducing the MFTS.

Although the project team had worked to realize the plan for demonstrating the site in an occasion of the TICAD 6 held at the end of August 2016, timing of completion went unclear due to delay in procurement procedures of the county and personnel rotation. For these reasons, the project team had to give up the pilot installation in Machakos County. Therefore, private properties became targets of pilot tests.

In addition to Machakos, other counties (e.g., Murang'a, Makueni, etc.) showed interest to LIXIL's solution through exhibition at the TICAD 6, and the project team had meetings to know their conditions of water use and issues for possible future cooperation.

Photo 3 Introduction of Active MFTS

Photo 4 Squat Type MFTS

Photo 5 Presentation to Officers of Machakos County at a Pilot Site

Photo 6 Public Toilet of Machakos Conty

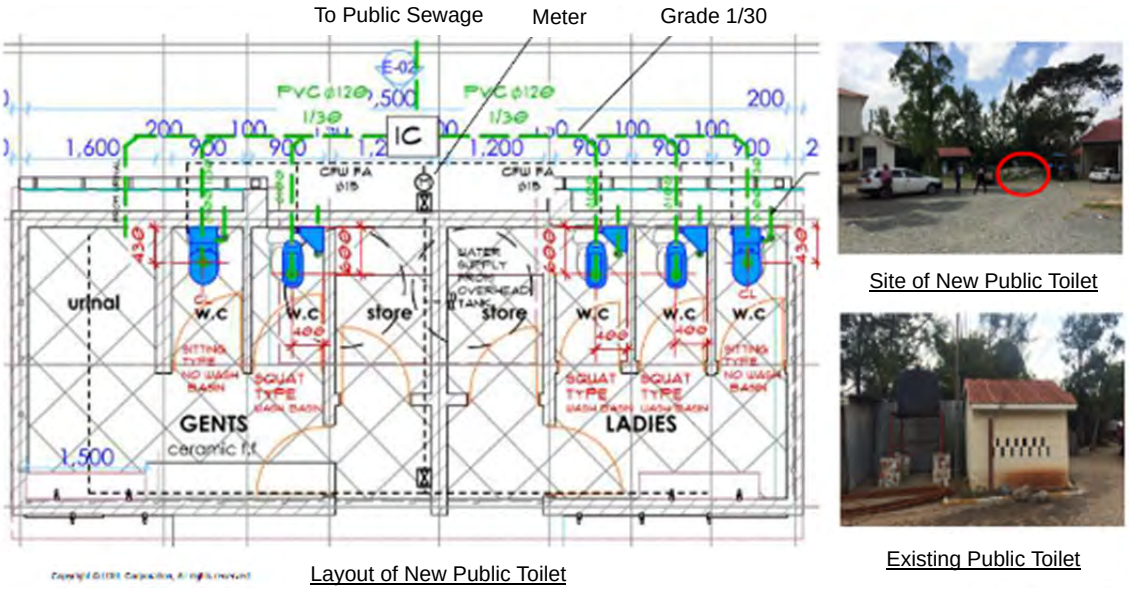


Figure 4 Plan of Pilot Test at Machakos County

4.2.2 Private Properties

The project team observed a number of private resident compounds called “plot” mostly for “lower-middle of pyramid” population that should have high water saving demand in order to conduct pilot projects. In addition to existing properties, the project team investigated open plots and customs of property management in consideration of possibility to build a new apartment to install toilets. Typical plot is a middle size building forming dense residential area and is composed by tiny rooms and common wash rooms per floor or rooms with toilet and kitchen. The project team assessed water saving demand (i.e., frequency of piped water supply), conditions of drainage and plumbing (i.e., ease of replacing toilets), security of the surrounding

area, accessibility from arterial roads, and willingness of owners during visits to a lot of properties around Nairobi.

As a result, the project team reached agreement with a property owner in Kangemi area, 8 km west from Nairobi CBD. 3 toilets were installed to households along a vertical pipe in a three stories building by LIXIL's bearing cost on December 2016. 3 target households are connected to a septic tank with the same vertical pipe and subject to pilot evaluation of performance. Plumbing network was modified in order to eliminate noise of drainage flowing from a neighboring building for evaluation of sweeping ability sewerage. In addition, water maters were equipped to kitchen and toilet of each household and a rooftop tank for supply to bath rooms in order to monitor water usage. Frequency of water supply is 3 days a week in this area, and residents pour stored water to tank of toilet for flushing in days of disconnection.

Until now, tenants express satisfaction with usability and no problems in clearing waste is observed. Moreover, water use of a household is found to be 25% less since installation. Monitoring of the impact will continue.

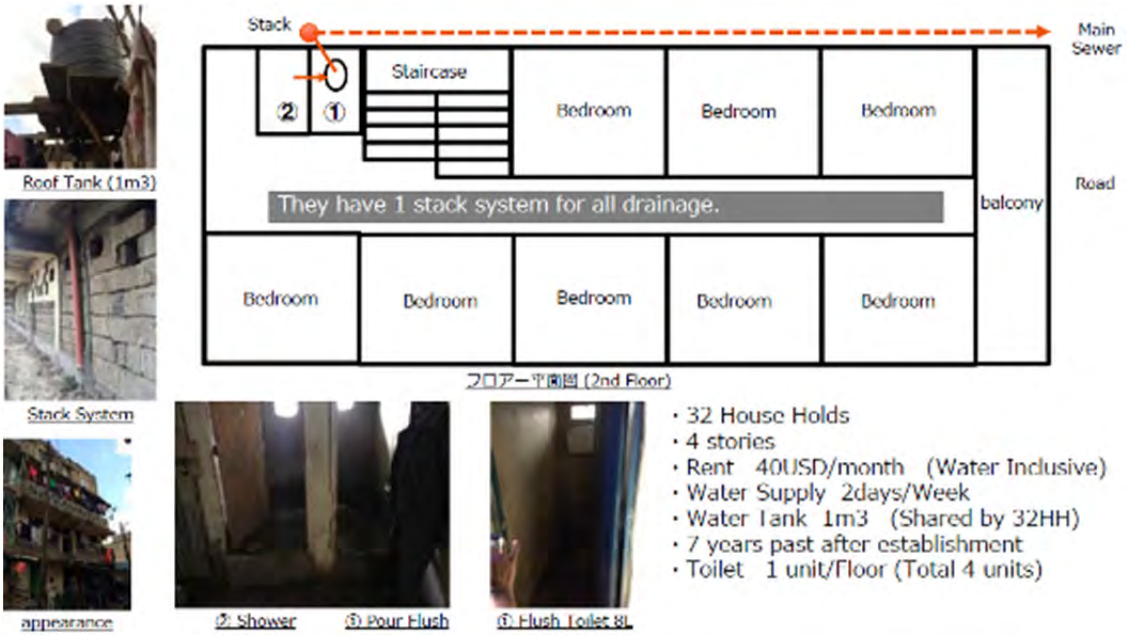
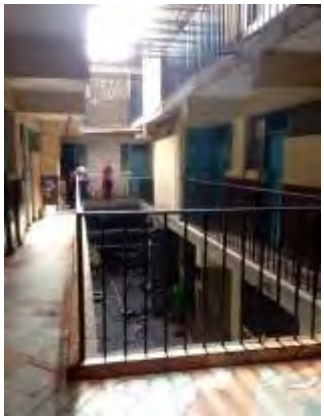


Figure 5 Layout of Typical "Plot" Housing in Nairobi



(a) Inside of Building in Kariakor

(b) Interview to a Property Owner in Kariakor

(c) Inside of Building in Kitengela

(d) Slum Housing and Sewage in Mathare

(e) Outside of Building in Mathare

(f) Lot for Sale in Kariobangi

Figure 6 Overview of Site Observation

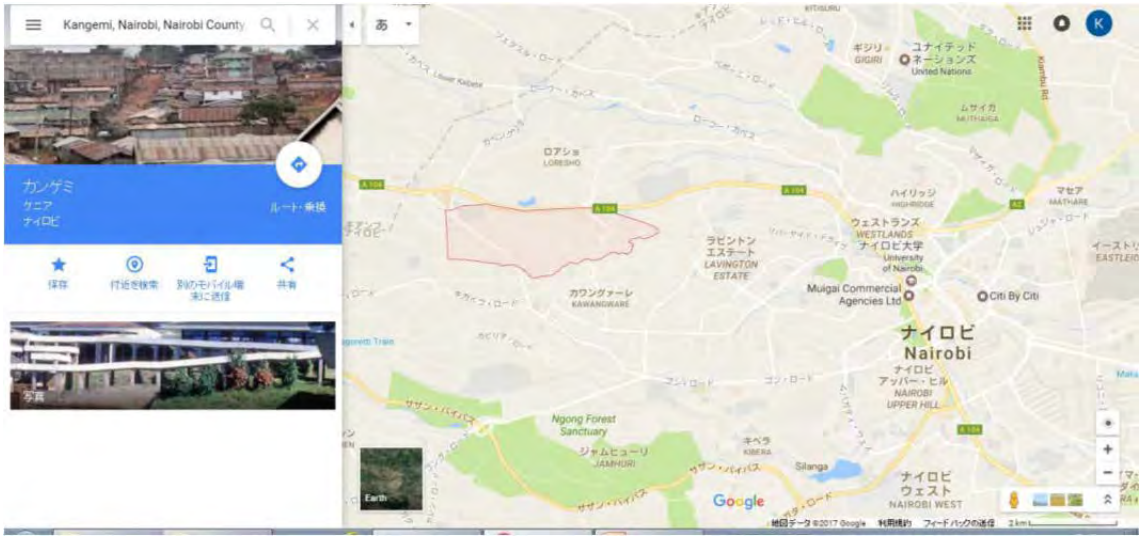


Figure 7 Overview of Kangemi Area

Figure 8 Overview of the Pilot Apartment

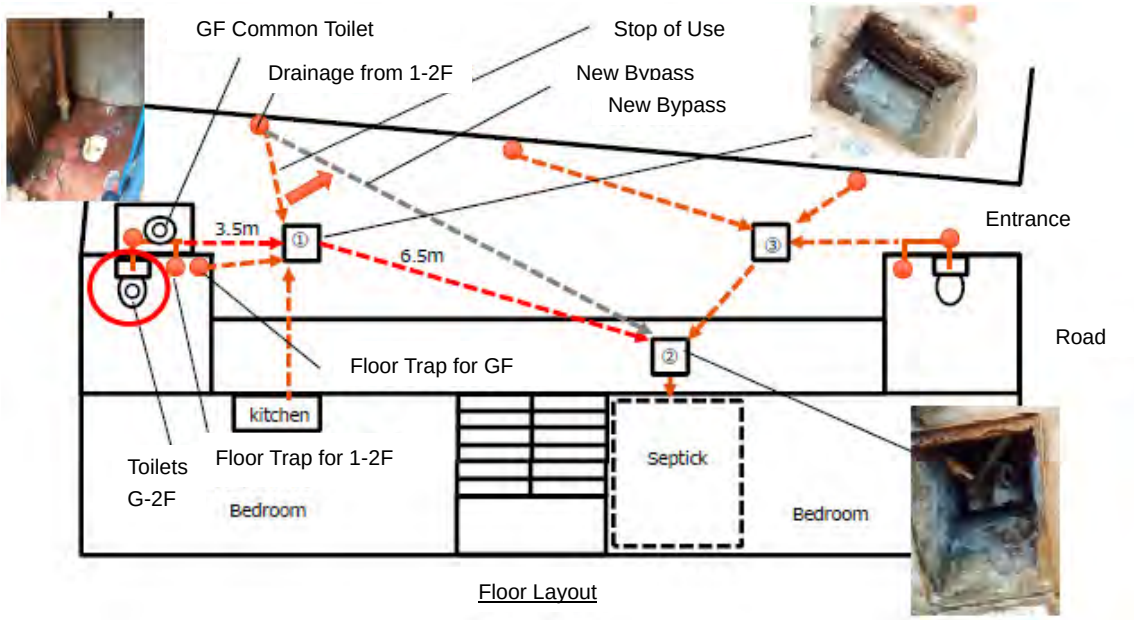


Figure 9 Layout of Drainage (After Pilot Intervention)

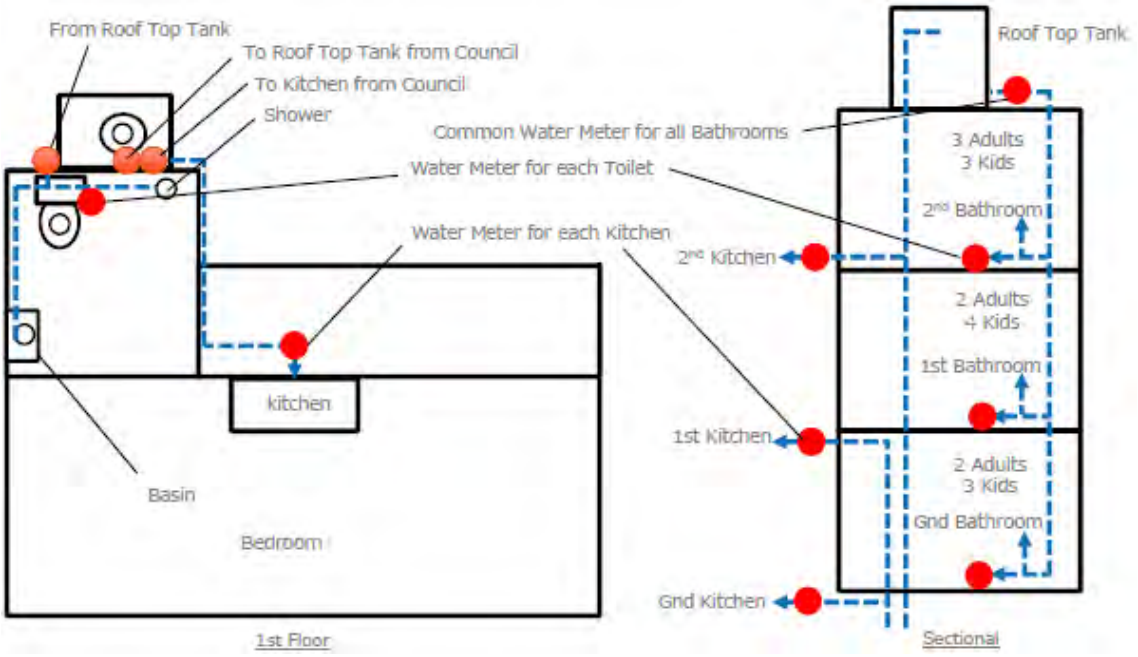
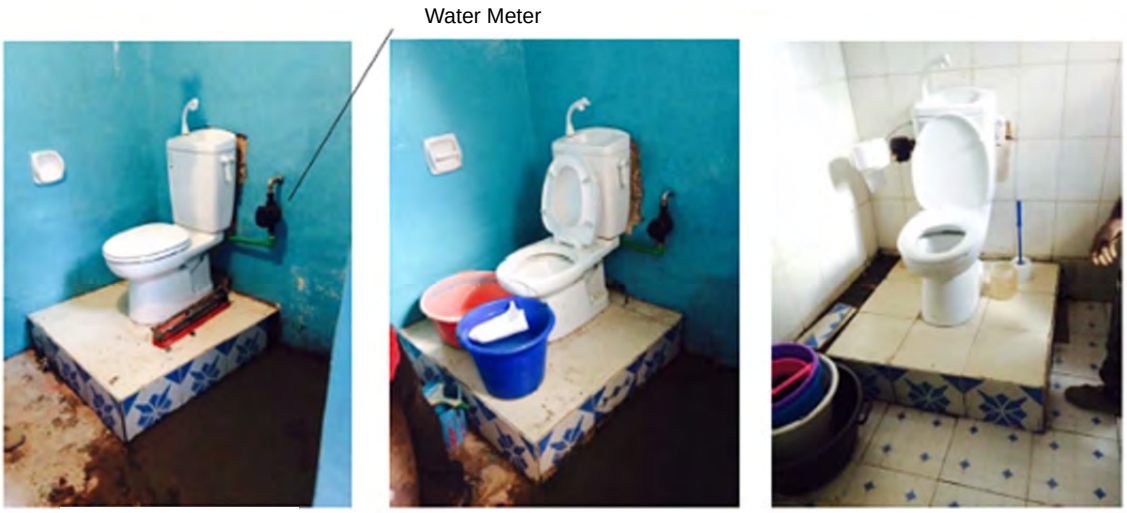


Figure 10 Location of Water Meters



GF Toilet 1F Toilet 2F Toilet

Note: Right side of the toilets is shower zone with drainage on the floor.

Figure 11 Installed Toilets

4.2.3 ODA Projects

JICA Kenya Office introduced a school project as a candidate for grassroots grant, but budget for toilets was too low to procure the MFTS. 10 projects of 10 million Japanese Yen are formulated annually in Kenya, and this possibility may be considered, when there are possible project and partner (e.g., counties interested in LIXIL's solutions).

It has been confirmed OSA, a external resource of this project, can be a trader (agent) to procure the product under this scheme.

4.2.4 Others

The project team visited a social venture called AfricAqua[3] that actively works on water issues in Kenya and undertook discussion for possible collaboration and demonstration. They expressed interest in the MFTS and willingness to use the product in exhibitions and their projects. Further coordination for collaboration in various forms continues.

4.3 Examination on Local Marketing of the MFTS

Through examination of product design and price suitable to the local market, lower middle of pyramid (L-MOP) population is identified as a segment with high demand for the MFTS. This targeting is relevant size of the L-MOP population is big in urban areas and they are likely to live in housing with unstable water supply.

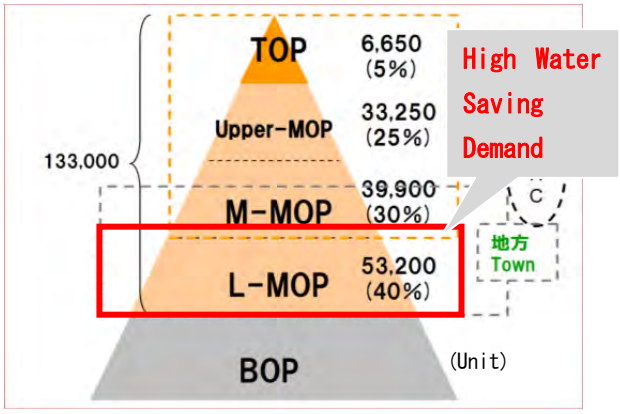


Figure 12 Structure of Toilet Market in Kenya

However, income of the segment is not high, and it makes affordable price of toilets low. As it is difficult to enter into the market with original cost structure, various measures to improve it are considered. In addition to design and production center, incentives and financial support are also considered, as all of them largely affect cost for selling.

4.3.1 Local Needs and Market Environment

Local needs and market environment are examined as follows.

[Growth Potential] Continuing growth of the market is expected, as GSP per capita and the number of building steadily grow more than 8% per annum.

[Customer]

Private Housing: Residential buildings for high income population are developed basically in a

[3] It initiates a number of projects for water supply and public toilets and receives funds from international donors and multinational companies (for CSR activities).

project basis, and borehole in the area backs up constant supply of tap water. Also, they can access water easily from arterial network for cheaper cost than the poor. Therefore, their need for water saving is low. Housings for L-MOP are located further from arterial network of water and face difficulty in water management due to frequent disconnection and lack of back up borehole. They however use flush toilets and have high need for water saving.

Private Non-housing: Non-housing market is mainly of high-end properties that can manage water supply, and need for water saving is low.

Government: Financial conditions of the public sector cannot afford expensive products. For example, National Housing Corporation (NHC) sets its procurement cost of toilets for L-MOP housing as 50-100 USD. However, there is a case that Water Services Board (WSB) introduced water saving toilets in a project for water supply improvement around Kisumu where people were strongly dissatisfied with water supply.

International Development Partners: International development partners such as the United Nations, World Bank, African Development Bank, etc. pursue maximum beneficiaries by minimum investment in principle in their project appraisal, so high price products are not likely to be considered as their option. Cost examination is important for proposal to such organizations. While UN-HABITAT focuses on technical assistance and capacity development rather than project investment, it plans supply of housing for refugees by financial assistance from the government of Japan.

[Competition] European companies are competitive in the markets of High-MOP and above. L-MOP is the main market of this business, but Chinese and Indian products that are widely sold for 25-100 USD there.

[Others] Through demonstration, local stakeholders raised points to be considered for localization such as: durability (especially of exposed valve, mechanical parts, etc.) for use in public toilets, simplification/explanation of handling lever, direction of installation of squat types (Kenyan users face door in contrary with Japanese), and so forth.

[Summary] High demand for water saving has been identified in the big market of low-end housing, while it is supposed to keep growing by 8% a year along with growth of population and GDP. On the other hand, it is required to lower costs for both private and public markets, as international development partners and local governments tend to limit their expenditure.

4.3.2 Customization and Pricing of the Product

The project team surveyed price of conventional toilets and willingness to pay for the MFTS in the L-MOP market and identified an acceptable rate of water saving premium on the product. Based on the result, appropriate retail price for the market has been set, which can be realized by production in South African factories of Grohe Dawn that is a LIXIL's subsidiary.

The MFTS functions with adequate volume of water for sweeping wastes. One way to ensure this is to use sewer water in a septic tank with a pumping system, but contractors want to avoid it due to complexity in design, construction, and maintenance. Also, initial and operational cost for the system may cancel out water saving benefits.

As an alternative solution to the pumping system, it has been proved that shower water can carry wastes when it flows in a same pipe of toilets in a building. This mechanism is validated in the pilot site of housing as described in the previous section.

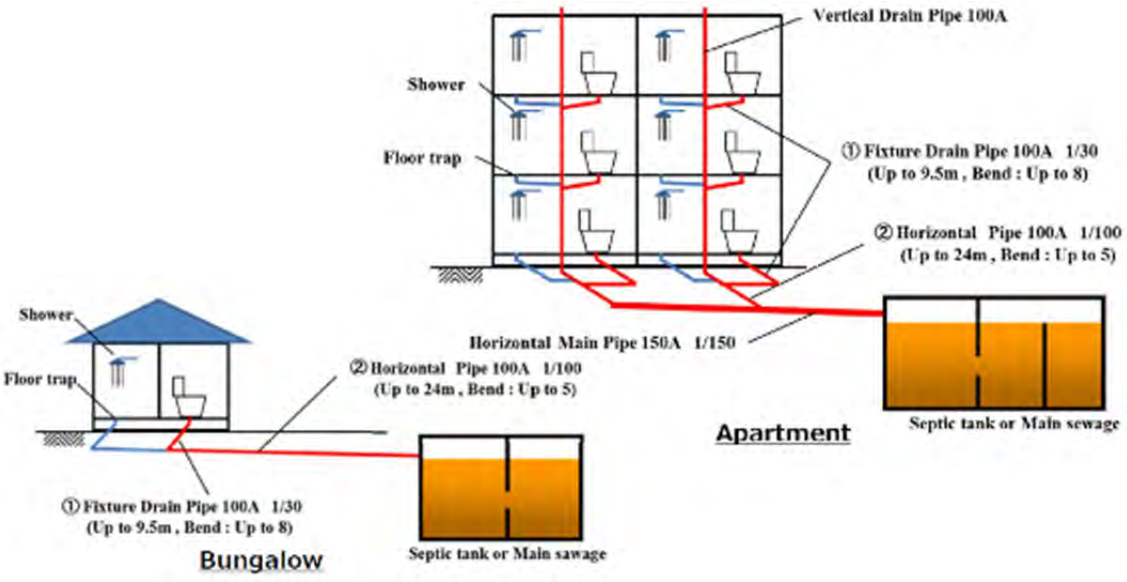


Figure 13 Diagram of Waste Carriage with Shower Drainage

Expensive pumping system can be replaced by effective use of other drainage water for carrying wastes. If this can make the retail cost less than 150 USD, market opportunities will expand not only in the L-MOP market but also in international aid and public markets.

4.4 Seminars and Technical Trainings on the MFTS

Important points for promotion of the system include transfer of technology to install the MFTS and plumbing, specification and certification of the product as well as awareness raising of the system. Key concepts can be defined as follows.

Specification: It is targeted to define a new category of water saving toilets as a standard specification for construction projects of public agencies. Once it is applied, competitors will be limited.

Certification: Establishment and acquiring of certification such as eco label is expected to facilitate application to environmental projects and bring incentives.

4.4.1 Approach for Specification

A certain scale of public properties can be a target of promotion. As a first step, it is necessary to understand how and by whom housing equipment is procured in Kenya to plan effective ways of promotion. The project team interviewed stakeholders and figured out a decision making structure. Figure below summarize a representative flow of design and procurement.

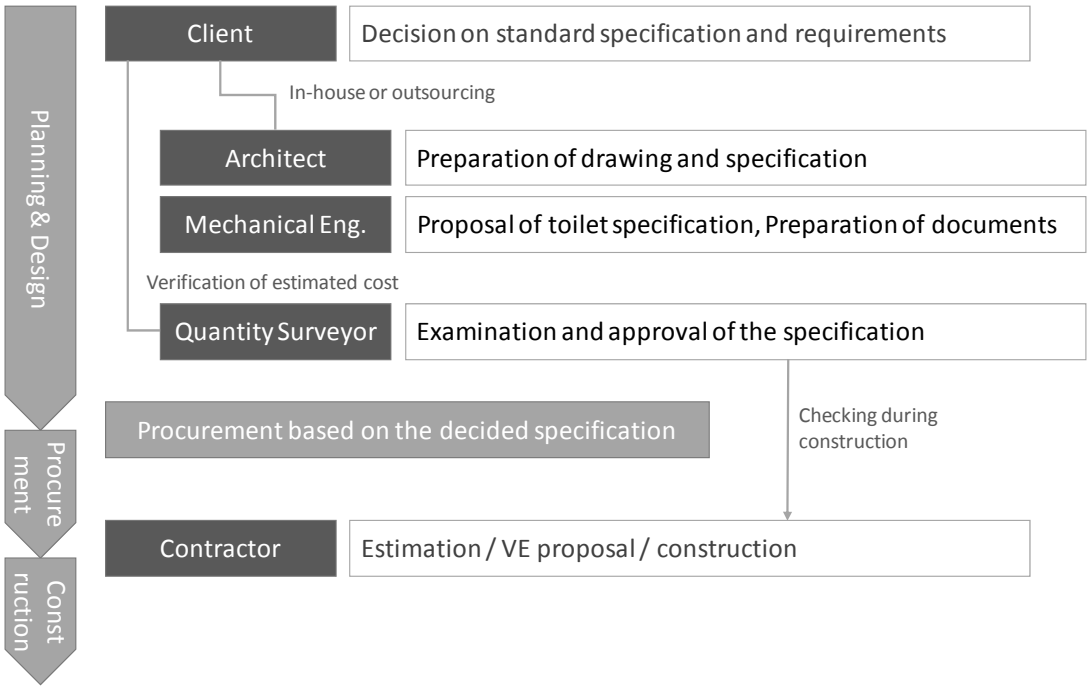


Figure 14 Flow of Public Construction Projects in Kenya

Role of and promotion approach to stakeholders shown in the figure are described below. It was found that "client" and "mechanical engineer" have strong influence on the decision whether to apply eco-friendly toilets.

Client

Major public project owners undertake planning and procurement based on their own standard specifications for construction works. If they adopt and define water saving toilets in their

specifications, possibility of utilization of the products would increase.

Thus, a category of water saving toilets should be set properly in the standard specifications. The first step is to discuss with organizations such as the Ministry of Transport, Infrastructure, Housing and Urban Development (MTIHUD) about the new category and to propose necessary technical criteria (e.g., flush volume, etc.). At the same time, sensitization on benefits (e.g., saving of water tariff and conservation of water resource) is needed, so that clients expand specification of water saving toilets.

Architect

In a planning stage, architect elaborates details of design drawing and specifications for procurement. Technical organizations managing a number of construction projects usually employ in-house architects, while others such as the Ministry of Education and the Ministry of Health are supposed to outsource the process to architect offices. In principle, specification in design defines performance required to applied products. There are cases when knowledgeable architects make more specific proposal to their client, it would be beneficial to sensitize architects on advantages and design conditions of the MFTS through seminars or workshops for expanding opportunities for application of the product.

Mechanical Engineer (ME)

ME is in charge of planning of toilets. Clients assign ME in some cases, while architect takes this role in other cases. MEs are important players for promotion of the MFTS, as they propose specifications of toilets and plumbing and prepare bidding documents. They are also important targets of sensitization of the MFTS for promotion.

Quantity Surveyor (QS)

QS has strong influence on public procurement process in Kenya. Bids cannot be ordered without approval by QS after their assessment of design and cost under conditions given by the client. QS may be a barrier against the specification of water saving toilets in design, as their priority is on cost rather than social impacts. In this sense, QS is a key player, and appropriate approach should be considered to obtain approval from the QS.

Contractor

Contractors submit quotation in response to requirements for works. Except for cases of value engineering proposal, they basically follow specifications and construct. Taking this into account, it is not likely that contractors propose expensive MFTS, when it is not specified in bidding documents. Meanwhile, there is a necessity to disseminate construction technology for making them install the MFTS correctly, when required.

Others

In private projects, clients usually specify toilets to be applied, while architects may propose. Particularly in cases of small scale construction by individual property owners, they directly approach builders and select parts and equipment together within their budget, by skipping architects. Show rooms to present the product would be effective to reach such customers in the future.

4.4.2 Approach for Certification

Recent Trend

Survey found no functioning certification programs of water saving or eco products in Kenya. [4] Kenya Green Building Society (KGBS), a private entity established on April 2015, introduces GreenTag certification for environmental friendly building equipment and GreenStar for buildings of high environmental performance. These certifications are utilized mostly in South Africa and Australia. Also, they promote American certification called LEED for environmental buildings in Kenya. Primary targets of such certifications in Kenya seem to be large scale commercial and office properties.

On the other hand, framework of EcoMark Africa (EMA) is being established as a continental wide certification, but it was not effective as of 2016. Target sectors in the primary stage include food and agro-forestry products, while it will extend to the construction stage in the following stage.

Implementation Structure

Considering the circumstances mentioned above, this project aimed at establishing a new product certification program for a specific sector. Also, the team worked for using the certification as a basis for product recommendation through green procurement regulation or financial incentives such as tax exemption or subsidy. Legislative and policy backup was found to be critical to realize the schemes. Thus, functional promotion scheme has to be designed with three fundamental elements of “certification”, “incentive”, and “legislation” as well as involvement of relevant stakeholders.

For a working platform toward such promotion framework, establishment of JCC with multiple organizations was aimed. NCA was supposed to be a chair organization of the committee, and it was agreed in the memorandum of understanding (signed on 22nd February 2016). It was targeted t o achieve outputs shown in the table below through activities with the JCC.

[4] In the housing sector, the Energy Regulatory Commission enforces regulation to equip solar water heating.

From left: James Mwangi, Housing Department, Moses Gatuna, Deputy Director of Housing, Jane Mwangi, Director of Housing

Photo 7 Discussion with MLHUD

Center: Eng. Maurice Akech, GM, Research, Business and Development & Capacity Building, Right: Samson Lukoba, Corporation Secretary Legal

Photo 8 Discussion with NCA

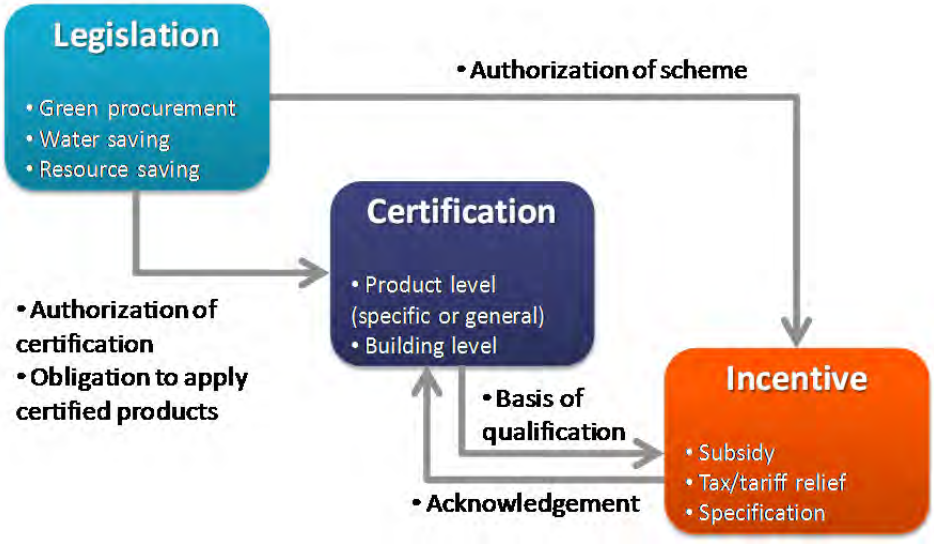


Figure 15 Elements for Establishing a Promotion Scheme

Table 5 Outputs and Indicators for Establishing a Promotion Scheme

Output	Indicator
1) Define "green products"	− Committee's agreement on the process to define a new product category and criteria
2) Design certification/ evaluation process	− Agreement on the role by the committee members − Agreement on the draft process outline − Launching of the certification
3) Make a list of green products	− Publication of the list of green products
4) Define "green buildings"	− Committee's agreement on the definition
5) Formulate legislative structure for promotion of green products/ buildings	− Agreement on the concept and road map − Draft paper for lawmaking process − Approval and enforcement of the law

Key Considerations

The project team built a consensus on common ground for this task through discussion. Major points are summarized below.

1) Level of Certification: Product or Building

While green building certifications have emerged from the private sector in Kenya (e.g., KGBS promotes LEED originated from the United States and Green Star from Australia / South Africa), there is no established program certifying individual equipment for buildings. Such product level certification is more desirable for evaluation and promotion of the MFTS. NCA agreed on this point.

2) Establishment of a New Program or Utilization of an Existing Framework

Establishment of a new certification program allows flexibility in system design, while it requires a huge workload. If an existing framework can be used, preparation and adjustment may be easier.

Eco Mark Africa (EMA), whose secretariat locates in Nairobi, sets up an eco-mark program which will be applicable across the continent. Although current targets of EMA are limited to agriculture, forestry, fishery, and tourism sectors, it will be extended to the building sector in the near future. Hence, it was confirmed to seek a possibility to exploit the EMA framework and coordinate with stakeholders.

3) Evaluation: by Public or Third-party Organization

Evaluation for certification is done by a public organization or third party evaluators. Assuming use of the EMA framework as mentioned above, its process should be checked and followed.

4) Legislation: Certification Backed up by Legislation/Policy or Stand Alone Program

National legislation such as energy saving act can authorize and enforce certification. However, its process will be time consuming and highly uncertain. Therefore, substantial examination of certification should come first, and momentum for making legislation should be built through pilot programs, lobbying, and so on.

Schemes to be Considered

There is a variation of schemes by combination of certification incentive, and legislation. Following 5 schemes are subject to consideration.

A) Regulation of Product Performance

Law or regulation sets a certain standard and enforces production or consumption of products

satisfying the standard. For example, regulation of equipping solar water heating that complies with standards set by NCA is a case of this scheme.

B) Green Procurement

Public (and private) organizations are obliged/recommended to purchase environmental friendly products. Environmental certification of products can be used as a standard. For example, Japan has green procurement act linked with eco-mark certification as its operational standard.

C) Subsidy/Rebate

Consumer (property owner) purchasing certified products can receive subsidy or payback as rebate. As an example in Japan, energy saving housing point program is operated for building levels. Several states in America have rebate program for water saving equipment.

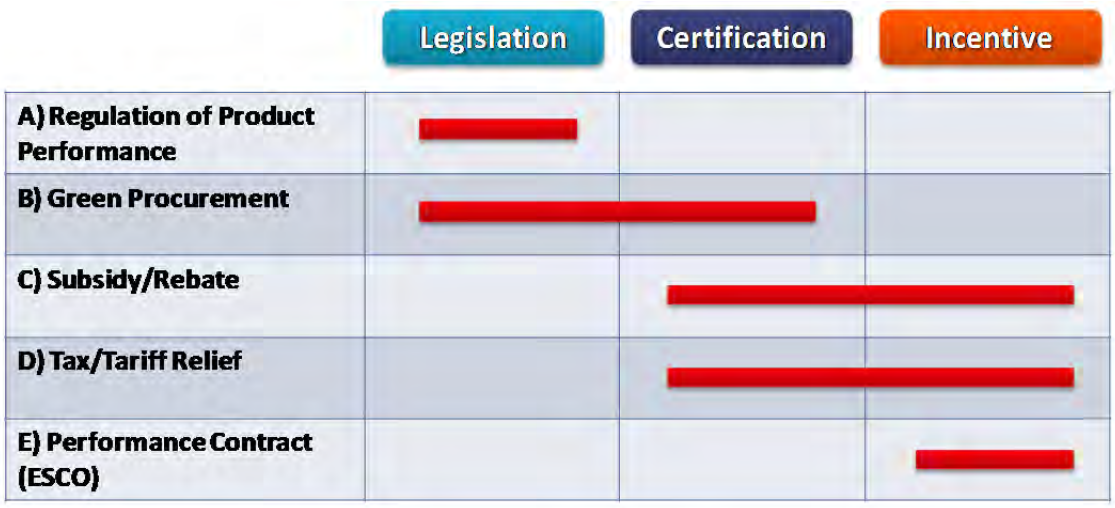
D) Tax/Tariff Relief

Producers of certified products can enjoy advantageous tax rate and a lower selling price.

E) Performance Contract

Special form of contract between consumer (owner) and service provider (producer) can be used to lower initial price for installation with recovery from saved operational cost in comparison with other service/product for a certain period. Energy Service Company (ESCO) is an example of this scheme.

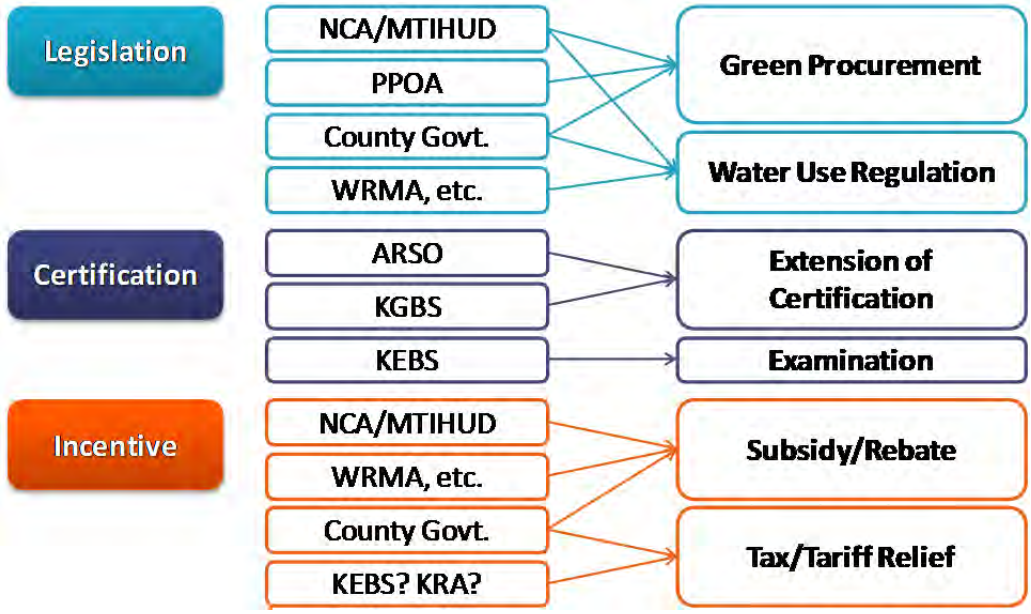
Table 6 Relation between Promotion Schemes and Components



Among these schemes, effective and feasible one for Kenya should be designed and agreed by stakeholders. Table below summarizes advantages and challenges/considerations of each scheme, and figure below shows related organizations.

Table 7 Outline of Activities in Major Field Trips

Scheme	Advantage	Challenge/Consideration
A) Regulation of Product Performance	✓ Powerful without financial input	✓ Who can regulate ✓ How to structure and manage?
B)) Green Procurement		
C) Subsidy/Rebate	✓ Direct incentive to the market	✓ Financial resource?
D) Tax/Tariff Relief		
E) Energy Service Company	✓ No new (public) institutional arrangement	✓ Restriction on such contract? ✓ Complication for customers?



Abbreviations: ARSO = African Organization for Standardization, KEBS = Kenya Bureau of Standards, KGBS, Kenya Green Building Society, KRA = Kenya Revenue Authority, MTIHUD = Ministry of Transport, Infrastructure, Housing and Urban Development, NCA = National Construction Authority, PPOA = Public Procurement Observation Authority, WRMA = Water Resource Management Authority

Figure 16 Involvement of Kenyan Stakeholders with Expected Promotion Schemes

Stakeholder Meeting

NCA and LIXIL held a General stakeholder meeting for discussion with stakeholders to materialize actions toward establishing promotion scheme on 25th October 2016. Program of the meeting is shown below. Meeting report is included as an annex.

Table 8 Organizations Participated in the Meeting

National Construction Authority (NCA)
LIXIL
Ministry of Transport, Infrastructure, Housing and Urban Development (MTIHUD)
Kenya Bureau of Standards (KEBS)
Kenya Green Building Society (KGBS)
African Organization for Standardization (ARSO)
Kenya Property Developers Association (KPDA)
Kenya Private Sector Alliance (KPSA)
JICA Kenya Office

Table 9 Program of the General Stakeholders Meeting

08:30 – 09:00	Registration
09:00 – 10:00	**Session 1: Opening**
09:00 – 09:05	Welcome remarks: *General Manager of the National Construction Authority (NCA)*
09:05 – 09:10	Remarks: *Executive Director of the National Construction Authority (NCA)*
09:10 – 09:15	Remarks: *Permanent Secretary of the Ministry of Transport, Infrastructure, Housing, and Urban Development*
09:15 – 09:30	Introduction of participants
09:30 – 10:00	Introductory presentation and demonstration of water saving technology: *Satoshi Kitamura, LIXIL Micro Flush Toilet Project Team*
10:00 – 10:20	**Tea/Coffee Break**
10:20 – 12:30	**Session 2: Promotion Scheme of Green Products**
10:20 – 10:30	Introduction of JICA-funded Promotion Project on Micro Flush Toilet System: *Izumi Sakata, LIXIL Micro Flush Toilet Project Team*
10:30 – 10:50	Introduction of global practice of promoting green products: *Koichiro Tamura, LIXIL Micro Flush Toilet Project Team*
10:50 – 11:10	Introduction of trend and challenges for promotion of green products in Kenya: *Kenya Green Building Society (KGBS)*
11:10 – 11:30	Introduction of the Africa Eco Mark Mechanism: *African Organization for Standardisation (ARSO)*
11:30 – 12:30	Discussion on (1) possible promotion schemes in Kenya and actions to be taken and (2) applicability and process of certification system of green products in Kenya: *moderated by LIXIL Micro Flush Toilet Project Team*
12:30 – 12:40	Preparation of summary

12:40 – 13:00	**Session 3: Closing**
12:40 – 12:50	Summary and adoption of discussed roles and actions of participants: *moderated by LIXIL Micro Flush Toilet Project Team*
12:50 – 13:00	Closing remarks: *NCA*
13:00 – 14:00	**Lunch**

Note: Time is as originally scheduled.

(a) Presentation by LIXIL

(b) Product Demonstration

(c) Meeting Participants

(d) Discussion

Figure 17 Scenes of the Meeting

This meeting discussed a feasibility of the establishment of certification and incentive schemes for promoting the MFTS and consensus building in the JCC framework and reached resolutions shown in the box below. Although participants recognized the importance of promoting green technologies and discussing in a technical committee, they could not elaborate prospective promotion scheme in this meeting.

Resolution of the Meeting

1. **Participants recognize importance and necessity of promoting green products in Kenya to reduce consumption of resources.**
2. **It is recommended to formulate a Joint Technical Committee that consists of both private and public sectors.**
3. **Terms of reference of the Joint Technical Committee will be prepared by NCA and LIXIL for making concrete actions.**
4. **The Joint Technical Committee is expected to demonstrate advantages and indicators to promote green technologies.**
5. **Sensitization activities are recommended as short term and continuing actions.**
6. **All participants of this meeting are invited as a member of the Joint Technical Committee.**

The project team had a follow up meeting to discuss further steps. Formulating a Joint Technical Committee (JTC) was proposed for establishing the promotion scheme.

Table 10 Proposed Structure of the Joint Technical Committee

Committee	Member Organizations	Task	Expected Output
JTC_1	NCA, KGBS, WRMA, PPOA, MTIHUD, Nairobi, Mombasa, Counties (e.g., Machakos, Kiambu)	Green Procurement	✓ Promotion of green products/technologies ✓ Support for green products
JTC_2	ARSO, KGBS, KEBS, NCA, NEMA	TBD	TBD
JTC_3	JICA, NCA, LIXIL	TBD	TBD

Abbreviations: ARSO = African Organization for Standardization, JICA = Japan International Cooperation Agency, JTC = Joint Technical Committee, KEBS = Kenya Bureau of Standards, KGBS, Kenya Green Building Society, KRA = Kenya Revenue Authority, MTIHUD = Ministry of Transport, Infrastructure, Housing and Urban Development, NCA = National Construction Authority, NEMA = National Environmental Management Authority, PPOA = Public Procurement Observation Authority, TBD = To Be Discussed, WRMA = Water Resource Management Authority

5. Evaluation of Implementation Results

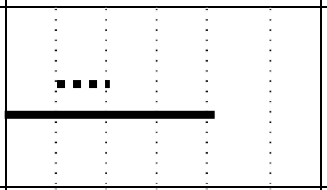
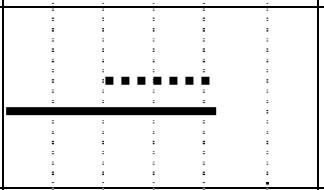
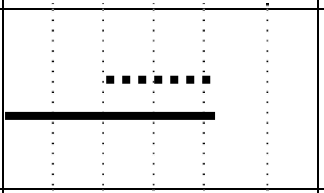
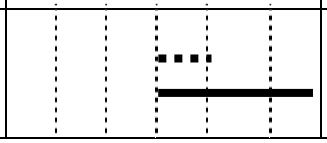
5.1 Outputs in Social Contribution

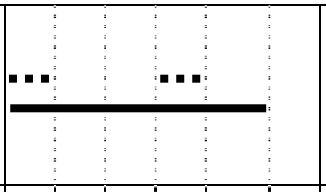
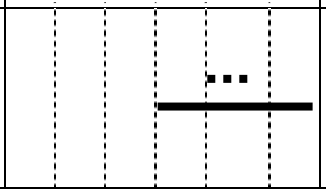
This project raised strong awareness of more than 10 public organizations on the necessity of water saving and effectiveness of the MFTS. Also, potential future customers such as private property owners, urban dwellers, and various organizations were also sensitized. While these are positive outputs of tasks 1-①② in the table below, establishment of certification and incentive has not been achieved. Issues behind it are shown in the following section.

This project is preceded by mass selling of the MFTS in the local market and has installed actual unites in pilot and demonstration basis. Therefore, actual impacts water saving in city and regional levels will come out in the following phase of the business.

5.2 Outputs in Business, Remaining Issues, and Solutions

Table below shows status of 5 targets at the end of the project.

#	Tasks in This Project	Planned/Actual Schedule	Achievement and Evaluation		Remaining Issues and Solutions
		1st Field / 2nd Field / 3rd Field / 4th Field / 5th Field / 6th Field			
1-①	Holding demonstration workshops		Done	・Valuable feedbacks from major public and private organizations	
1-②	Presenting benefits for users and development impact		Done	・Major public and private organizations	・Necessity of continuous monitoring at the pilot site for collecting real data
2-①	Collecting needs for improvement of the product		Done	・Identification of information and measures for improvement especially on plumbing and drainage	
2-②	Examination of price and marketing strategies		Done	・Setting strategies for localization and pricing based on local survey	
3-①	Holding seminars on the MFTS to stakeholders		Done	・Holding the general stakeholders meeting	・Big demand for training skills of installation and maintenance

3-②	Discussing conditions to establish standard and specification		Remain-ing	・Launching discussion for establishment of promotion schemes among multiple organizations	・Cases that promotion of an individual product is not effective
3-③	Assisting documentation on technical standard and specification		Remain-ing	・Not established real certification and incentive schemes	・Long time required for completing national process to build a new mechanism

5.2.1 Outputs in Business

Outputs in business side of this project are as follows.

① Raising awareness of the MFTS through promotion and demonstration

Demonstrations of the product were done more than 10 times to property owners for a pilot installation, public and private organizations, and key stakeholders at the general stakeholder meeting as well as at individual sites. Pilot test in a private rental apartment revealed that water use per household was saved by 25%. Furthermore, lots of counties showed interest in the product at the TICAD 6. These contributed to raising awareness of the product before the launch of selling in the local market.

② Establishment and strengthening of sales channel of the product in Kenya

LIXIL can exploit network of Kenyan branch that has been established and office of its subsidiary company. Through this promotion project, the network was extended to organizations that can collaborate in introducing water saving technology and property managers specializing in low and high income housing that are the main business target.

③ Adjustment of the product and its price to customers' needs and the local market environment

The project team identified necessary information and measures for improvement especially on plumbing and drainage through product demonstrations, interviews with various stakeholders, and site visits. Also, appropriate local selling price was analyzed in consideration with water saving premium and the way to realize cost reduction by producing in South African factories of the LIXIL group. It will enable cost reduction to 150USD, while 500USD is an import price from Japan.

④ Assistance for establishment of standard and specification for promotion of the MFTS

The project team explored designing promotion scheme through discussions with NCA and related organizations. General stakeholders meeting was held with multiple organizations on October 2016, which proposed discussion toward establishment of a JTC. Although public

organizations tend to take a long time in decision making, this promotion project at least opened a forum for discussion amongst a number of local organizations for establishing promotion scheme.

⑤ Obtaining approval and certification from related organizations in Kenya such as public administration, architects, developers, and construction companies

The project team received opinions on the product and its installation from the government, architects, developers, real estate managers in Kenya and confirmed no problem in application. No particular certification has been received, as there is not functioning and appropriate one and the product has not been sold in the market. Certification is expected to be linked with incentive schemes for promotion, but it cannot be easily realized and should be followed up.

5.2.2 Remaining Issues and Solutions

The project team identified following issues and lessons for achieving the goals of this project. Possible solutions are also summarized with tabulation of an action plan.

Impact Monitoring and Presentation

It took time to select a proper pilot site for confirmation of conditions of area, building, and owner's will. However, through the process, the project team obtained real and detailed information on the real estate market, water supply, and living conditions of target customers around Nairobi. The pilot site should be kept monitoring for collecting data of actual impacts in Kenya. The data should be presented in an effective way to show advantages in operational costs and social benefits.

Barrier against Promotion with an Individual Technology and Target Segments

Although positive responses to the MFTS were given from all market segments, wealthier customers do not usually purchase toilets for existing buildings but are more likely to procure them with other equipment in construction where architects and mechanical engineers coordinate. This is not only about the case of toilets, but individual products are likely to face difficulties in promotion.

On the other hand, owners of apartments in the lower income market, which is our target segment, tend to select housing equipment in hardware shops around them. In addition, they usually hire regular plumbers for installation unlike coordinated procurement in the wealthy market.

The MFTS requires particular arrangement of plumbing, as it has to drain wastes with fewer

volume of water. In order to address this, promotion and demonstration targeting property owners (i.e., decision makers), plumbers, and hardware shops will work effectively. In addition, local employees will be mobilized for promotion and maintenance services along with dissemination of the product.

Necessity of Capacity Building

The MFTS has to be installed with special attention on plumbing arrangement to achieve full functionality. For wider dissemination of the product, skills of installation and maintenance of the system have to be developed. As NCA also has a big interest in improvement of construction skills, there should be a demand of training that will be mutually beneficial to both parties. Therefore, continuous discussion will be held with NCA for the training opportunities.

Time and Commitment for Acquiring Incentive Schemes

Although the project team examined and discussed on promotion schemes combining certification, legislation, and financial incentives, it was found that national level process took a long time for realizing them. Most stakeholders acknowledge the importance of promoting green products, but it is difficult to build an actual incentive scheme. There are a few environmental certifications for the building level, but they remain on a voluntary basis at present. Gaining institutional back up would first require achievements and data accumulated from pilot projects and further benefits as a packaged solution as mentioned above. Therefore, proper actions will be considered, while collecting data and practical cases as well as following stakeholders' activities.

Further Promotion in Conjunction with Project Formulation Survey / Promotion Project

In order to address challenges described above, promotion as packaged and standardized green housing technologies is expected to be more appealing and competitive due to maximization of environmental impact and cost reduction in design, procurement, construction and operation. More specifically, there will be a way of collaboration with a future Project Formulation Survey / Promotion Project that will aim at standardizing design, construction, and equipment for energy/resource saving, sanitary, and safe housing constructions, as explained section 6.3.2 later. Also, MFTS could be a component of technologies in training and capacity building activities in the future project. Coordination will be made when such trainings are actually planned.

Pricing and Preparation for Product Supply

Subsidiary firm GROHE DAWN will be in charge of production, as explained in section 6.2.3 later. Next steps include finalizing specifications, pilot production, and examining costs. Also, relevance of local pricing will be examined through promotion and demonstration in the field.

Table 11 Remaining Issues and Action Plan

Remaining Issue	Action	FY2017 1Q	FY2017 2Q	FY2017 3Q	FY2017 4Q	FY2017 1Q	FY2017 2Q	FY2017 3Q	FY2017 4Q
Use of Monitoring Data	The pilot site should be kept monitoring for collecting data of actual impacts in Kenya. The data should be presented in an effective way to show advantages in operational costs and social benefits.	Present Site		New Site (Nairobi and Major Cities)					
Promotion with an Individual Technology	Promotion and demonstration targeting property owners (i.e., decision makers), plumbers, and hardware shops will be planned for appealing to them.		Recruiting	Promotion					
Capacity Building for Installation and Maintenance in the Field	As NCA also has a big interest in improvement of construction skills, continuous discussion will be held with NCA for the training opportunities.		Cordination		Implementation of Training				
Establishment of a Practical Promotion Scheme	As gaining institutional back up would first require achievements and data accumulated from pilot projects, substantial business implementation will be focused along with coordination with NCA.	Coordination / Follow up of NCA's Progress							
Further Promotion through JICA Schemes	There will be a way of collaboration with a future Project Formulation Survey / Promotion Project that will aim at standardizing design, construction, and equipment for energy/resource saving, sanitary, and safe housing constructions			Adoption and Implementation					
Pricing and Preparation for Product Supply	Next steps include finalizing specifications, pilot production, and examining costs with a subsidiary fjrm. Also, relevance of local pricing will be examined through promotion and demonstration in the field.	Specification, Test		Preparation		Production			
			Pricing						

6. Business Plan after the Project

6.1 Objectives and Goals of the Business

6.1.1 Outputs Expected from the Business to the Local Society and Economy

Background in Kenya

Rapid urbanization in and around Nairobi has brought a lot of issues in infrastructure along with continuing growth of population and GDP of Kenya. Water resource in the country is endangered in the future, and due to shortage of supply, urban areas suffer from constant restriction of days of supply by area or stoppage lasting for a couple of weeks. Such problems are more likely to occur in dense residential areas for low income population, and it imposes on the residence the burden to store water in a number of jerry cans (i.e., 20L plastic bottles) in their apartment during one or two days of water supply in a week. To make things worse, their houses equip low price toilets that consume 10L of water for every flush, so they are burdened to pour about 5L of water from a bucket for using the toilet every time during outage of supply.

(a) Storage of Water during Supply

(b) Tanks in a Room

(c) Tanks and Buckets on a Corridor

(d) Western Style Flush Toilet

(e) Squat Type Flush Toilet

Figure 18 Living Conditions to Be Improved by the Business

Social Impacts

Quality of Life (QOL) of residents in low income areas will be improved through reducing their labor and time for storing and pouring water by installation of the MFTS which can significantly reduce flush water from 10L to 1L. Furthermore, water saving toilets can contribute to conservation of water resource in Kenya.

Currently Kenya Revenue Authority prepares for introducing value-added tax on sewer services, and it is deemed to further stimulate needs on water saving once applied.

6.1.2 Outputs Expected from the Business (Business Perspectives)

Table below shows estimated sales plan of the MFTS in Kenya with assumption of retail price as 12,500 KES. It plans 250 million KES of sales in EAC countries and South Africa in 2022.

Table 12 Assumed Sales Plan of the MFTS

		2018	2019	2020	2021	2022
		Kenya	Kenya	EAC, South Africa	EAC, South Africa	EAC, South Africa
Shipment	Unit	3,000	6,000	10,000	15,000	20,000
Unit Price (DDP)	KES	12,500	12,500	12,500	12,500	12,500
Sales	KES	37,500,000	75,000,000	125,000,000	187,500,000	250,000,000

6.2 Business Plan

6.2.1 Business Outline

Although basic business model is same as that of suppliers of ordinary sanitary-ware, site demonstration will be fully utilized for promotion and awareness raising of technical features of the MFTS to customers. In addition, certification of eco products will be used for promotion in the future when it is established.

6.2.2 Target of the Business

High income residences are basically developed by project basis, which drills own borehole as a backup for constant tapped water supply in its area. Also, such properties are usually located close to arterial water pipeline, and it enables residents to access cheaper water than the poor population and lowers their need to save water. Likewise, public housings target relatively middle and high income and supply a certain amount of water for low price, so water saving demand is deemed low. On the other hand, low income housings are scattered in areas away from arterial water pipelines and do not have individual boreholes to address frequent stoppage

of supply. However, residents in these areas use flush toilet, so they have high demand for water saving and thus relevant as a target of the business. Size of the targeted market is estimated to be 83,000 units per year, 62% of 134,000 units as the whole size of toilet market. New buildings will be a priority target, as it is generally easier to install there in terms of prior arrangement and coordination of plumbing at planning and design stage.

Table 13 Conditions of Water Supply and Need of Water Saving by Segment

Pyramid in Cities	Profession (Example)	Income USD/month	Type of Residence	Stability of Supply	Sources and Price of Water (USD/m3)	Backup	Water Saving Need
TOP 5%	Executive	1,000 <	Sale	Good	Piped water (0.5) Borehole (0.5)	-	Low
H-MOP 33%	Finance Communication Service	500-1,000	Sale	Fair (Several per month)	Piped water (0.5) Borehole (0.5)	Tank	Low
L-MOP 62%	Public Manufacture Transport	150-500	Rent	Bad (5days per week)	Piped water (0.5) Vendor (3-10) (Borehole is expensive to drill.)	Tank Jerry Can	High
BOP	Slum	< 150	Rent	-	Vendor (3-10) (Borehole is expensive to drill.)	Jerry Can	-

6.2.3 Implement Structure of the Business

Business model demarcates responsibilities of development to LIXIL Corporation, marketing and service to LIXIL Kenyan branch, and manufacturing and distribution to a subsidiary, GROHE DAWN. It is planned to place the product in hardware shops and involve property owners and distributers through promotion and demonstration in various areas. Local staffs will be employed for services such as maintenance in accordance with business expansion.

Table 14 Implementation Structure of the Business

		Development	Manufacturing	Marketing	Distribution	Service
LIXIL		→				
	KENYA BRANCH			→		→
	GROHE DAWN (SUBSIDIARY)		→		→	

6.2.4 Schedule of the Business

Customization design has been already under consideration, and investment decision will be

made in the first half of 2017 (currently under consideration). Sales will be started from April 2018. Eco certification scheme will be established as a marketing tool, as soon as it is established.

Table 15 Schedule of the Business

Schedule		2017	2018	2019	2020
Planning	Decision on the Business	Invest		Addition	
Development	Customization Design				
Manufacturing	Setting up Production Line	Initial		Addition	
	Production				
Marketing	Sales and Operation				
	Use of Eco-certification				

6.2.5 Investment and Financial Plan

Initial investment will be done in 2017 and additional investment will be done in 2019. It is planned to mobilize running costs from own resource. It is aimed to expand the business to various cities in Kenya as well as Eastern and Southern Africa.

Table 16 Investment and Financial Plan

		2017	2018	2019	2020	2021
		Kenya	Kenya	EAC, South Africa	EAC, South Africa	EAC, South Africa
Facility Investment	mil. JPY	30	0	100	0	0
Increase of Operating Cost	mil. JPY	0	11	0	0	0
Self Finance	mil. JPY	30	11	100	0	0
Externaf Finance	mil. JPY	0	0	0	0	0

6.2.6 Competition Environment

European companies are strong in market of conventional toilets for H-MOP, and GROHE DAWN, LIXIL's subsidiary, have also penetrated into Kenyan market with toilets branded Vaal since 2015. Meanwhile, Chinese and Indian brands have strength in the targeted L-MOP market, and retail price ranges from 25-100 USD. However, there are no other products like the MFTS that can flush only with 1L of water.

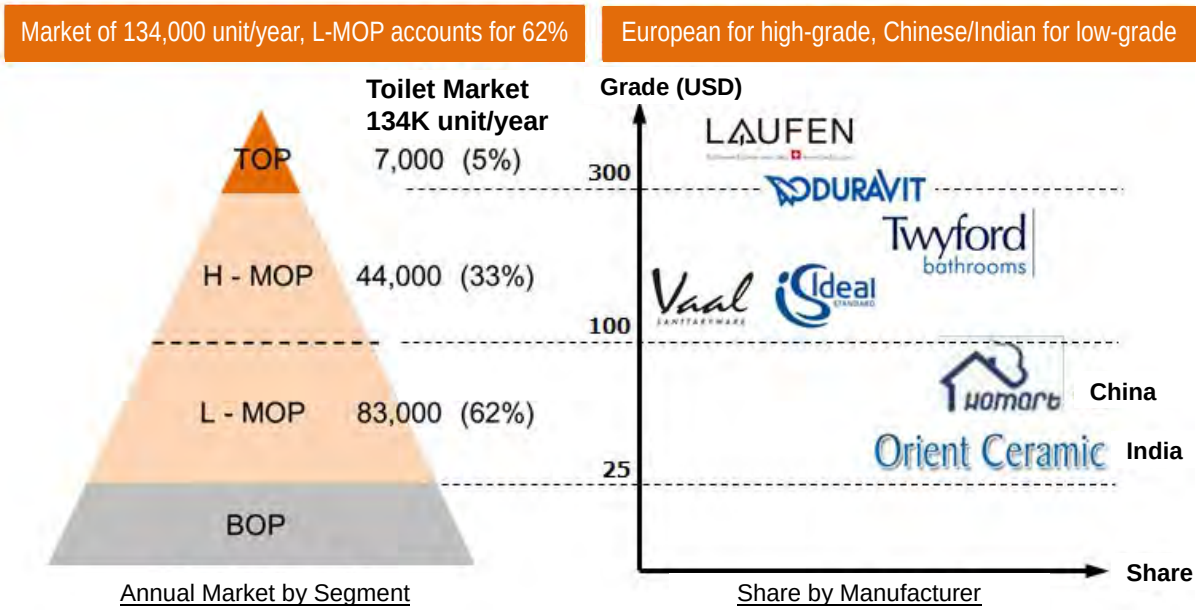


Figure 19 Share and Target Segment of Competitors

6.2.7 Challenges and Solutions for the Business

Although it is not crucial for usage, local plumbers are not skilled enough to handle special arrangement of piping for installation of the MFTS. Therefore, it is necessary to impart skills for installation and maintenance of the system for wider promotion in the market through training. NCA has a remarkable interest in improvement of construction technology, so training activities are mutually beneficial to both parties.

Although discussion for establishing schemes for certification and incentive has been opened among related organizations, further efforts have to be made in order to realize what can actually benefit the business. However, this is not an essential condition for launching the business, while NCA's initiative to handle the committee is respected for the time being. Necessary follow up can be made, and established scheme will be utilized.

6.2.8 Possible Risks in the Business and Measures

As already stated above, rapid urbanization in and around Nairobi has brought a lot of issues in infrastructure. Water resource in the country is endangered in the future, and due to shortage of water supply even in well established cities, some areas of dense low income housings suffer from stoppage lasting for even a couple of months. As the MFTS is a product designed for use with water supply, appropriate target areas will be selected in consideration with water supply ability in Kenya.

On the other hand, there is a risk of imitation, and patent of the product model sold in Japan has

expired, since it was acquired 30 years ago. Application for new patent has been submitted based on customized design for the African market, and it can be a measure against imitation.

6.3 Collaboration with ODA Projects

6.3.1 Necessity of Collaboration

As described in the background, there is a high necessity of realizing efficient water use in order to address serious water resource conditions in Kenya. JICA Kenya Office recognizes that "public and private sectors have to collaborate for standardization of housing plan and equipment as well as formulation of related laws and regulations (e.g., on building standard, energy saving, quality assurance)". Awareness on supply of quality housing has been aroused especially after building collapse due to flood in 2016.

On the other hand, this project learned that standardization of an individual technology requires long time, and this challenge is shared with promotion not only of the MFTS but also of other individual technologies. In order to overcome this, it would be more effective to consolidate a team among experts such as architect, contractor, equipment manufacturer, housing developer, etc and standardize housing construction with appropriate packaging of resource saving products and technologies, so that synergy of each component can solve development issues. Furthermore, construction cost can be saved, as standardization can reduce unnecessary work load. As NCA has shown interest in this approach and mobilization of know-how in Japan, there is a substantial demand of survey, promotion project, or technical cooperation involving related private companies for extending impacts based on activities done in this project.

Table 17 Issues in Kenya Expected to be Addressed by Product/Technology of the Private Sector

Development Issues	Housings in Kenya have been constructed in a short period of development boom without due attention to regulations in order to respond to rapid inflow of population into urban areas. Therefore, housing supply is not necessarily appropriate in terms of quality, cost, and resource, and it results in collapse of several buildings in cities like Nairobi in recent years (e.g., 6 stories housing apartment collapsed in Nairobi on 29th April 2016, and more than 30 died. Officials of Nairobi ordered to demolish buildings that were found to be incompliant or dangerous on 5th May of the year.). In order to overcome such circumstances, it is deemed necessary that public and private sectors have to collaborate in standardization of housing planning and equipment as well as formulation of related laws and regulations (e.g., on building standard, energy saving, quality assurance), as was experienced in Japan during the rapid economic growth in 1960s

Target Area	Nairobi Area
Related Public Organizations	NCA (National Construction Authority), MLHUD (Ministry of Lands, Housing & Urban Development), NHC (National Housing Corporation)
Related ODA Program/ Project	Promotion Project on Micro Flush Toilet System for Watershed Management and Improvement of Water Environment in Urban Areas in Kenya (LIXIL, November 2015 – April 2017)
Considerations	This issue should be tackled by a team of experts such as architect, contractor, equipment manufacturer, housing developer, and so on.
Product/ Technology/Know-how Expected to be Used	Know-how and technology to consolidate products and technologies appropriately for standardization and resource saving of housing construction

Source: https://www.jica.go.jp/sme_support/reference/other.html

Although several county governments and non-profit organizations have showed interest in the MFTS, their financial resource seems to be lacking. Grant aid could be respond to their needs.

6.3.2 Expected Project Scheme

Collaboration can be considered with various schemes as shown below.

Table 18 Project Schemes of Expected Collaboration

Project Scheme	Possibility of Collaboration
Project Formulation Survey / Promotion Project	To conduct transfer of Japanese technology and know-how on housing construction for saving energy/resource, sanitation, and safety to public organizations, business, and experts in Kenya. To assist research, development, and establishment of institutional foundation for standardizing design, construction technology, equipment/material for housing (Since these schemes target small and medium enterprises, LIXIL's involvement will be provision of the MFTS as a component technology for training and standardization to a project team to be led by smaller firm.)
Long-term Expert / Volunteer	To provide advice and assist institutional building for resource saving and standardization of building technology by transferring technologies and experience of Japan
Grant Aid	To apply for grassroots project to introduce the MFTS by county governments or non-profit organizations To add the MFTS in specification of grant facility construction projects

Loan	To add the MFTS in specification of loan facility construction projects
Technical Cooperation	To continue/expand project formulation survey or promotion project upon request

6.3.3 Details of Collaboration Project

Outlines are described in the table above. Project formulation survey or promotion project may be structured by an initiative of company that have advantages in building a framework and capacity with holistic combination of various technologies, in which the MFTS is situated. First stage may start from a project formulation survey for activities including a) capacity development, b) research and development of standardization, c) technology transfer with a movable model room, d) training through trip to Japan, and e) preparation for institutional development.

ANNEX

Proceeding of the Meeting for Promotion of Green Products Applicable in Kenya

NATIONAL CONSTRUCTION AUTHORITY

LIXIL
Link to Good Living

PROCEEDING OF THE MEETING

For

Promotion of Green Products Applicable in Kenya

October 2016

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ANNEX

1. Introductory presentation and demonstration of water saving technology (Presentation by LIXIL Micro Flush Toilet Project Team)

2. Introduction of JICA-funded Promotion Project on Micro Flush Toilet System (Presentation by LIXIL Micro Flush Toilet Project Team)

3. Introduction of global practice of promoting green products (Presentation by LIXIL Micro Flush Toilet Project Team)

4. Introduction of trend and challenges for promotion of green products in Kenya (Presentation by KGBS)

5. Introduction of the Africa Eco Mark Mechanism Introduction of the Africa Eco Mark Mechanism (Presentation by ARSO)

EXECUTIVE SUMMARY

For promotion of green products which is applicable in Kenya, this General meeting is planned to formulate a Joint Technical Committee of multiple stakeholders and make determination on fundamental directions toward establishment of certification and incentive schemes through discussion. The meeting was held at Fairview Hotel, Nairobi on 25th of October, 2016.

The meeting was divided into 3 sessions; **Session 1: Opening** started from remarks of the National Construction Authority (NCA) and the Ministry of Transport, Infrastructure, Housing, and Urban Development, and LIXIL made a presentation of its water saving solutions with demonstration of an actual toilet unit; **Session 2: Promotion Scheme of Green Products** included presentations from the LIXIL Team, Kenya Green Building Society (KGBS), and African Organization for Standardisation (ARSO) concerning promotion and certification schemes for Kenya, and a discussion session on the same topic followed; and **Session 3: Closing** concluded the following resolutions among participants:

1. Participants recognize importance and necessity of promoting green products in Kenya to reduce consumption of resources.

2. It is recommended to formulate a Joint Technical Committee that consists of both private and public sectors.
3. Terms of reference of the Joint Technical Committee will be prepared by NCA and LIXIL for making concrete actions.
4. The Joint Technical Committee is expected to demonstrate advantages and indicators to promote green technologies.
5. Sensitization activities are recommended as short term and continuing actions.
6. All participants of this meeting are invited as a member of the Joint Technical Committee.

1. MEETING OUTLINE

1.1. Background

In Kenya, population and urban areas are growing rapidly, while usable water source is limited to respond to the increasing demand. Creation of social infrastructure and urban environment for efficient water use is an urgent challenge to be tackled in the country. In order to address these issues, it is demanded to promote resource saving technologies in the construction market of Kenya through establishing certification scheme of such technologies.

In this connection, National Construction Authority (NCA) of Kenya and LIXIL Corporation[1] signed the "Memorandum of Understanding for The collaboration to develop system for certifying green products which can be applied to buildings in Kenya and develop a certification scheme for the same" on 22nd February, 2016. Under the framework, NCA and LIXIL collaborate to initiate a working committee made up by relevant organizations to materialize the certification scheme.

1.2. Objective

For promotion of green products which is applicable in Kenya, formulate a Joint Technical Committee of multiple stakeholders and make determination on fundamental directions toward establishment of certification and incentive schemes through discussion.

General meeting is planned to achieve full or part of the goals described below.

[1] LIXIL is a manufacturer of household equipment. It is based in Japan and has a worldwide group network. Presently, LIXIL undertakes "Promotion Project on Micro Flush Toilet System (MFTS) for Watershed Management and Improvement of Water Environment in Urban Areas in Kenya" since November 2015.

(1) Define "green products"

- Committee's agreement on the process to define a new category and criteria of green products in the building sector

(2) Design certification/evaluation process

- Agreement on the role of each committee member
- Agreement on the draft process

(3) Formulate legislative structure for promotion of green products/buildings

- Identification of possible incentive schemes for promotion of green products

1.3. Schedule

Tuesday, 25th of October, 2016

1.4. Location

Fairview Hotel, Nairobi

1.5. Program

08:30 – 09:00	Registration
09:00 – 10:00	**Session 1: Opening**
09:00 – 09:05	Welcome remarks: *General Manager of the National Construction Authority (NCA)*
09:05 – 09:10	Remarks: *Executive Director of the National Construction Authority (NCA)*
09:10 – 09:15	Remarks: *Permanent Secretary of the Ministry of Transport, Infrastructure, Housing, and Urban Development*
09:15 – 09:30	Introduction of participants
09:30 – 10:00	Introductory presentation and demonstration of water saving technology: *LIXIL Micro Flush Toilet Project Team*
10:00 – 10:20	**Tea/Coffee Break**
10:20 – 12:30	**Session 2: Promotion Scheme of Green Products**
10:20 – 10:30	Introduction of JICA-funded Promotion Project on Micro Flush Toilet System: *LIXIL Micro Flush Toilet Project Team*
10:30 – 10:50	Introduction of global practice of promoting green products: *LIXIL Micro Flush Toilet Project Team*
10:50 – 11:10	Introduction of trend and challenges for promotion of green products in Kenya: *Kenya Green Building Society (KGBS)*
11:10 – 11:30	Introduction of the Africa Eco Mark Mechanism: *African Organization for Standardisation (ARSO)*
11:30 – 12:30	Discussion on (1) possible promotion schemes in Kenya and actions to be taken and (2) applicability and process of certification system of green products in Kenya: *moderated by LIXIL Micro Flush Toilet Project Team*
12:30 – 12:40	Preparation of summary
12:40 – 13:00	**Session 3: Closing**
12:40 – 12:50	Summary and adoption of discussed roles and actions of participants: *moderated by LIXIL Micro Flush Toilet Project Team*
12:50 – 13:00	Closing remarks: *NCA*
13:00 – 14:00	**Lunch**

1.6. Participants

Participants come from the following organizations.

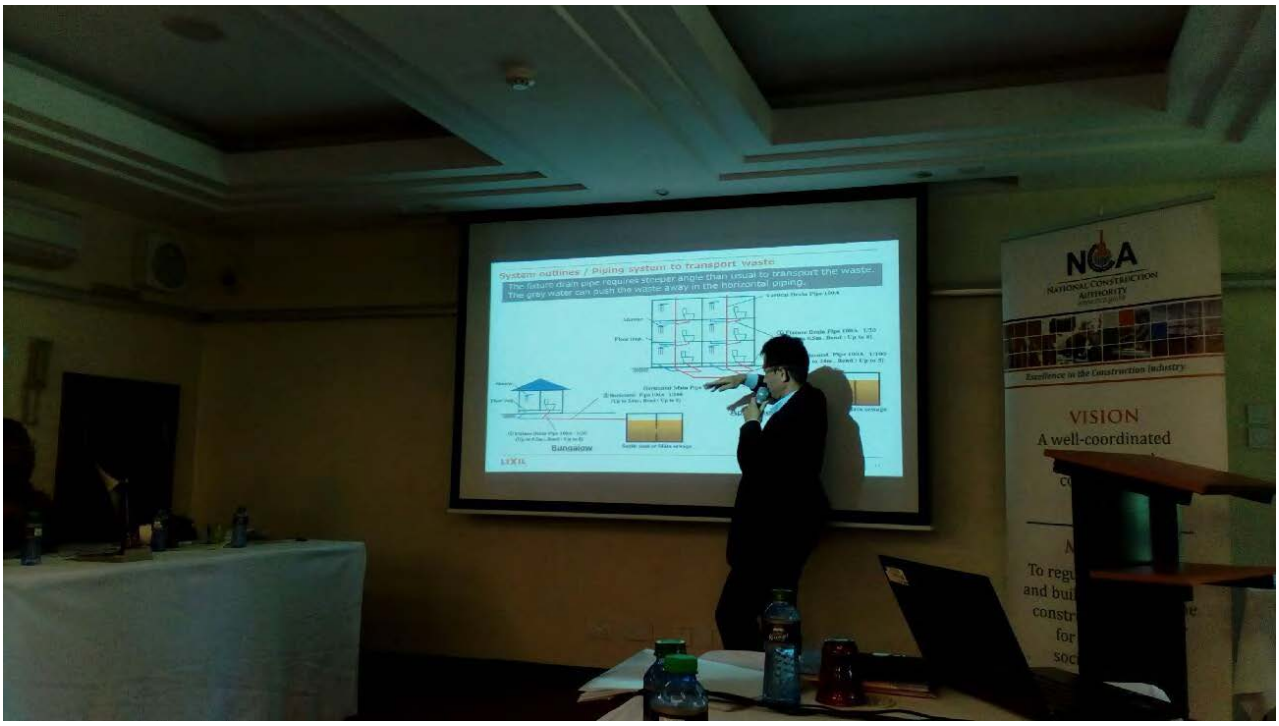
Ministry of Transport, Infrastructure, Housing, and Urban Development (MTIHUD)
Kenya Bureau of Standards (KEBS)
Kenya Green Building Society (KGBS)
African Organization for Standardization (ARSO)
Kenya Property Developers Association (KPDA)
Kenya Private Sector Alliance (KPSA)
JICA Kenya Office
NCA
LIXIL Team (LIXIL, OSA, and PADECO)

2. MAIN SESSIONS

2.1. Presentations

Presentation slides in the meeting are compiled in the Annex 1~5.

Remark from MTIHUD



Presentation from LIXIL

Demonstration of Micro Flush Toilet

Demonstration of Micro Flush Toilet

Group Photo

MTIHUD and LIXIL

Presentation from KGBS

Presentation from ARSO

Discussion Session

2.2. Discussion

Possible Promotion Schemes

- Government body to promote green procurement
- The construction industry lacks incentives, contrary to policy makers in other areas professionalism such as agriculture and mining
- there is need to show value addition of figures and facts that support green procurement system
- There is need for baseline study on green construction to be conducted by the Green Society of Kenya
- The Green Theme should be emphasized in Kenya's building code. With this, there is need to form a movement/taskforce to incorporate the theme in the building code
- Inasmuch as Green Procurement wasn't incorporated in the Act that controls the construction industry, it is possible to make amendments to the Acts
- There is need to work with developers such as banking institutions to promote financial incentives for green products

- There is need to incentivize Kenya's green building approval process by stakeholders such as counties. The process needs to be more efficient than the current one
- The government needs to enforce certain minimum standards for constructions. There is thus need to harmonize all bodies dealing with green products with the sole aim of having a combined agency aimed at policy making for green constructions.
- There is need for more collaboration between the Kenya Bureau of Standards, ARSO and NCA on standardizations for development. This should thus originate Kenyan Standards

Process of Promoting Green Products

- KEBS needs active participation in forums for promotion of green products
- The LIXIL team need to demonstrate the positive impacts of the product, with bias on environmental/economic/financial viability of the product. This is to include light verifiable statistics
- NCA to promote the product through enabling the LIXIL Company speak in forums such as contractor trainings
- There is need for public sensitization on the product. It was however noted that in case the product cost is less than US$ 200 then there will be no need for incentives with regard to the product

3. RESOLUTIONS OF THE MEETING

The meeting reached the following resolutions.

1. **Participants recognize importance and necessity of promoting green products in Kenya to reduce consumption of resources.**

2. **It is recommended to formulate a Joint Technical Committee that consists of both private and public sectors.**

3. **Terms of reference of the Joint Technical Committee will be prepared by NCA and LIXIL for making concrete actions.**

4. **The Joint Technical Committee is expected to demonstrate advantages and indicators to promote green technologies.**

5. **Sensitization activities are recommended as short term and continuing actions.**

6. **All participants of this meeting are invited as a member of the Joint Technical Committee.**