別添 5.　本邦研修（研修員受入れ）の実施実績
（研修完了報告書含む）

Non-Revenue Water management

DURATION : 17.06.11 ～ 17.06.24

NAME OF PARTICIPANTS	NATIONALITY	PRESENT POST
Mr.MWARUA Hezekiah Nguma D-17-02765	KENYA	Technical and Operations Manager, Technical & Operations, Kilifi-Mariakani Water and Sewerage Services Co. Ltd(2017)
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Mr.GATHAIRU James Muthee D-17-02767	KENYA	Commercial Manager, Commercial Department, Nakuru Water and Sanitation Services Co. Ltd(2009)
Mr.MBUTHIA Bernard Mwaura D-17-02768	KENYA	Managing Director, Nyahururu, Nyahururu Water and Sanitation Co. Ltd(2014)
Mr.JURA Moses Odhiambo D-17-02769	KENYA	Head of Technical Services, Technical Department, Kisumu Water and Sewerage Co. Ltd(2010)
Mr.KIPLAGAT Jimmy Kipkemboi D-17-02770	KENYA	AG MD /Head-Technical Services, Administration/Technical, Eldoret Water and Sanitation Co. Ltd(2012)
Mr.NGUNDA George Karanja D-17-02771	KENYA	General Manager, Management, Meru Water and Sewerage Services(2016)
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Mr.KARUGENDO Hamilton Macharia D-17-02773	KENYA	Managing Director, Administration/Management, Embu Water and Sanitation Co. Ltd(2005)
Mr.MABONGA David Nakibongochi D-17-02774	KENYA	National Coordinator of Project, NRW Unit, Ministry of Water & Irrigation(2009)
Mr.MUNGAI George Guchu D-17-02775	KENYA	Managing Director, Administration, Ruiru-Juja Water & Sewerage Co. Ltd(2009)
Mr.ALIMA Samwel Aluoch Otieno D-17-02776	KENYA	Director, Water, Sewerage and Sanitation, Ministry of Water & Irrigation(2015)
Ms.SUMBA Leunita Asande D-17-02777	KENYA	Director / CEO, Directorate, Kenya Water Institute(2016)

Training Completion Report

1. Content of This Report

(1) Course overview

(a) Course name

Non-Revenue Water Management

(b) Training period

Monday, June 12, 2017 to Friday, June 23, 2017

(c) Number of trainees

13

(2) Content of training

(a) Overall conceptual diagram of training

See the Appendix.

(b) Calendar

See the Appendix.

(c) Training curriculum

See the Appendix.

(3) Comments on the training course

(a) Lectures

The lectures were focused on the topics of Non-Revenue Water (NRW) reduction measures with an eye to facilitate the trainees' understanding on all the aspects of water service in Japan.

The lectures were delivered mainly by the Tokyo Metropolitan Government Bureau of Waterworks as well as the Japan Water Works Association, Mr. Koizumi, Senior Fellow Professor of Tokyo Metropolitan University, and partly by the PUC personnel (Customer Center).

The lecturers were notified in advance about the organizations and titles of the Kenyan trainees, given explanation on the water service conditions in Kenya, and provided with data on the outline of baseline survey results.

The trainees mainly consist of managers of departments in charge of planning

of NRW management, i.e., a “management team.” Therefore, the lectures were focused on the changes in water service in Japan in general and Tokyo in particular, NRW management, business management and charges, formulating of mid- and long-term plans, fostering of human resources, material standards for water pipes and others, certification systems, etc., and hands-on training in the field such as leak detection was incorporated.

This was intended to allow the trainees to understand the practical aspects in the promotion of this Project, and consequently manage and give instructions to the personnel in a comprehensive manner.

The trainees enthusiastically concentrated on the lectures and asked many questions to the lecturers in all the lectures.

Water service in Japan (Japan Water Works Association)

Water service in Tokyo (Tokyo Metropolitan Government Bureau of Waterworks)

Introduction to research on water pipe line technologies of Japan (Dr. Koizumi, Senior Fellow Professor of Graduate School, Tokyo Metropolitan University)

NRW reduction measures (Tokyo Metropolitan Government Bureau of Waterworks)

(b) Discussion, practical training, exercise, and presentation

Kenya aims to reduce the national average NRW rate, which was 42% in FY2015, to 25% by 2025.

The current trainees are in a position to promote the NRW reduction measures in each of their organizations. In view of the compartmentalized administrative organizations of Kenya, however, a cross-cutting collaborative system must be established in the future.

Therefore, discussion on two topics was held three times to provide an opportunity for achieving inter-organizational collaboration: (1) How to promote nationwide NRW reduction and the main Project, and (2) How to achieve inter-organizational collaboration for the sake of item (1) above. The content of the discussion was reported in presentations given by six trainees.

[Discussion]

First session: Wednesday, June 14

The trainees were divided into four groups, each of which discussed what they learned and noticed about the water service administration in Japan, summarized it on whiteboards, and gave presentations on it.

The trainees were absorbed in discussion about the content of presentations so enthusiastically that the training ended over one hour later than planned.

Second session: Tuesday, June 20

The four groups of trainees discussed two topics: (1) How to promote nationwide NRW reduction and the main Project, and (2) How to achieve inter-organizational collaboration for the sake of item (1) above. All the four groups had a heated discussion. Although they were supposed to give interim presentations, some trainees wished to continue the discussion, so some of the groups did not give interim presentations.

Third session: Friday, June 23; Final summary and opinion exchange

Six presenters gave presentations on the two topics. Then, the trainees and the Japanese engineers exchanged opinions actively.

In the final summary, all the presenters significantly exceeded the allocated presentation time of 10 minutes. In the actual presentation session, however, all of them finished their presentations in 10 minutes. This shows that all the presenters had strong consciousness of problem-solving and that they seriously worked on the two topics.

Some of the groups said that they continued discussion until late in the night before to prepare materials for their presentation.


[Practical training]

After the trainees heard a lecture on leak detection technologies at the Training and Development Center of the Tokyo Metropolitan Government Bureau of Waterworks, they received practical training on discovering dummy leaks by operating various detectors on their own.

Although the trainees do not have an opportunity to operate the equipment in Kenya, they actively and enthusiastically practiced detecting leaks, which was impressive. In addition, demonstrations were given on a correlative leak detection method and a minimum flow rate method.


[Presentations]

At the time of program orientation on the first day of training, it was explained that the four groups of trainees would discuss two topics three times: (1) How to promote nationwide NRW reduction and the main Project, and (2) How to achieve

inter-organizational collaboration for the sake of item (1) above, and that six trainees would give presentations using PowerPoint materials (presentation for 10 minutes and questions for five minutes).

The six trainees gave presentations from 1:00 to 3:00, Friday, June 23, during the third session.

In the presentations, the trainees pondered upon what they learned in lectures and visits in the training in Japan from their respective standpoints, incorporated what they learned into the problems of their own country, and, regarding the two topics, extracted issues, devised solutions, and established objectives, all of which were quite accurate.

For the PowerPoint slides used in the presentations given by the trainees, see the Appendix.

(c) Visits

The trainees visited facilities under the control of the Tokyo Metropolitan Government Bureau of Waterworks (Higashi-Murayama Purification Plant, Tama Water Operation Center, and the Training and Development Center) to learn about raw water connection and purification management, water operation management, and configuration of training fields.

The trainees also visited the plants of three companies: (1) Water meter assembly plant, (2) Polyethylene pipe manufacturing plant, (3) Manufacturing plant for corporation cocks with pipe saddles, couplings, valves, and transmission pipes attached to service pipes.

The training in the morning concerned mainly the PowerPoint-based explanation of the system of standards for products, the products themselves, and quality

management at the time of manufacturing. The training in the afternoon included such activities as demonstration of product quality testing, etc., and visits to observe the current state of manufacturing processes.

Tama Water Service Integrated Management Office (Tokyo Metropolitan Government Bureau of Waterworks)

Higashimurayama Purification Plant (Tokyo Metropolitan Government Bureau of Waterworks

Water meter plant (Plant A)

Waterworks polyethylene pipe manufacturing plant (Plant K)

Water supply equipment (Plant M)

Obsolete facilities of Lake Biwa Canal

(d) Training period, makeup, and content

The design of the de-facto two-week training achieved a well-balanced configuration between theory/classroom training, sessions for exchange of opinions among trainees, visits, etc., in consideration of the management team.

The training mainly concerned NRW management and were prone to last beyond the planned end time because many questions were asked. However, it was managed flexibly.

Regarding the coming training for the action team, the trainees requested that more time should be spent on the practical aspects such as the use of major tools for discovering illegal connections (water theft), management of block water distribution, and practical training on leak detection.

(e) Textbooks (English), equipment, and facilities

Some of the textbooks translated into English were handed out to the trainees in the orientation on the first day. The other textbooks that were not handed out on the first day were handed out before the lectures started.

The trainees requested us to provide them with the video used in the lectures on the NRW management, etc., and the video that they watched at the Lake Biwa Canal Museum of Kyoto.

After negotiation with the Tokyo Metropolitan Bureau of Waterworks and the Kyoto Bureau of Waterworks and Sewerage that holds jurisdiction over the Lake Biwa Canal Museum, the former video was provided but the latter video watched at the Museum was not provided for copyright reasons.

The provided video will be sent by mail to the trainees at a later date.

The leak prevention equipment used for the training was borrowed equipment owned by the Training and Development Center of the Tokyo Metropolitan Government Bureau of Waterworks (such as listening sticks, electronic leak detectors, and correlative leak detectors).

The facilities used for the training were the conference rooms of the JICA Tokyo International Center, Tokyo Metropolitan Government Bureau of Waterworks, and Tokyo Waterworks International Co., Ltd., as well as the conference rooms and training facilities of the receiving organizations.

(4) Trainees

(a) Qualifications

The trainees who received the training were executive officers and NRW

management unit leaders of the Ministry of Water & Irrigation (MWI), Water Service Regulatory Authority (WASREB), Kenya Water Institute (KEWI), and water service providers (WSPs). They were the key persons in promoting the NRW management in Kenya. They had abundant technical knowledge and were appropriate persons for receiving the training.

(b) Enthusiasm for training participation and attitudes toward the training

The trainees participated in the training with constant seriousness throughout the training period. They were really friendly to the lecturers and to each other. They were often observed to discuss the technologies and standards of Japan in comparison with those of their own country. They asked questions based on their knowledge of technologies and management in their own country, covering wide-ranging topics such as ways of thinking about NRW management, methods for quality control of products and materials, ways of thinking about instrument errors and tolerances of water meters, and water charge systems. All of these topics were technical and sophisticated.

Their enthusiastic attitude in Q&A sessions often made the training last longer than the planned training time, showing their strong devotion to absorption of knowledge on waterworks technologies.

(5) Utilization of training outputs

(a) Outputs gained in the training

The trainees compared the problems encountered by their organizations with those of the waterworks systems of Japan, and received hints for solving problems in the entire water system such as NRW reduction and administrative improvement.

In the opinion exchange sessions, they also showed strong awareness about the importance of collaboration between the organizations for the sake of problem solution.

(b) How to utilize the outputs

The trainees mainly made the following remarks:

- To achieve the goals, they will certainly hold regular meetings between the organizations for sharing of information and outputs.
- They will purchase equipment and materials for NRW reduction measures and establish an action plan to implement said measures.
- To establish an action plan, they will analyze effective methods for NRW

reduction, create a list of priority issues such as necessary technologies and leak detectors, and develop necessary human resources.

- They will design new training programs for NRW reduction and make and carry out OJT training plans.
- Having heard the explanation of training programs by the instructors of the Japan Water Works Association, they requested advice on designing NRW reduction training programs in Kenya.
- To ensure quality of equipment and materials of waterworks, they will utilize the Water Services Providers Association of Kenya (WASPA) to construct an organization that assumes the role of an organization for inspecting and certifying equipment and materials for waterworks, like the one played by the Japan Water Works Association, etc.
- They will review and enhance the standards for adopting waterworks materials to ensure the use of materials that more than satisfy the standards.
- They will work to establish a call center for around-the-clock customer service (including reception of reports on surface leakage).
- They will revise the NRW reduction standards, etc.

(6) Training environment

The weather during the training period in Japan was mostly good despite the expectation of rain because the period fell on June.

It was hot and humid, reaching nearly to 30 degrees centigrade in Kyoto, where the trainees stayed for visits to plants and other purposes. However, they were energetic during the visitations, and none of them became sick.

Unless site inspections were needed, the training/conference rooms of JICA Tokyo were used for the training. This had reduced the traveling time for the trainees, allowing them to both maintain their energy and make effective use of the training time.

(7) Other special remarks

Wherever the trainees went, they took turns expressing words of appreciation and gratitude on behalf of others to the lecturers and the guides and other persons at the plants that they visited.

The persons in charge at these plants were impressed with the politeness of the Kenyan trainees.

2. Appendix

(a) Detailed training schedule (actual) and other documents (overall conceptual diagram, detailed training schedule (actual), and training curriculum)

(b) List of trainees

(c) PowerPoint materials used in the presentations given by the trainees

LIST OF PARTICIPANTS
Non－Revenue Water Management

ケニア国別研修「無収水管理」

2017/6/12～2017/6/23

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4	 KENYA ケニア	Mr. MBUTHIA Bernard Mwaura Mailing Address E-Mail D1702768	Nyahururu Water and Sanitation Co. Ltd(2014), Nyahururu, Managing Director（準高級）
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LIST OF PARTICIPANTS
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2017/6/12～2017/6/23

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11	 KENYA ケニア	Mr. MUNGAI George Guchu Mailing Address E-Mail D1702775	Ruiru-Juja Water & Sewerage Co. Ltd(2009), Administration, Managing Director（準高級）
12	 KENYA ケニア	Mr. ALIMA Samwel Aluoch Otieno Mailing Address E-Mail D1702776	Ministry of Water & Irrigation(2015), Water, Sewerage and Sanitation, Director（準高級）
13	 KENYA ケニア	Ms. SUMBA Leunita Asande Mailing Address E-Mail D1702777	Kenya Water Institute(2016), Directorate, Director/CEO（準高級）

１．発表内容

２つのテーマ①全国的な無収水削減及び本体プロジェクトにどのように取組むか
（研修で得た知識等を活用し、ケニア国における無取水削減対策を進めるにあったての課題）
②上記①のために、組織間連携をどのように図るかについて

２．発表日時
2017 年 6 月 23 日（金）PM1 時～3 時

３．発表者　研修員代表 6 名

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4.	Mr. Daniel MainaNgugi	Site Engineer, Water Services Regulatory Board
5.	Mr. George KaranjaNgunda	General Manager, Meru Water and Sewerage Services
6.	Mr. Jimmy KipkemboiKiplagat	Acting Managing Director, Eldoret Water and Sanitation Company Ltd.

NON- REVENUE WATER REDUCTION ACTION PLAN FOR KENYA WATER INSTITUTE

Dr. Leunita A. Sumba

KEWI'S OBJECTIVES

1. To improve the training programme to incorporate practical skills
2. To improve practical demonstration teaching aids
3. To consistently develop highly competent human resources that can keep up with the demands of the water sector
4. Carry out collaborative research and development

TRAINING PROGRAMME THAT WILL INCORPORATE PRACTICAL SKILLS

S/No	Activity/Timeframe	Technical /Financial support/collaboration
1	Revise the training Curriculum	JICA/MWI
2	Carry out pilot training with selected WSPS	WSPs
3	Use the output of the pilot training to improve the courses- December 2018	JICA/MWI
4	Train KEWI trainers (ToT) – June 2018	JICA/Training &Tec. Dev center

IMPROVED PRACTICAL TRAINING

S/No	Activity/Timeframe	Technical /Financial support/collaboration
1	Construct leak training platform by June 2018	JICA/MWI
2	Purchase/ acquire training equipment	JICA/MWI
3	Develop/acquire training videos	JICA/Training & Tech. Dev. center
4	Develop/acquire cut out models	JICA//Industry (meters, pipes etc)

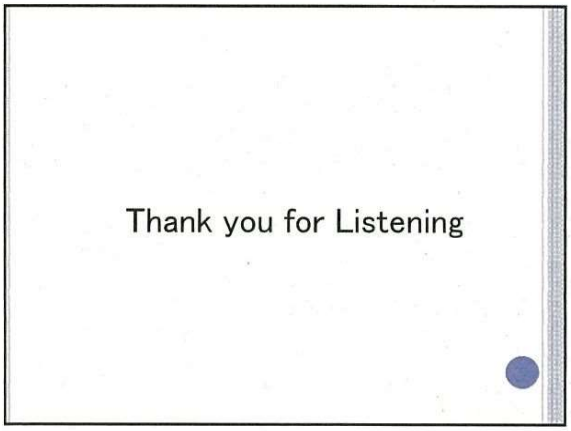
TRAIN HIGHLY COMPETENT HUMAN RESOURCES

S/No	Activity/Timeframe	Technical /Financial support/collaboration
1	Develop framework for certification of experts	MWI/WASPA/WASREB/ JICA
2	Develop an induction course for MDs, TM, and distribution team	"

COLLABORATIVE RESEARCH AND DEVELOPMENT

S/No	Activity	Technical /Financial support/collaboration
1	Carryout collaborative research	WSPs/Academia/industry/KEWI
2	Use research findings to improve training programmes	KEWI/Experts
3	Convene water research conference	MWI/WASPA/KEWI

Thank you for Listening



Non-Revenue Water Training Action Plan

Prepared By:

Mungai George (Ruiru-Juja WSP)
Mbuthia Bernard (Nyahururu WSP)
Jura Moses (Kisumu WSP)
Gathairu James (Nakuru WSP)

Outline of Presentation

- Key Issues
- Expected Outcome
- Strategy/Detailed Action Plan

How to Tackle the Issues related to Strengthening Capacity in Non-Revenue Water Reduction in Kenya by Utilizing Knowledge through this Course

- **KEY ISSUES**

➢ Asset Renewal
➢ Quality of Materials
➢ Training
➢ Customer Services
➢ Long-Term Planning

Expected Outcome:-Asset Renewal

- Planned Pipe Network Replacement
- Planned Meters Replacement
- Hardware and Software

Expected Outcome:-Quality of Materials

- Inspection and Certification (Standards)
- Adoption of Emerging Technology
- Research and Development

Expected Outcome:-Training

- Certification of Water Professionals
- Bridging Gap: Formal Vs Industry
- Succession Planning

Expected Outcome:-Customer Services

- **Establishment of Dedicated Customer Department**
- **Appropriate Customer Care Software**
- **Strong Linkage: Customer Department Vs Operations**

Expected Outcome:-Long-Term Planning

- **Development of Strategic Plans**
- **Linkage of Physical Development To Developed Master Plans**

Strategy:-Action Plan (Asset Renewal)

Target/Strategy	Timeframe	Responsibility	Monitoring
i) Phased pipe replacement/renewal by age and materials	• Immediate (Asbestos/GI) • 5 years (uPVC) • 10 years (HDPE) • 40 years (Stainless/Steel)	• WSP • County Gvt • WSB • WSTF	❖ WSPs to submit M&E Reports Bi-Annually to WSTF/CG
ii) Phased meters replacement by age and volume	• Immediate (Adoption of EMF for large consumers) • 5 years (Domestic/Residential) • After every 90,000m³ (Industrial & large commercial) • Immediate (Bulk/District Meters	• WSP • WSP • WSP • WSB/MWI/WSTF	❖ Self ❖ Self ❖ Self

Strategy:-Action Plan (Asset Renewal)

Target/Strategy	Timeframe	Responsibility	Monitoring
iii) Acquisition of Appropriate Leak Detection Equipment and Software	• Immediate (Electronic & Time integral leak detector) • 5 years (Correlation leakage detector)	• WSP • County Gvt • WSB • WSTF	❖ WSPs to submit M&E Reports Bi-Annually to WSTF/CG
iv) Digital Asset Mapping (GIS)	• Immediate	• WSP	❖ Self

Strategy:-Action Plan (Quality of Materials)

Target/Strategy	Timeframe	Responsibility	Monitoring
i) Establish institution dedicated to inspect and certify water-related materials	• 3 years	• MWI/WASPA/KEWI/WASREB/KEBS	❖ All
ii) Adopt appropriate technology	• Continuous	• WSP/WSB/MWI/WSTF	❖ Self

Strategy:-Action Plan (Training)

Target/Strategy	Timeframe	Responsibility	Monitoring
i) Formation of a water sector inspection, certification and accreditation body similar to JWWA.	• 2 years (For amendment of water act 2016) • 3 years (Full implementation)	• MWI, • WASREB • WASPA • KEWI • KEBS • WASPA • WASREB	❖ Self
ii) Collaborative efforts between water industry players and academia on research and relevant curriculum development.	• Immediate and continuous	• WASPA, • WASREB • MWI • KEWI • UNIVERSITIES • KAM	

Strategy:-Action Plan (Training)

Target/Strategy	Timeframe	Responsibility	Monitoring
iii) Legislative minimum technical qualification/training for water professionals	• 2 years (For amendment of water act 2016)	• MWI, • WASREB • WASPA • KEWI	
	• 5 years (Full implementation)	WASREB	❖ WSPs (Self) ❖ WASREB
iv) Post formal professional training in water-related aspects to address the succession planning in lower and middle cadre (operational) positions.	• Immediate	• WASPA • WASREB	❖ Body similar to JWWA (Kenya Water Works Association)

Strategy:-Action Plan (Customer Services)

Target/Strategy	Timeframe	Responsibility	Monitoring
i) Departmentalize customer service units at WSPs level. (Full department with line budget)	• 2 years	• WSP	❖ Self ❖ WASREB
ii) Institutionalize culture change to be customer oriented.	• Immediate and continuous	• WSP	❖ Self

Strategy:-Action Plan (Customer Services)

Target/Strategy	Timeframe	Responsibility	Monitoring
iii) Establish an integrated, robust, customized customer software.	• 2 years	• WSP	❖ Self
iv) Establish a dedicated and fully facilitated technical information and execution unit.	• Immediate	• WSP	❖ Self

Strategy:-Action Plan (Long-Term Planning)

Target/Strategy	Timeframe	Responsibility	Monitoring
i) Effective coordination between relevant stakeholders.	• Immediate and continuous	• WSB • WSP • CG	❖ WSB

ABBREVIATIONS

- **WSP - Water Services Providers (Utilities)**
- **WSB - Water Services Board**
- **MWI- Ministry of Water and Irrigation**
- **KEWI- Kenya Water Institute**
- **KEBS- Kenya Bureau of Standards**
- **WASREB- Water Services Regulatory Board**
- **CG- County Government**

THANK YOU

TO PROVIDE SUPPORT TO KEWI

Action Plan for KEWI:

- Facilitate in the development of training Platform
- Support development training material for Non-revenue Training course;
- Support development course curriculum
- Assist in identifying a pool of Training Experts

7

Support to WASREB

Action Plan for WASREB

- To provide support to develop water services rules
- Linkage to Counties
- Assist in the dissemination of standards
- To assist in monitoring the use of standards
- To collaborate and coordinate with Road Agencies

8

PERIOD

The action Plan shall be implemented concurrently with the Program for Strengthening Capacity in Non Reduction in Kenya

9

END

Arigato GosaimasU

10

MINISTRY OF WATER AND IRRIGATION

NON-REVENUE WATER MANAGEMENT

TRAINING IN JAPAN ACTION PLAN

Eng. SAO Alima

Mr. David Mabonga

1

Table Contents

2

LESSONS LEARNT

During our training in Japan, we learnt that:

- There is effective Planning and Implementation in Japan;
- There is strong partnership among stakeholders;
- Emphasis is given to R&D resulting in patents;
- There is emphasis is given to Training;
- Involvement of everyone in the organization;
- Standards are developed and adopted;
- Effective Monitoring system;

3

POLICY FORMULATION

Policy Issues on NRW, Action Plan

- Finalize National Policy on Non-Revenue Water Management
- To give direction on the Management and reduction of NRW in the country.
- Draft Policy is under preparation
- Undertake stakeholder consultation
- Aimed to reduce NRW to 20% by 2025

4

SUPPORT TO WSPS ON PROVISION OF EQUIPMENT

Provide the following to 9 Water Service Providers;

- Pressure loggers,
- Programming Cable for pressure loggers
- Portable Ultrasonic Flow Meter
- Portable meter tester
- Hand pump for leak check
- Leak detector
- Listening stick
- Leak noise correlator
- Pipe locator and others

5

SENSITIZATION

To sensitize the following stakeholders;

- Develop Linkage with WASPA for knowledge sharing,
- Water Service Providers using 9 out of 91,
- Council of Governors (COG),
- Chief Executive Committee Members (CEC) in charge of Water,
- Private Companies,
- Consultants on standards, material quality and workmanship
- Contractors on standards, material quality and workmanship

6

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KENYA VISION 2030

Strengthening Capacity in Non-Revenue Water Reduction in Kenya

Action Plan Presentation

Ngugi M. Daniel
Engineer, Technical Services

Water Services Regulatory Board

Presentation outline

A. Utilization of knowledge earned to tackle issues of NRW reduction

1. Issues
2. Expected outcomes
3. Strategies

B. Collaboration with other organization

4. Partner organizations
5. Short term activities
6. Medium/long term activities

How to Tackle the Issues related to Strengthening Capacity in Non-Revenue Water Reduction in Kenya by Utilizing Knowledge through the NRW Management course

(1) Issues

i. Governance
ii. Regulatory standards
iii. Quality of materials
iv. Workmanship and skills
v. Planning
vi. Capacity building
vii. Customer focus
viii. Resources
ix. Capacity of Wasreb

(2) Expected Outcomes/Results

i. Full compliance in implementation of NRW Standards by the 9No WSPs in the project and largely by the WSPs at least to medium size (Total 55No) that are largely public
ii. KEWI trained and certified NRW professionals
iii. NRW Management as a brand discourse (publicity, publications, infomercials, ASK shows, Other exhibitions...) by all sector players for awareness creation to relevant agencies and customers
iv. NRW function and structure creation at WSPs/Counties and operationalization
v. NRW malpractices being treated as economic sabotage, barrier to the right to access of water as per Constitution hence corruption
vi. Progressive reduction in sub-standard materials from the manufacturers and the market
vii. Specifications' conscious WSPs that are keen to reject products delivered and not meeting quality desired before acceptance and a growing culture of sampling deliveries for quality tests at accredited labs before acceptance

(3) Strategies

i. Enforcing compliance to implementation of existing/revised/new diversified standards and regulations by Utilities.
ii. Dissemination of regulatory standards
iii. Collaboration with Kenya Bureau of Standards) and other relevant government agencies to contain sub-standard materials in the market and destruction of water infrastructure
iv. Upscaling intensity of implementation of NRW standards to actualize NRW reduction plans, strategies and strategic objectives in the strategic plans of utilities (at least half yearly for each WSP)
v. Close collaboration with KEWI in curriculum development/review for relevance to the industry

Strategies cont'd

i. Providing for justified NRW reduction resources in the tariff after linking NRW reduction plans to strategic plans and the tariff conditions. May recommend subsidy from government(s) where appropriate
ii. Linking utilities to potential funding (commercial loans/grants etc) for addressing NRW e.g. Performance Based Financing programme, Performance Based Contracting, PPPs etc
iii. Rolling out use of majivoice system by more utilities beyond the current usage to address customer complaints through a tracking real time system. By encouraging benchmarking to those using the system
iv. Wasreb (may) need to decentralize for effectiveness of its regulatory role with implication on funding requirements

How to collaborate with other Organizations

in order to tackle above issues

(4) Resources / Partner Organizations

MWI – liaison/collaboration; KEWI – collaboration; WSBs – liaison; WSPs –regulation; WASPA - liaison, Counties – capacity building and liaison, KEBS – liaison; KRA – liaison; Roads authorities – liaison, academia - liaison.

(5) Short term activities

i. Establishing working relationship frameworks with those entities where none exist

ii. Bringing/collating together issues of concern raised by utilities and formally putting them across to the relevant agencies for understanding and collaborative action

iii. Development of diversified standards for the sector

(6) Medium/long term activities

i. Introduction of specialized regulatory standards informed by unfolding dynamics

ii. Continuous and regular engagements for monitoring and reviews of progress of related/common activities with concerned organization(s)

iii. Linking industry with academia for focused research outputs

ARIGATO GOZAIMAS

Strengthening Capacity in Non-Revenue Water Reduction in Meru

George Karanja Ngunda
General Manager
Meru Water and Sewerage Services
KENYA

How to Tackle the Issues related to Strengthening Capacity in Non-Revenue Water Reduction in Meru by Utilizing Knowledge through the Course

(1) Issues

(2) Expected Outcome

(3) Strategy

(1) Issues

a) Water rationing due to high population growth
b) Ineffective leak detection due to aged bulk meters
c) High demand to expand water coverage to uncovered areas
d) Reduced staff effectiveness due to natural attrition
e) Reduced effectiveness of M&E

(2) Expected Outcome

a) Adequate continuous water supply with good pressure to all customers
b) Accurate bulk water data for effective leak detection
c) Expanded water supply and increased customer base
d) Trained and effective staff
e) Effective M&E

(3) Strategy

a) Lay expanded pipelines to act as dual lines and install high capacity pumps at HLT site to distribute water from newly constructed WTP
b) Procure bulk meters with good specifications
c) Source for funds to expand the water supply to uncovered areas

(3) Strategy

d) Prepare and implement fiscal year Off-JT and OJT training plans; and start knowledge bank in Meruwater website
e) Revise and enforce the Standard Operating Procedures

How to Collaborate with Other Organizations in order to Tackle above Issues
(MWI, WASREB, KEWI, WASPA, Counties, WSBs, other WSPs, etc.)

(4) Resources / Partner Organizations

(5) First Step to be Carried out

(6) Medium/Long term Activities

(4) Resources / Partner Organizations

a) Savings, County Govt subsidy, materials credit from suppliers and/or Bank loan
b) High quality meter specifications through WASPA/TWSB/WASREB/KEWI/TWSB/ MWI; and peer reviews and benchmarking fora with other WSPs

(4) Resources / Partner Organizations

c) Long term loan/Kenya Pooled Water Fund/Commercial Banks and OBA subsidy/WSTF/WASREB with Meru County's backing
d) Training budget/KEWI/WASPA/WSPs
e) In-house SOPs revision

(5) First Step to be Carried out

a) Install good quality bulk meters
b) Expand dual pipelines
c) Intensify leak detection/repair
d) Prepare fiscal year Off-JT and OJT plans and commence trainings
e) Revise SOPs

(6) Medium/Long term Activities

a) Expand water supply coverage

End

&

THANK YOU

Non-Revenue Water Reduction Action Plan

Presented by;

Kiplagat Jimmy	Eldoret Water
Ambundo Jesse	Mavoko Water
Mwarua Hezekiah	Kilifi- Mariakani

1

Issues and Lessons Learnt

- Lessons from the three pillars of NRW Reduction,
  - Long term Scheduled/planned replacement of aging pipelines, use of quality materials and water meter management (Replacement, servicing etc)
  - Early detection, prompt repairs of water leaks and curbing illegal water use.
  - Human resource development on NRW management and registration of plumbers
- Quality Assurance and Control
  - Development of standards for the quality of all materials used in water supply (Pipes, fittings, meters, equipment etc)

2

Issues (Cont)

- Inspection verification and certification of all the water supply materials
- Enhanced Customer Focus
- Automation of processes

Expected Outcome

- Reduced levels of NRW from the current level to below 25% within five years
- Use of approved materials and equipment with a system of verification and certification of materials
- Skilled workforce with registered plumbers
- Improved customer satisfaction

4

Strategies

- Strategies for the three pillars of NRW reduction,
  - Incorporating water pipeline replacement plans to the company's strategic plan. The plan will be split into annual targets with budgetary provision. (use GIS as guideline)
  - Restructuring of the patrolling teams with set schedules, targets and proper reporting system
  - Sensitization of customers and the general public in reporting water issues.
  - Phased acquisition of NRW reduction (leak detection) equipment

5

Strategies (contd)

- Training and capacity building on personnel in NRW
- development of structured knowledge bank.
- Development of policies/standards for the minimum standards for the quality of materials.
- Strengthening of the inspection and acceptance committee to ensure quality water supply materials
- Development of meter management policy and plan

Strategies (contd)

- Creation of call centers with adequate staffing levels
- Automation of meter reading processes and water treatment processes

How to Collaborate with Other Organizations in order to Tackle above Issues

8

Resources / Partner Organizations

- MWI – Linking WSPs with partner organizations, Policy formulation
- WASREB – Approval tariffs with emphasis on NRW reduction, monitoring and evaluation.
- KEWI – Research in the water sector, Training and development of a national knowledge bank for the water sector.
- WASPA – formulation of guidelines, advisory role on NRW

9

- Counties – Provision of resources, conducive environment, County By-laws
- WSB – Fundraising for asset development and infrastructure upgrade
- WSPs- Implementation, Monitoring and evaluation of the action plan

Objective	Outcome	Strategy	By Who	Time frame	Indicator
Long term Scheduled/planned replacement of aging pipelines,	Reduction of leaks by 50%	Incorporating water pipeline replacement plans to the company's strategic plan. The plan will be split into annual targets with budgetary provision.	TM	Immediate and continuous	Length of pipelines replaced
Water meter management (Replacement, servicing etc)	Functional meters and improved metering accuracy,	Implementation of the meter management policy and plan	MD/TM	Immediate	No. of functioning meters
Use of quality pipelines and fittings	Improved pipeline system reliability	Strengthen inspection and acceptance committee	MD	Immediate and continuous	Reduced number of leaks
Early detection, prompt repairs of water leaks and curbing illegal water use.	Improved turn around time of response to leaks	Restructuring of the patrolling and emergency teams with set schedules, targets and proper reporting system, Phased acquisition of NRW reduction leak detection equipment	TM	Immediate	Reduced levels of NRW

Objective/Description	Outcome	Strategy	By Who	Time frame	Indicator
Human resource development on NRW management	Skilled workforce Registered Plumbers	Training and capacity building of personnel in NRW, Development of structured knowledge bank (archive) Registration of plumbers	HRM	Short term, continouos	Quality of workmaship, Number of staff trained
Development of standards for quality of all materials used in water supply (Pipes, fittings, meters, equipment etc)	Use of approved materials and equipment in the water sector with a system of verification and certification of materials	Development/Adopt of policies/standards for the minimum standards for the quality of materials.	TM/MWI	Mid Term	standards in place
Inspection, verification and certification of all the water supply materials	Improved reliability and lifespan of the pipeline systems	Establishment of a water supply material inspection and verification body.	MD	Immediate, continuous	Detailed method of inspection and verification
Customer Focus	Improved customer feedback on NRW related information	Sensitization of customers and the general public in reporting water issues.	HCS	Immediate	Improved customer satisfaction

THANK YOU!

Non-Revenue Water Management

DURATION : 18.12.02 ～ 18.12.15

NAME OF PARTICIPANTS	NATIONALITY	PRESENT POST
Mr.KATHERU Cyrus Mugendi D-18-08424	KENYA	Technical Officer, Technical, Embu Water and Sanitation Co. Ltd(2006)
Mr.LIECH Job Michael D-18-08425	KENYA	Non Revenue Water Engineer, Technical, Kisumu Water and Sewerage Co. Ltd(2017)
Mr.MOSETI Walter Mokongu D-18-08426	KENYA	Trainer / Instructor, Trainer / Academic Department, Kenya Water Institute(2007)
Mr.MUTAI Gilbert Kipchumba D-18-08427	KENYA	Asst. Distribution Manager, Technical, Nakuru Water and Sanitation Services Co. Ltd(2018)
Mr.MWANGI Peter Kariithi D-18-08428	KENYA	Technical Services Manager, Technical, Nyahururu Water and Sanitation Co. Ltd(2014)
Mr.NDATHO Silas Kirimi D-18-08429	KENYA	Technical Assistant 1 - NRW, Technical, Meru Water and Sewerage Services(2012)
Ms.MBUGUIRO Patricia Wanjeri D-18-08430	KENYA	Non Revenue Water Specialist, Technical, Water Services Providers Association(2015)
Ms.MWANGI Mary Wanjiru D-18-08431	KENYA	Technical Manager, Technical Services, Ruiru-Juja Water and Sewerage Company(2015)

Training Completion Report

1. Detailed training plan (actual version)

Detailed training plan (actual version)

Main subject;	Capacity building on NRW reduction technology				
Training course number :			Acceptance form	Training by country	
Training peri	2018/12/3	～ 2018/12/14	Number of trainee		8 persons

Training goals :	①About practical methods of NRW management, understand not only individual technologies such as leak detection, but also a method for making a leak prevention plan from a long-term perspective. ②Deepen insights from a wide range of perspectives such as water operation, water purification facilities, construction management, quality control of water supply materials, drawing management, and be able to use it for daily work in a form suitable for Kenya.
Training items :	①Deepen understanding through practical training on efficient water leak detection technology. ②Improve the planning ability, such as the trainee himself creating a water leakage prevention plan to reduce the water leakage rate. ③Understand practical examples of efficient water operation utilizing the water treatment system and network of the latest water purification plant in the Tokyo Waterworks Bureau. ④Understand the quality control methods of materials (meters, water pipes, water supply equipment). ⑤Visit construction site of distribution pipes to understand the required level of construction management and construction quality.

Date	Timetable		Program	Lecturer				Training place	Accommodation
				Name	Company and position	Phone number			
12/1(Sat)	～		Nairobi→						
12/2(Sun)	～		Narita						
12/3(Mon)	10:00 ～ 12:30		JICA Orientation and Briefing						JICA Tokyo
	14:15 ～ 14:30		Courtesy call: TWI	Mr. Mashiko	President of TWI			Shinjuku-ku	
	14:30 ～ 14:45		Orientation of the Program①	Mr. Taguchi	KEC	03-5320-9541		〃	
	14:45 ～ 15:45		Orientation of the Program②	Mr. Sekita	TWI Division, Senior Engineer	03-5320-9541		〃	
	16:00 ～ 17:00		Customer service (customer center)	Ms. Abe	Human Resources Department, PUC	03-3343-4639		Shinjuku-ku	
	18:00 ～ 19:30		Welcome Party					JICA Tokyo	
12/4(Tue)	9:00 ～ 12:00	LC	Water Service in Japan and Tokyo	Mr. Kidokoro	TSS	03-5320-9423		JICA Tokyo	JICA Tokyo
	13:00 ～ 15:00	LC	Water Service Business (Strategy, financial balance, water tariff)	Mr. Kano	PUC	03-3343-4690			
	15:00 ～ 17:00	LC	Human resources management.	Mr. Kubo	Training and Development Center, Bureau of Waterworks Tokyo	03-5483-3507			
12/5(Wed)	10:00 ～ 11:30	SI	Treatment plant facilities	Mr. Yamamoto	Chief of Ozaku Purification Plant	0422-51-4505		Hamura City	JICA Tokyo
	13:30 ～ 14:30	SI	Water supply operation center	Mr. Futsu	Tama Water Control Department, Bureau of Waterworks Tokyo	048-259-7420		Tachikawa City	
	16:00 ～ 17:00	OJT	1st Team discussion for promotion of consensus.	Mr. Saito	General Manager, TSS	03-5320-9423		JICA Tokyo	
12/6(Thu)	11:00 ～ 11:30	LC	Water Meter and its quality control	Mr. Tsunekawa	General Manager, Aichi Tokei Denki	052-661-5160		Nagoya City	Kyoto
	13:00 ～ 13:30	LC	Water Meter and its quality control	〃	〃	〃			
	13:30 ～ 15:30	SI	Manufacturing process of water meters	〃	〃	〃			
12/7(Fri)	10:00 ～ 12:00	LC	Utilization polyethylene pipe for water supply	Mr. Nakanishi	Kubota ChemiX	06-6648-2375		Sakai City	Kyoto
	13:00 ～ 16:00	SI	Manufacturing process of polyethylene	〃	〃	〃			
12/8(Sat)	9:30 ～ 11:30	SI	Biwa lake canal museum in Kyoto city.					Kyoto City	JICA Tokyo
12/9(Sun)	～		Organize training contents						JICA Tokyo
12/10(Mon)	9:30 ～ 12:00	LC	NRW reduction Management	Mr. Shimoyama	Section chief, TSS	03-3721-5170		Setagaya-ku	JICA Tokyo
	13:00 ～ 16:30	OJT	Leak detection training	Mr. Tanaka	Subsection chief, TSS	〃			
12/11(Tue)	9:30 ～ 11:00	LC	Leak control technology	Mr. Shimoyama	Section chief, TSS	03-3721-5170		Setagaya-ku	JICA Tokyo
	11:00 ～ 12:00	OJT	Leakage measurement (Minimum night	Mr. Tanaka	Subsection chief, TSS	〃			
	13:00 ～ 16:00	OJT	Leakage detectio technology	〃	〃	〃			
12/12(Wed)	9:00 ～ 12:00	OJT	2nd Team discussion for promotion of consensus	Mr. Saito	General Manager, TSS	03-5320-9423		JICA Tokyo	Fukushima
	13:30 ～ 15:00	SI	Distribution pipe replacement work	Mr. Miyajima	Nakasu	03-3323-1641		Setagaya-ku	
12/13(Thu)	10:00 ～ 11:30	LC	Water supply apparatus, valves, fittings.	Mr. Sekiguchi	Maezawa Kyuso Kogyo	03-3711-6337		Motomiya City	JICA Tokyo
	13:00 ～ 15:30	SI	Manufacturing process of water valves,	〃	〃	〃			
12/14(Fri)	9:00 ～ 12:00	OJT	3rd discussion among trainees	Mr. Saito	General Manager, TSS	03-5320-9423		JICA Tokyo	JICA Tokyo
	13:30 ～ 15:30	Pre	Presentation of action plans from	〃	〃	〃			
	15:30 ～ 16:00		Evaluation report meeting	Mr. Sakamoto	Water Resources Team2, Global Environment Dept. JICA	03-5226-9535			
	16:00 ～ 16:30		Closing ceremony and presentation of cirtificates.	Mr. Moko	Director, Water Resources Team2, Global Environment Dept. JICA	〃			

SI: Site inspection
LC: Lecture
Pre:Presentation

TSS: Tokyo Suido Service
TWI: Tokyo Waterworks International Co., Ltd.
KEC: Kyowa Engineering Consultants Co., Ltd.

PUC: Public Utility Services Center Co., Ltd.

2. Participant list

コース研修員名簿

（国別研修）Non-Revenue Water Management

DURATION：18.12.02 ～ 18.12.15

部課名： ＴＩＣ・経済基盤環境

担当者： 大澤　英輝

J-18-22087
無収水管理

NAME OF PARTICIPANTS	NATIONALITY	PRESENT POST
Mr.KATHERU Cyrus Mugendi D-18-08424	KENYA	Technical Officer, Technical, Embu Water and Sanitation Co. Ltd(2006)
Mr.LIECH Job Michael D-18-08425	KENYA	Non Revenue Water Engineer, Technical, Kisumu Water and Sewerage Co. Ltd(2017)
Mr.MOSETI Walter Mokongu D-18-08426	KENYA	Trainer / Instructor, Trainer / Academic Department, Kenya Water Institute(2007)
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Ms.MWANGI Mary Wanjiru D-18-08431	KENYA	Technical Manager, Technical Services, Ruiru-Juja Water and Sewerage Company(2015)

3. Photos of training

Orientation on the first day of training

Kenyan hand tightening
(After an acknowledgment to the visit)

Summary of training (JICA Tokyo)

Exhibition Room of Training and Development Center, Bureau of Waterworks

Training completion ceremony (JICA Tokyo)

Welcome party (JICA Tokyo)

別添 6.　供与機材・携行機材実績（引渡リスト含む）

REPUBLIC OF KENYA

MINISTRY OF WATER & SANITATION AND IRRIGATION

MAJI HOUSE
NGONG ROAD
P. O. BOX 49720-00100
NAIROBI
Website: www.water.go.ke

Telegrams: "MAJI" Nairobi
Telephone: +254204900303
G.L +254 20 2716103
Fax: +254 20 2728703
Email: dwssd@water.go.ke

30th May, 2022

To: JICA Kenya Office

RE: TECHNICAL COOPERATION PROJECT FOR STRENGTHENING CAPACITY DEVELOPMENT IN NON-REVENUE WATER REDUCTION IN KENYA

CERTIFICATE OF HANDOVER

This certificate of handover is to certify that the equipment in the attached list, which was utilized for "Project for Strengthening Capacity Development in Non-Revenue Water Reduction in Kenya" under a Technical Cooperation between Kenya and Japan, have been handed over properly to Ministry of Water & Sanitation and Irrigation, as of 30th May, 2022.

Attached: List of Equipment

for witness

Eng. SAO Alima
Water Secretary
MWS&I

Masayuki TAGUCHI
Chief Advisor
JICA Experts Team

For: PRINCIPAL SECRETARY

List of Equipment

Equipment procured (on Phase1)

Purpose	Description of items	Quantity		Delivered
Equipment for KEWI	Notebook PC	1	set	KEWI
	Multi-purpose photocopier machine	1	set	
	Digital camera	1	set	
	Overhead projector	1	set	
Survey equipment for MWS&I	Portable ultrasonic water meter	1	unit	MWS&I
	Pressure data logger	10	unit	MWS&I (4) KEWI (3) Nyahururu (3)
	Potable checker of water meter	2	unit	MWS&I
	Leak noise correlator	1	Unit	KEWI
	Electronic leak detector	1	Unit	MWS&I
	Metal locator	1	Unit	MWS&I
	Listening stick (1.5m & 1.0m lengths)	8	Unit	MWS&I

Equipment procured (on Phase3)

Purpose	Diameter	Quantity		Delivered
Covid-19 emergency support for freezing the Kenyan side budget	Pressure reducing valve (PRV)	9	sets	Nyahururu WSP
	Pressure data logger	15	sets	Kilifi-mariakani WSP, Mavoko WSP, Ruiru-juja WSP, Embu WSP, Kisumu WSP, Eldoret WSP, Nyahururu WSP, Meru WSP, Nakuru WSP
	Portable ultrasonic water meter	6	sets	Kilifi-mariakani WSP, Mavoko WSP, Ruiru-juja WSP, Embu WSP, Eldoret WSP, Nyahururu WSP,

②Agreement on finalisation of the equipment

MINISTRY OF WATER AND IRRIGATION
STATE DEPARTMENT FOR WATER SERVICES

Telegrams: "MAJI" Nairobi
Telephone: Nairobi +254 20 2716103
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E-mail: ps@water.go.ke

DEPARTMENT OF WATER, SEWERAGE
AND SANITATION DEVELOPMENT
MAJI HOUSE
NGONG ROAD
NAIROBI

REF: WD/3/3/1338 VOL. II (47)

DATE: 4th April 2017

Masayuki IGAWA,
The Chief Advisor,
JICA Experts Team,
Maji House,
NAIROBI

REF: SUBMISSION OF THE LIST OF EQUIPMENT TO BE PROVIDED BY JAPAN

Reference is made to the Minutes of Meeting on the First Joint Coordination Committee of the Project Strengthening Capacity in Non-Revenue Water Reduction signed on October 19, 2016 between the Ministry of Water and Irrigation (MWI) and Japan International Cooperation Agency, Annex 1 – Draft Work Plan 1, 8.1 List of Equipment and your letter **Ref. No. KECKEN-13** dated 30th March 2017.

It is agreed that the reviewed and changes made on the type and number of equipment following the results of the Baseline Survey carried out by the JICA Expert Team in collaboration with the MWI is implemented forthwith. In this regard, we would like that the equipment in the proposed list be provided by the Government of Japan for successful implementation of the project.

We appreciate your continued support and cooperation

Eng. SAO Alima
Ag. DIRECTOR WATER, SEWERAGE
& SANITATION DEVELOPMENT

File Copy
Water Secretary
Principal Secretary
} **To see for information**

Project for Strengthening Capacity in Non-Revenue Water Reduction

KEC / TSS / TWI Joint Consultants

Address: Head Office: KEC Bldg. 1-62-11, Sasazuka, Shibuya-Ku, TokyoJAPAN

Telephone: 03-3376-3178, Facsimile: 03-3320-6542. Postal Code 151-0073

Ref. No.KECKEN-13
Date: 30th March, 2017

Principal Secretary
Ministry of Water and Irrigation
P.O. Box 49720
Nairobi.

ATTN: Engineer S.A.O. Alima

Dear Sir,

RE: SUBMISSION OF THE LIST OF EQUIPMENT TO BE PROVIDED BY JAPAN

With reference to Draft Work Plan 1 which is attached to M/M on 19th October, 2016, it was necessary to review the contents of equipment to be procured by JICA in Japan and provided to Kenyan side. In the initial plan, as shown in the table 1, water quality inspection equipment such as residual chlorine meters, electric resistivity meters and GPS were included in the equipment list according to R/D.

Following the results of the Baseline Survey carried out by the JICA Expert Team in collaboration with the MWI, we have reviewed it and would like to propose that instead of above equipment, Electric leak detector, Leak noise correlator, Metal locator and Listening stick are appropriate from the effective implementation of Training's point of view, as shown in the table 2.

Therefore, we would like you to issue a letter of request to JICA team. We prepared the Draft of the letter and left it with Mr. Mabonga.

We thank you for your continuous support and cooperation.

Best regards,

Masayuki IGAWA.

MasayukiIGAWA
Chief Advisor
JICA Expert team

Table 1: Original Plan of Equipment Procurement by JICA

(as in the Draft Work Plan before conducting the Baseline Survey)

Item	Quantity	Unit Price	Price
Portable ultrasonic flow meters	5	¥1,189,900	¥5,949,500
Pressure gauge with loggers	10	¥250,000	¥2,500,000
GPS	5	¥32,000	¥160,000
Portable checker of water meters	2	¥250,000	¥500,000
Residual chlorine meters with 1,000 of reagents	9	¥24,100	¥216,900
Portable electric resistivity meters	9	¥29,000	¥261,000
Total			¥9,587,400

Table 2: Modified Plan of Equipment Procurement by JICA

(Recommendation from JICA Expert Team after the Baseline Survey)

Item	Quantity	Unit Price	Price
Portable ultrasonic flow meter	1	¥1,629,500	¥1,629,500
Pressure logger	10	¥343,000	¥3,430,000
Portable checker of water meters	2	¥250,000	¥500,000
Leak noise correlator	1	¥3,100,000	¥3,100,000
Electric leak detector	1	¥498,000	¥498,000
Metal locator	1	¥185,000	¥185,000
Listening stick (1.5m & 1.0m)	8	¥25,000	¥200,000
Total			¥9,542,500

別添 7.　その他の活動実績

1)　Technical Note on The Finalized Selection of Pilot WSPs

THE PROJECT FOR
STRENGTHENING CAPACITY IN NON-REVENUE WATER REDUCTION

TECHNICAL NOTE

on

the Finalized Selection of Pilot WSPs

agreed upon between
Ministry of Water and Irrigation (MWI)
and
Japan International Cooperation Agency (JICA)

Nairobi, March 20, 2017

for Masayuki IGAWA
Chief Advisor
JICA Expert Team

Engineer S.A.O Alima
Director,
Water, Sewerage and Sanitation Development
Ministry of Water and Irrigation (MWI)
The Republic of Kenya

The JICA Expert Team discussed tentative results of selecting seven Pilot Water Supply Providers (WSPs) out of fifteen candidate WSPs (in addition to the pre-selected two leading WSPs (Meru WSP and Embu WSP under Tana WSB)) with the NRW Unit of MWI at the beginning of December, 2016. After revisiting some of the tentatively selected Pilot WSPs to confirm their conditions, the selection was finalized without changes between MWI and the JICA side. Table 1 shows the details of previously agreed prerequisite and selection criteria used for the selection. Table 2 and Figure 1 show the results of the selection including the scoring for each selection criteria. The candidate WSPs having the highest total point in each WSB area were selected as the seven Pilot WSPs because of their potential as future leading WSPs for NRW reduction in their respective regions and Kenya.

As a result, Ruiru-Juja WSP (Athi WSB), Nyahururu WSP (Northern WSB), Nakuru WSP (RV WSB) and Kisumu WSP (LVS WSB) have been selected as the four Pilot WSPs which JICA experts will support mainly during Phase 2 (2nd and 3rd years) of this project. Mavoko WSP (Tanathi WSB), Eldoret WSP (LVN WSB) and Kilifi-mariakani WSP (Coast WSB) have been selected as the three Pilot WSPs which JICA experts will support mainly during Phase 3 (4th and 5th year) of this project. Figure 2 shows the variation of NRW ratios at the selected Pilot WSPs since 2007. The NRW Unit of MWI and JICA Headquarters approved this finalized selection of the seven Pilot WSPs.

Table 1: Prerequisite and Selection Criteria and Basis of Assessment for Each Aspect for selecting Pilot WSPs (1/2)

			Prerequisite Criteria				
Same as the Pre-selection Criteria			1) WSPs that are not receiving other development partner's assistance with similar activities of the Project. (Yes if there has not been recently) 2) WSPs that have established NRW units. 3) O&M cost recovery is 80% or more. 4) Metering ratio is 75% or more. 5) Water coverage ratio is 30% or more. 6) Water service hours are 10 hour or more. 7) Service connections are more than 5,000. (Medium or Larger WSP (number of towns)) 8) WSPs in location acceptable under JICA's security guidelines.				
			Number of the pre-selection criteria which are currently not met.				
Additional Criteria			9) Counties, WSBs and WSPs have willingness to sign Memorandum of Understanding (MoU).				
Selection Criteria	Aspect to Evaluate	Weight (note 1)	Level Assessment Level 5	Level 4	Level 3	Level 2	Level 1
1: NRW reduction activities based on NRW plan [Allocation: 20 Points]	1) Whether the County has a clear water supply development strategy.	1	Strategy/plan of the County includes a pipe replacement plan and mentions about NRW (e.g. in its county integrated development plan)	Strategy/plan of the County does not include a pipe replacement plan but it mentions about NRW.	Strategy/plan of the County includes a pipe replacement plan but it does not mention about NRW.	-	Strategy/plan of the County does not includes a pipe replacement plan nor mentions about NRW.
	2) Whether the WSP uses subsidy from the County.	1	The WSP does not use subsidy from the County for its water supply services.	The WSP uses subsidy from the County (excluding payment for services).	-	-	The WSP applies for subsidy to the County but not able to receive it.
	3) Whether the WSP has an NRW reduction plan.	1	The WSP has an annual NRW reduction plan for this year.	-	-	-	The WSP does not have an annual NRW reduction plan for this year.
	4) Whether the WSP has been implementing the NRW reduction plan.	2	The WSP carries out NRW reduction activities along the NRW reduction plan.	The WSP has NRW reduction plan but its NRW reduction activities are not following the plan.	The WSP carries out NRW reduction activities but does not have NRW reduction plan	-	The WSP does not have NRW reduction plan and does not carry out NRW reduction activities.
	5) Whether the WSP periodically reports NRW reduction activities to its Board of Directors	1	The WSP periodically reports its NRW reduction activities to its Board of Directors (in addition to the monthly report to WSB/WASREB).	-	The WSP reports its NRW reduction activities to its Board but not periodically.	The WSP currently does not report the activities to its Board but has a plan to report in the near future.	The WSP neither report the activities to the Board nor have a plan to report in the near future.

Table 1: Prerequisite and Selection Criteria and Basis of Assessment for Each Aspect for selecting Pilot WSPs (2/2)

Selection Criteria 2: WSP's Organization and structures necessary for NRW reduction [Allocation: 20 Points]	1) Whether the NRW Unit has allocated necessary and adequate staff for NRW reduction activities.	2	The roles of the NRW Unit is clear and sufficient staff is allocated to implement activities.		The roles of the NRW Unit is not clear but sufficient staff is allocated to the Unit.	The roles of the NRW Unit is clear but no prospect of having sufficient staff.	The roles of the NRW Unit is not clear and no prospect of having sufficient staff.
	2) Status of budget allocation for NRW reduction.	1.5	Budget for NRW reduction has been continuously allocated for three years or more.	Budget for NRW reduction has been continuously allocated for two years.	Budget for NRW reduction is allocated this year.	-	No budget is allocated for NRW reduction this year.
	3) Whether the WSP has an internal capacity building system such as OJT.	1	The WSP has a functioning internal capacity building system sufficient for various NRW reduction activities.	The WSP has an internal capacity building system for NRW reduction but it is not functioning well or not sufficient.	The WSP has internal capacity building system but not specific to NRW reduction.	The WSP does not have an internal capacity building system but it has a plan to develop the system.	The WSP neither have an internal capacity building system nor a plan to develop it.
	4) Whether the WSP has sufficient communication between commercial and technical staff for NRW reduction.	1	Communication between commercial and technical staff are sufficient for effective and efficient NRW reduction activities, which include monthly inter-departmental meetings for NRW reduction and use of information technologies.	Meetings between commercial and technical staff specifically for NRW reduction are held once a month.	Inter-departmental meetings for NRW reduction are not held once a month but NRW reduction activities and NRW ratios are usually discussed in monthly general meetings.	Inter-departmental meetings, where NRW reduction activities and NRW ratios are discussed, are held less frequent than monthly but at least quarterly.	Inter-departmental meetings, where NRW reduction activities and NRW ratios are discussed, are held less frequent than quarterly.
Selection Criteria 3: Technical capacity of WSP on NRW reduction [Allocation: 40 Points]	1) Whether zoning and bulk meters are functioning.	2	NRW ratios for well-established sub-zones (i.e. DMA) are calculated monthly based on functioning bulk meters.	NRW ratios are partly calculated at sub-zones level every month while NRW ratios of all the distribution zones are calculated monthly based on functioning bulk meters.	NRW ratios of all the distribution zones are calculated monthly based on functioning bulk meters.	A single NRW ratio of all water service areas is calculated monthly based on functioning bulk meters.	A single NRW ratio of all water service areas is not calculated monthly based on functioning bulk meters.
	2) Whether maps of pipeline networks are well prepared and utilized.	2	A full-scale GIS database (including service pipes, customer meters, etc.) has been well-established, updated and well-utilized (e.g. for pipe rehabilitation planning, hydraulic analysis,	A full-scale GIS database (including service pipes, customer meters, etc.) has been established but it has some problems with completeness, update and/or utilization.	A preliminary GIS database has been established (including transmission and distribution branch mains).	Paper drawings are available for transmission and distribution trunk mains, but drawings of branch distribution mains are limited.	Available paper drawings of transmission and distribution trunk mains are limited.
	3) Whether the WSP properly controls the accuracy of customer meters.	2	High-accuracy customer meters (e.g. Class C) are used and systematically exchanged area by area in a cycle of less than 10 years.	High-accuracy customer meters (e.g. Class C) are used, and Customer meters are exchanged customer by customer both proactively (e.g. checking with billing system and field tests) and passively .	High-accuracy customer meters are not used, but Customer meters are exchanged customer by customer both proactively and passively.	Customer meters are only exchanged passively but promptly when found broken or customer complained.	Customer meters are only exchanged passively and not promptly when found broken or customer complained.
	4) Whether the WSP appropriately manages illegal water use.	2	Illegal connections are minimum.	Illegal connections are not minimum but there are no area where illegal connections are found repeatedly.	Illegal connections are found repeatedly in limited areas although proactive control measures are conducted.	Illegal connections are still common in many areas.	Illegal connections are widespread all over its service areas.
	5) Whether the WSP actively makes efforts to reduce leakage.	2	Various measures including step test are conducted for underground leakage detection in accordance to an effective and efficient strategy.	Multiple measures are proactively conducted for underground leakage detection.	Underground leakage detection is conducted rather passively only when the needs arises.	Regular patrol for surface leakage detection is conducted.	Regular patrol for surface leakage detection is not conducted.
	6) Whether the WSP repair leakage promptly	2	Taking less than one day on average to fix leakages once they are reported or detected.	Taking less than two days on average to fix leakages once they are reported or detected.	Taking less than three days on average to fix leakages once they are reported or detected.	Taking less than one week on average to fix leakages once they are reported or detected.	Taking more than one week on average to fix leakages once they are reported or detected.
Selection Criteria 4: Financial status related to NRW reduction [Allocation: 20 Points]	1) Difference between Cash Flow Available for Debt Service and Total Debt (million KES) (note 2)	3	>50	21-50	11-20	0-10	<0
	> Cash Flow Available for Debt Service (mill KES)						
	>Total Debt (mill KES)						
	2) Liquidity Ratio (%) (note 3)	1.5	>25%	20-25%	15-20%	10-15%	<10%
	3) Liquidity Reserves as % of annual operating expenses (%)	1.5	>25%	20-25%	15-20%	10-15%	<10%
	4) O&M Cost Coverage Ratio (%)	1.5	>130%	120-130%	110-120%	100-110%	<100%
	> Grants Revenue (mill KES)						
	> Grant Dependency for opex (%)						
	5) Collection Efficiency (%)	1.5	>95%	93-94%	90- 92%	85-89%	<85%
	6) Average Tariff Differentia (%) (note 4)	1	>50%	35-50%	20-35%	5-20%	<5%
	7) Revenue Diversification (%) (note 5)	1	<10%	10-30%	30-50%	50-70%	>70%

Note 1: Score = Weight x Level, and Point for each selection criteria = Total score / Max score x Allocated points; Note 2: Cash flow available to service debt payments (i.e. net operating cash flow + interest repayments) - Total debt, which indicates utility's ability to service debt; Note 3: Liquidity reserves (i.e. cash & near cash reserves) / Current liabilities; Note 4: (Unit production cost - Average tariff) / Unit production cost; and Note 5: (Residential revenue - Institutional revenue) / Total revenue

Table 2: Evaluation Sheet for Selecting Pilot WSPs

Type of WSP in the Project		Leading WSP				Pilot WSP Candidates																															
WSB Area		Tana				Athi						Tanathi				RV				LVS		LVN				Northern						Coast					
WSP		Embu		Meru		Ruiru-Juja		Limuru		Kiambu		Machakos		Mavoko		Nakuru		Chemususu (Eldama Ravine)		Kisumu		Eldoret		Nzoia		Nanyuki		Nyahururu		Isiolo		Kilifi–Mariakani		Kwale	
NRW Ratio / Difference from the Previous Year (as background information)	2007 / 08	58	-	27	-	31	-	-	-	-	-	-	-	38	-	46	-	82	-	59	-	42	-	51	-	46	-	56	-	43	-	38	-	23	-
	2008 / 09	57	-1	28	1	34	3	-	-	38	-	41	-	35	-3	47	1	80	-2	62	3	52	10	57	6	46	0	57	1	38	-5	39	1	59	36
	2009 / 10	55	-2	23	-5	31	-3	33	-	58	20	48	7	37	2	53	6	80	0	50	-12	25	-27	61	4	43	-3	57	0	51	13	39	0	50	-9
	2010 / 11	41	-14	23	0	31	0	30	-3	37	-21	48	0	39	2	47	-6	69	-11	49	-1	27	2	52	-9	36	-7	53	-4	48	-3	38	-1	42	-8
	2011 / 12	40	-1	26	3	30	-1	32	2	42	5	62	14	34	-5	48	1	66	-3	50	1	29	2	46	-6	35	-1	51	-2	41	-7	43	5	41	-1
	2012 / 13	41	1	26	0	30	0	34	2	41	-1	57	-5	38	4	46	-2	71	5	47	-3	32	3	40	-6	33	-2	49	-2	43	2	47	4	38	-3
	2013 / 14	36	-5	29	3	29	-1	32	-2	38	-3	55	-2	46	8	32	-14	69	-2	42	-5	35	3	38	-2	35	2	49	0	35	-8	44	-3	32	-6
	2014 / 15	49	13	19	-10	28	-1	32	0	35	-3	48	-7	46	0	37	5	70	1	49	7	45	10	43	5	35	0	46	-3	34	-1	47	3	46	14
Prerequisite Criteria		Assessment																																			
Same as the Pre-selection Criteria	1) WSPs that are not receiving other development partner's assistance with similar activities of the Project. (Yes if there has not been recently.)	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	SNV (2014-15)	No	-	Yes	VEI	No	-	Yes	VEI	No	SNV	No	SNV, WB	No	SNV	No	-	Yes	SNV	No	WB	No	WB	No
	2) WSPs that have established NRW units.	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
	3) O&M cost recovery is 80% or more.	126	Yes	109	Yes	114	Yes	115	Yes	94	Yes	113	Yes	101	Yes	111	Yes	14	No	104	Yes	105	Yes	97	Yes	104	Yes	110	Yes	93	Yes	101	Yes	83	Yes
	4) Metering ratio is 75% or more.	100	Yes	100	Yes	100	Yes	100	Yes	100	Yes	100	Yes	94	Yes	94	Yes	35	No	100	Yes	100	Yes	78	Yes	90	Yes	100	Yes	100	Yes	91	Yes	98	Yes
	5) Water coverage ratio is 30% or more.	68	Yes	57	Yes	77	Yes	45	Yes	37	Yes	57	Yes	66	Yes	90	Yes	45	Yes	68	Yes	72	Yes	82	Yes	94	Yes	80	Yes	58	Yes	39	Yes	47	Yes
	6) Water service hours are 10 hour or more.	23	Yes	22	Yes	22	Yes	18	Yes	17	Yes	11	Yes	9	No	17	Yes	10	Yes	24	Yes	15	Yes	22	Yes	23	Yes	20	Yes	11	Yes	14	Yes	8	No
	7) Service connections are more than 5,000. (Medium or Larger WSP (number of towns))	Large(2)	Yes	Large(2)	Yes	Large(2)	Yes	Medium (1)	Yes	Medium (1)	Yes	Medium (2)	Yes	Large(1)	Yes	Very Large(4)	Yes	Small(1)	No	Very Large(5)	Yes	Very Large(2)	Yes	Large(6)	Yes	Large(1)	Yes	Large(1)	Yes	Medium (1)	Yes	Large(3)	Yes	Large(1)	Yes
	8) WSPs in location acceptable under JICA's security guidelines.	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
	Number of the pre-selection criteria which are currently not met.	0		0		0		0		0		1		1		1		3		1		1		1		1		0		1		1		1	
Additional Criteria	9) Counties, WSBs and WSPs have willingness to sign Memorandum of Understanding (MoU).	-		-		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Selection Criteria	Aspect to Evaluate	Assessment																																			
		Value / Level	Point (note 1)	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point	Value / Level	Point
Selection Criteria 1: NRW reduction activities based on NRW plan 【Allocation: 20 Points】	1) Whether the County has a clear water supply development strategy.	1		1		1		1		1		1		1		5		1		1		4		1		1		1		3		1		3.0	
	2) Whether the WSP uses subsidy from the County.	5		5		5		4		4		4		4		5		4		5		5		5		5		4		1		5		4	
	3) Whether the WSP has an NRW reduction plan.	5	16.0	5	17.3	1	12.0	5	16.7	1	11.3	1	11.3	5	15.3	1	14.7	1	11.3	5	17.3	5	19.3	5	17.3	1	9.3	1	12.7	5	13.3	5	14.0	5	15.3
	4) Whether the WSP has been implementing the NRW reduction plan.	4		5		3		5		3		3		4		3		3		5		5		5		2		5		4		4		4	
	5) Whether the WSP periodically reports NRW reduction activities to its Board of Directors	5		5		5		5		5		5		5		5		5		5		5		5		3		3		3		2		3	
Selection Criteria 2: WSP's Organization and structures necessary for NRW reduction 【Allocation: 20 Points】	1) Whether the NRW Unit has allocated necessary and adequate staff for NRW reduction activities.	3		5		5		2		1		2.5		4		1.5		1		5		4.5		5		3		3		3		3		3	
	2) Status of budget allocation for NRW reduction.	5	14.2	5	17.8	3	15.6	3	9.8	1	6.2	5	12.7	4	17.5	5	12.4	4	9.8	5	20.0	5	16.4	5	20.0	3	11.3	4	16.0	3	12.7	3	10.5	1	7.6
	3) Whether the WSP has an internal capacity building system such as OJT.	4		4		3		3		2		2		5		2.5		2.5		5		3		5		3		5		3		2		1	
	4) Whether the WSP has sufficient communication between commercial and technical staff for NRW reduction.	2		3		4		3		3		3		5		4		3		5		3		5		2		5		4		2		2	
Selection Criteria 3: Technical capacity of WSP on NRW reduction 【Allocation: 40 Points】	1) Whether zoning and bulk meters are functioning.	3		4		4		2		2		4		2.5		2.5		2.5		2.5		4		2.5		3.5		4		3		3		3	
	2) Whether maps of pipeline networks are well prepared and utilized.	4		4		4		2.5		2		3		2.5		4		2.5		4		3.5		4		3		1		1		1		1	
	3) Whether the WSP properly controls the accuracy of customer meters.	4	29.3	4	36.0	4	29.3	4	23.3	3	20.0	3.5	28.7	2.5	24.7	4	30.0	0	20.0	4	19.3	4	30.0	4	27.3	4	26.0	4	24.0	3	20.0	1	14.7	1	14.7
	4) Whether the WSP appropriately manages illegal water use.	3		5		3		2		1		4		4		3		3		1		3		2		3		3		2		2		2	
	5) Whether the WSP actively makes efforts to reduce leakage.	3		5		2		2		2		2		2		4		2		2		3		3		2		2		2		1		1	
	6) Whether the WSP repair leakage promptly	5		5		5		5		5		5		5		5		5		1		5		5		4		4		4		3		3	
Selection Criteria 4: Financial status related to NRW reduction 【Allocation: 20 Points】	1) Difference between Cash Flow Available for Debt Service and Total Debt (million KES) (note 2)	25	4	101	5	62	5	2	2	2	2	6	2	19	3	61	5	3.7	2	4	2	78	5	17	3	24	4	4	2	7	2	-208	1	5	2
	> Cash Flow Available for Debt Service (mill KES)	96	-	101	-	62	-	2	-	2	-	6	-	19	-	61	-	3.7	-	8	-	78	-	17	-	24	-	4	-	7	-	7		5	
	>Total Debt (mill KES)	71	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	4	-	0	-	0	-	0	-	0	-	0	-	214	-	0	-
	2) Liquidity Ratio (%) (note 3)	109	5	116	5	120	5	10	1	2	1	8	4	30	5	20	4	0.5	1	2	1	17	3	7	1	18	3	9	1	131	5	5	1	4	1
	3) Liquidity Reserves as % of annual operating expenses (%)	49	5	63	5	43	5	3	1	2	1	6	5	11	2	9	1	1.6	1	1	1	18	3	6	1	10	1	3	1	9	1	1	1	4	1
	4) O&M Cost Coverage Ratio (%)	126	4	109	2	114	3	115	3	94	1	113	3	101	2	111	3	14	1	104	2	105	2	97	1	104	2	110	3	93	1	101	2	83	1
	> Grants Revenue (mill KES)	0	-	0	-	0	-	0	-	11.7	-	2.1	-	0	-	0	-	4.4	-	5.5	-	8.3	-	0	-	0	-	0	-	0	-	0	-	22.3	-
	> Grant Dependency for opex (%)	0	-	0	-	0	-	0	-	11	-	2	-	0	-	0	-	24	-	1	-	2	-	0	-	0	-	0	-	0	-	0	-	16	-
	5) Collection Efficiency (%)	89	2	107	5	100	5	92	3	84	1	79	1	92	3	96	5	101	5	94	4	108	5	91	3	93	4	95	5	101	5	98	5	76	1
	6) Average Tariff Differentia (%) (note 4)	61	5	17	2	36	4	29	3	22	3	53	5	48	4	43	4	53	5	52	5	48	4	45	4	38	4	49	4	29	3	46	4	32	3
	7) Revenue Diversification (%) (note 5)	51	2	23	4	72	1	57	2	69	2	80	1	9	5	8	5	54	2	-23	5	53	2	36	3	-31	5	-17	5	29	5	7	5	4	5
TOTAL POINT (Max 100)		75		88		74		58		44		64		71		73		50		67		80		74		60		64		58		48		45	
Selection as Pilot WSP		Yes (Phase 1 to 2)		Yes (Phase 1 to 2)		Yes (Mainly Phase 2)		No		No		No		Yes (Mainly Phase 3)		Yes (Mainly Phase 2)		No		Yes (Mainly Phase 2)		Yes (Mainly Phase 3)		No		No		Yes (Mainly Phase 2)		No		Yes (Mainly Phase 3)		No	

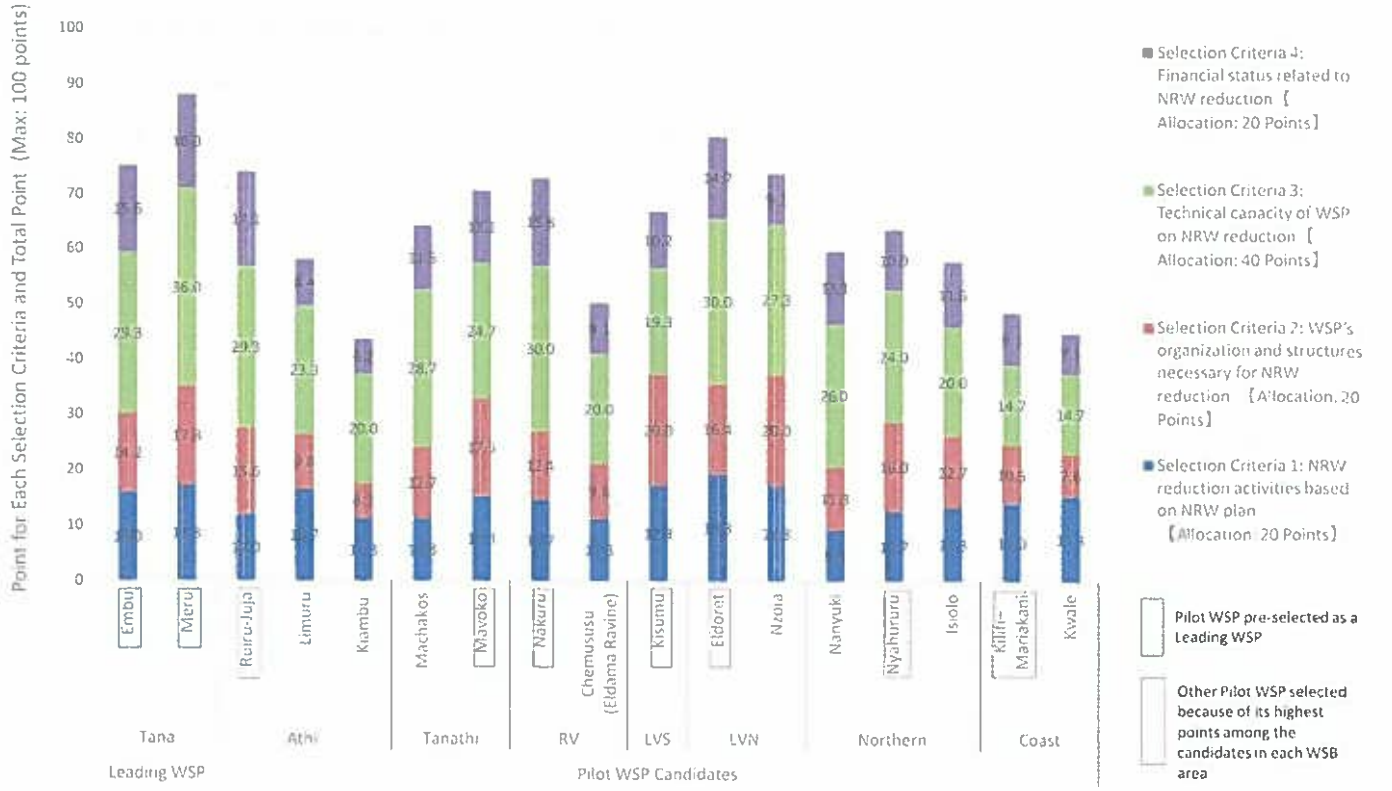


Figure 1: Pilot WSPs selected from Each WSB Area based on the Evaluation

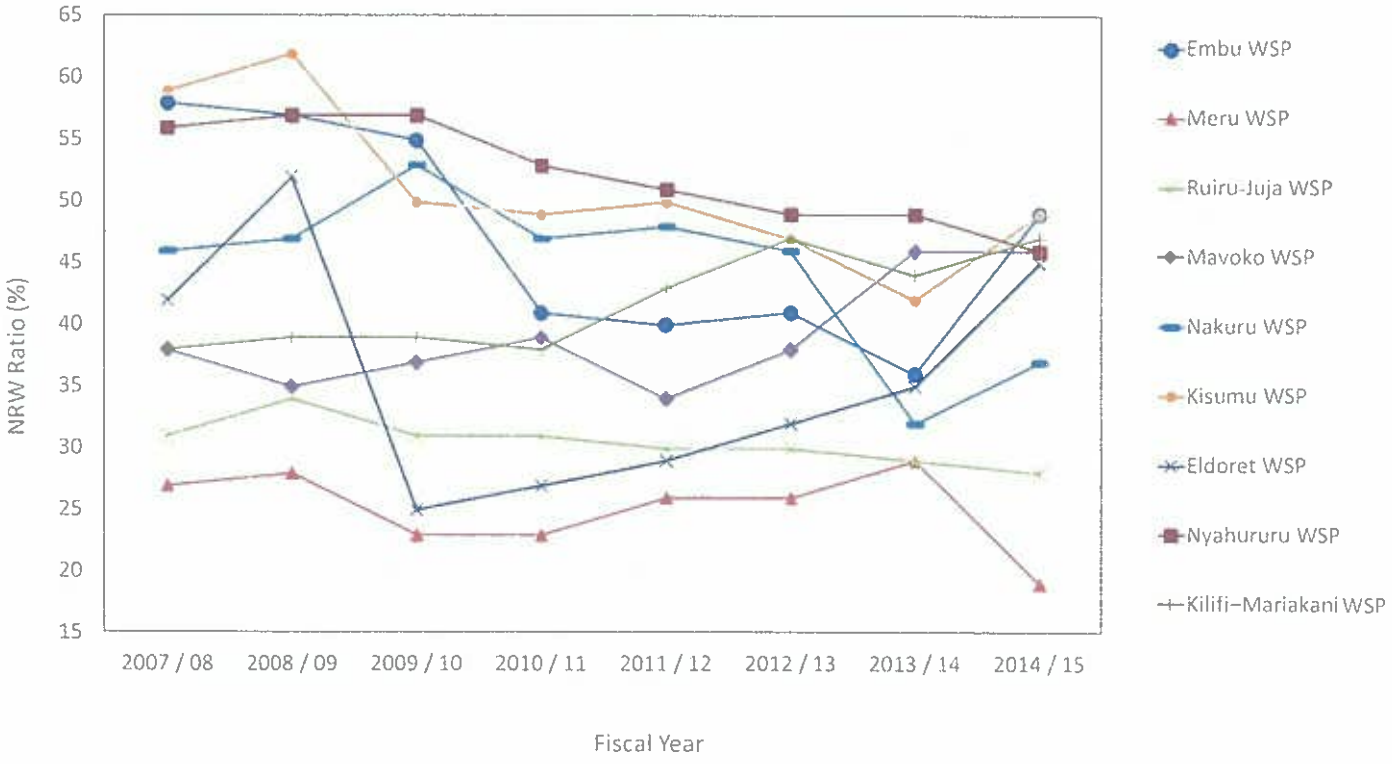


Figure 2: Variation of NRW Ratios at the Selected Pilot WSP since 2007

THE PROJECT FOR STRENGTHENING CAPACITY DEVELOPMENT IN NON-REVENUE WATER REDUCTION

MINUTES OF THE COUNCIL OF GOVERNORS (CoG) MEETING

Date	2017/03/20 (Monday) 10:00 - 12:45
Venue	CoG Office, Delta House, Nairobi
Agenda	1. Self - Introduction 2. Welcoming Remarks from the Chair 3. Presentation from WASREB 4. Presentation of Phase 1 Project 5. Presentation of Baseline Survey 6. Question and Answer.
Content	1. Self-Introductions All the members introduced themselves and their respective organizations. 2. Welcoming Remarks from the Chair The Chairperson, Dr. Kipkorir Sigi from the Council of Governors (CEC, Bomet County) who was the acting chair read the Opening remarks on behalf of the chairman of the Council of Governors Water, Forestry and Mining Committee, H.E. Governor Benjamin Cheboi, EBS, Governor of Baringo County who was in another meeting. (Full Text of the Opening Remarks Attached) 3. Presentation from WASREB Eng. Daniel Ngugi (Technical Officer, Water Services and Regulatory Board, WASREB) took the members through the WASREB's presentation on behalf of Eng. Njaggah (Director, Technical Directorate, WASREB). The presentation mainly highlighted the work of WASREB in regards to Non-Revenue Water and the main challenges that most Water Service Providers (WSPs) are facing in their fight against NRW which includes; ❖ Illegal Connections ❖ Denial ❖ Network Age - Most of the Water Service Providers in the country are operating on a very old network hence the high number of leakages' ❖ Political Interference more so now that water is a devolved function under the county governments. ❖ New Installations Easier - Most of the WSPs and their staff prefer making

	new installations rather than maintenance of the old ones. ❖ Skills Competence is an issue in most WSPs in the country ❖ Intermittent versus Sustained supply - Most WSPs are rationing the little water they have due to scarcity causing intermittent flow which in most cases affects the system. 4. Presentation of Phase 1 Project Eng. S.A.O Alima (Director, Water, Sewerage and Sanitation Development, Ministry of Water and Irrigation) gave a brief history on the phase 1 of the project in his presentation. He explained to the members how the Ministry saw there was a need to come up with some general standards to be used by all WSPs within the country in a bid to curb Non-Revenue Water (NRW) and this is when JICA was approached to assist in the formulation of the standards marking the first phase of the project. 5. Presentation of Baseline Survey In his second presentation, Eng. S.A.O Alima explained to the members that after the NRW Standards were set in the first phase of the project, most WSPs were not in a position to use them due to their complexity and also financial problems. Hence, there was need to strengthen the capacity of the management and staff mainly involved in NRW activities so that they can be more prepared and equipped to face the challenge. Therefore, Phase 2 of the Project (Current Project was formulated and named "The Project for Strengthening the Capacity Development in Non-Revenue Water Reduction in the Republic of Kenya," with the main aim being capacity building rather than infrastructure development. In his presentation he also took the members through the results of the baseline survey which was conducted by the JICA expert Team and also the selection criteria which were used to select the nine WSPs to be assisted in this Project. The selection criteria included factors like; the O&M ratio, Metering ratio, Hours of Supply, Other Donor Involvement, Existence of a NRW Unit among others. The nine selected WSPs were; ➢ Two leading WSPs (Starts in Phase 1: Year 1) Meru and Embu both from Tana Water Services Board ➢ Four Preceeding Pilot WSPs (Starts in Phase 2: Year 2 & 3) - Ruiru–Juja (Athi WSB) - Nyahururu (Northern WSB) - Nakuru (RV WSB) - Kisumu (LVS WSB)

	➢ Three following Pilot WSPs (Starts in Phase 3: Year 4 & 5) - Mavoko (Tanathi WSB) - Eldoret (LVN WSB) - Kilifi-Mariakani (Coast WSB) 6. Question and Answer. In this session, the main questions asked mainly dealt with the unwarranted destruction of pipes mainly during roads construction but one of the members from Uasin Gishu county gave an example of how they adopted fortnightly meetings with the relevant stakeholders in the roads construction industry eg. KENHA and KURA whereby they all agreed to work together as a team without destroying any of the existing infrastructure. Other members were also encouraged to adopt such a measure. The chairman also requested for the inclusion of the Council of Governors under Output 5 since they are key players in the water sector more so now that water is a devolved function which was agreed upon. There being no other business, the meeting was ended at 12:45pm.

ATTENDANCE:

1. Dr. Kipkorir Sigi (COG/Chief Executive Committee (CEC) Member, Bomet County - Chairperson.
2. Eng, S.A.O Alima (Director - Water, Sewerage and Sanitation Development, Ministry of Water and Irrigation)
3. Dr. Leunita Sumba (Director, Kenya Water Institute)
4. Mr. Masahito Miyagawa (JICA Kenya Office)
5. Mr. John N. Ngugi (JICA Kenya Office)
6. Mr. Joseph Kamau Kinyua (COG Kiambu County)
7. Mr. Mwachitu Kiringi (COG Kilifi County)
8. Mrs. Rose N. Kimeu (CEC, Water, Machakos County)
9. Eng. Daniel Ngugi (Water Services Regulatory Board)
10. Mr. David N. Mabonga (Ministry of Water and Irrigation)
11. Mr. Stephen Osingo (COG)
12. Mr. Augustus Mboya (Machakos)
13. Ms. Winfred Mbai (Machakos)
14. Ms. Edda Wambui (Water Services Providers Association)
15. Mrs. Mary Wambui (Ministry of Water)
16. Mr. Paul N. Muthama (Kenya Water Institute)
17. Mr. Joseph N. Kamau (Kiambu County)

18. Mr. Brian Muthoka (COG)
19. Mr. Moses Nzuki (Machakos)
20. Mrs. Ruth Mutua (Machakos)
21. Mr. Ambundo Jesse (Mavoko WSP)
22. Mr. Stephen Osingo (COG)
23. Ms. Nelly Mwenesi (COG)
24. Ms. Mwihaki Wambui (COG)
25. Mr. Masayayuki Taguchi (JICA Expert Team)
26. Ms. Hiroko Sugimoto (JICA Expert Team)
27. Mr. Shozo Mori (JICA Expert Team)
28. Mr. Naoki Harada (JICA Expert Team)
29. Mr. Shinichi Sekimoto (JICA Expert Team)
30. Mr. Charles Maingi (JICA Expert Team)
31. Mr. Gitahi Kunyuga (JICA Expert Team)

-

2) Frame Work of Cooperation between MWI and WASPA

Frame Work of cooperation

Between

Ministry of Water and Irrigation (MWI)

and

Water Service Providers Association of Kenya (WASPA)

PROJECT FOR STRENGTHENING CAPACITY IN NON-REVENUE WATER MANAGEMENT AND REDUCTION

PREAMBLE

Ministry of Water and Irrigation in collaboration with Japan International Cooperation Agency (JICA) is implementing the "Project for Strengthening Capacity in Non-Revenue Water Reduction" (the Project) through Technical Cooperation between the Government of Kenya and Japan with Water Services Regulatory Board **(WASREB)**, Kenya Water Institute **(KEWI)** and pilot WSPs as counterpart organizations. The Project purpose is to establish a NRW reduction support system for all Urban WSPs to implement NRW reduction activities. The framework of the Project consists of the following five components:

Output 1: Promotion and coordination of NRW reduction activities by MWI through its NRW Unit are strengthened.

Output 2: Use of NRW reduction standards by Urban WSPs are promoted by WASREB.

Output 3: NRW related training capacity of KEWI is strengthened.

Output 4: NRW planning and/or implementation capacity of pilot Urban WSPs is enhanced.

Output5: Experiences and knowledge of NRW reduction activities are shared among Urban Water Service Providers **(WSPs).**

This Framework of Cooperation is made and entered by and among the following parties:

Ministry of Water and Irrigation (MWI) as one party, represented by Eng. SAO Alima, Director Water, Sewerage and Sanitation Development

and

Water Service Providers Association (WASPA) as the other party, represented by Ms. Eddah Wambui, Executive officer of WASPA.

1. The Parties

Ministry of Water and Irrigation (MWI)

Ministry of Water and Irrigation, State Department for Water Services appointed Non-Revenue Water Management Unit (NRW Unit) with the following mandate and responsibility:

a. Formulation of national policies and strategies for NRW management and reduction;
b. Capacity Building and Coordination of NRW management and reduction activities in the country;

c. Promotion of NRW management and reduction activities including sensitization of counties;
d. Dissemination of standards for the management and reduction of NRW to all WSP's;
e. Compiling reports on the resources and other requirements needed to achieve reduction of NRW to acceptable level nationally;
f. Monitor levels of Non-Revenue Water and implement the recommendations set by WASREB;
g. Prepare a report on the status of NRW levels for MWI in liaison with WASREB;
h. Provide policy direction to MWI on the management and reduction of NRW.

Water Services Providers Association (WASPA)

The Water Services Providers Association **(WASPA)** was established in 2002 as association to support the Water Service Providers **(WSPs)** achieve their mandates of retailing water and sewerage services to consumers under the Water Act, 2002. The membership of the Association comprises of 66 licensed WSPs. The mandate of the Association is to provide a platform for members to advocate for issues pertaining to their development and sustainability. It is governed by an Executive Committee with 12 members consisting of Chairman, Vice Chairman, Treasurer and the Secretary. All of them are elected annually. The Secretariat is housed at the MWI Headquarters in Nairobi.

The core functions of the Association are:

a) To foster commercialization of water and sanitation services delivery in Kenya;
b) To promote sustainable management and development of water and sanitation infrastructure;
c) To stimulate and promote best practices and standards in development; management and delivery of water and sanitation services in Kenya;
d) To promote information and experience sharing through establishment of a data bank for information relevant to members, study tours, networking and participation in national and international events;
e) To advice members on training needs in collaboration with other actors and help establish staffing norms relevant to the sector, and also support members in acquisition of funds for developments.

2. The Rationale for the Cooperation between MWI and WASPA

To implement the Project effectively, the Ministry of Water and Irrigation (MWI) seeks for cooperation and/or collaboration with relevant organizations in urban water sector. The role of Water Service Providers Association **(WASPA)** as a membership organization of Water Service Providers **(WSPs)** is critical especially for achieving Output 5 and other Outputs. Therefore, the framework is to formalize the relationship between **MWI** and **WASPA** for the implementation of the Project.

3. Areas of Cooperation/Collaboration under the Framework of Cooperation

Specific areas of cooperation/collaboration under this framework are but not limited to:

- ✓ Collaborate with the MWI in the process of sensitization, consultation with stakeholders in the development of National Policy on Non-Revenue Water **(NRW)** management and reduction;
- ✓ Collect, document and share the experiences and knowledge on NRW management and reduction generated by the Project to Water Services Providers;
- ✓ Collaborate with WASREB and WSPs for reinforcement of management and reduction measures, including standards, nationally;
- ✓ Advocate among the Water Service Providers **(WSPs)** in the use of WARIS;
- ✓ Collaborate with WASREB in monitoring the performance of WSPs in the management and reduction of NRW in the use of WARIS.
- ✓ Document and publish best practices for the WSPs in the annual water sector review report.

4. Effectiveness and Termination

This framework of Cooperation shall be valid from the date of signing, [Date, Month, and Year] a until the completion of the Project;

5. Amendments

Any necessary amendments and additions to the framework of Cooperation may be negotiated among the parties. Agreed amendments and additions shall be evidenced by a written document signed by two parties.

6. Disclosure of Information and reporting requirement

During the implementation of the project, both parties involved in the frame work of cooperation shall share all the information with regard to the project freely. A joint semi-annual report of MWI and WASPA in collaboration with WASREB and JICA shall be prepared and shared within the Water Services Providers. Inputs from stakeholders shall be used to improve implementation. Annual joint report shall be incorporated in the water sector annual review report and IMPACT report of WASREB. Project documents shall be availed at all times to MWI, WASPA, WASREB and counties which are involved.

7. Costs under the Frame Work of Cooperation

The budget for the activities derived from this frame work of cooperation will be defined in the separate activity Assignment Agreements. Such activity agreements shall have due regard to accountability by either party and shall unequivocally state the extent of each party's contribution. Each party will meet own cost.

8. Law governing contract

The relevant Laws of Kenya shall govern this Frame Work of Cooperation.

9. Indemnity/release of liability

Ministry of Water and Irrigation (MWI) and Water Services Providers Association (WASPA) shall not be liable for the acts or defaults of the other party. All liabilities arising from or in connection with specific activities borne out by either party shall be the responsibility of that party.

10. Confidentiality

Both parties shall not transfer or divulge any confidential information to any other person or organization, not connected to either, unless:

- Prior written consent from both parties is obtained; and/or
- The Information is already in the public domain; and/or
- Disclosure is required by law or by judgement of a court of justice or an arbitral award.

Signed:

Eng. SAO Alima 12/5/17

Director Water, Sewerage and Sanitation Development
Ministry of Water and Irrigation MWI

Mrs. Eddah Wambui

EO, Water Service Providers Association

Witness by:

Masayuki Igawa

Chief Advisor
JICA Expert Team

3) MWS&I Self-financed Procurement Equipment and Materials Results

MINISTRY OF WATER AND SANITATION
INTERNAL MEMO

TO : **Head Supply Chain Management**

REF : **WD/3/3/1338 VOL. II (149)**

DATE : **31st May 2019**

SUBJECT: TECHNICAL INSPECTION REPORT OF NON-REVENUE WATER EQUIPMENT

The following Equipments were procured and delivered on 23rd May 2019.

1. Portable Meter Tester
2. Hand Pump for Leak Check
3. Ground Microphone (Leak Detector)
4. Listening Sticks
5. Leak Noise Correlator with Ground Microphone
6. Pipe Locator for Metal Pipes + Cable for Locating Plastic Pipes

The technical inspection was carried out on 31st May 2019 and they were found that they conform to the technical specification provided.

1. David N. Mabonga, Chief Superintendent Water.

   Signature DNmabonga.

2. Walter Moseti, Lecturer KEWI

   Signature WMoseti.

3. Shinichi SEKIMOTO, JICA Expert

   Signature 関元伸一

		Ground Microphone Detector	Portable Meter Tester	Hand Pump for leak Check	Listening sticks	Leak Noise Correlator with Ground Microphone	Pipe Locator for Metal pipes + Cable for locating Plastic pipes
1.	Meru	0	1	1	18	0	1
2.	Embu		1	1	7	0	1
3.	Kisumu	0	0	1	8	0	0
4.	Nakuru	0	0	1	8	0	0
5.	Ruiru-Juja	1	0	1	8	0	0
6.	Nyahururu	1	1	1	8	1	0
	Total	2	3	6	57	1	2

MINISTRY OF WATER AND SANITATION
INTERNAL MEMO

TO : **Director Water & Sanitation Development**

FROM : **Non-Revenue water Unit**

REF : **WD/3/3/1338 (109)**

DATE : **28th June , 2018**

Approved to include in the annual work plan
MWS 9/7/18
PS MWS

RE: PURCHASE OF EXHIBITION MATERIALS

Non-Revenue water staff wishes to participate in **Nairobi International Trade Fair show** by conducting some exhibitions on Non-Revenue Water. These exhibitions are aimed at sensitizing the general public on their role in Non-Revenue Water reduction in our water utilities. Below, I have attached a tentative budget for purchase of some exhibition materials for your consideration and further advise.

S/NO	ITEM DESCRIPTION	UNIT	QTY	RATE (KSH)	AMOUNT (KSH)
1.	MWS banner (Standing banner)	No	1	60,000	60,000
2	Flyer banner (table banner) for NRW unit	No	1	40,000	40,000
3	Handbills Printing	Pieces	1000	3	3000
4	Soft boards (4'x 8') / pins	No	4	2500	10,000
	TOTAL				113,000

N.B The banners will also be used in all our future exhibitions.

P. Mutua
NRW- UNIT

EQUIPMENT INSPECTION REPORT

The Ministry of Water Irrigation and Sanitation recently procured some Leak detection equipment for pilot WSPs under the project for strengthening capacity in Non-Revenue Water Reduction to be used by the Experts for training purposes and later by the WSPs.

Upon arrival at the Ministry's offices at Maji House, some Ministry Officials together with some members from the JICA Expert Team were requested to carry out an inspection of the equipment which was jointly done on Thursday 19th November 2020. Members present were;

1. Eng. Chemeril - MWI&S NRW Unit
2. Ms. Patricia Mutua - MWI&S NRW Unit
3. Eng. Boniface Waweru - MWI&S NRW Unit
4. Eng. George Karanja - JICA Expert Team
5. Mr. Charles Maingi – JICA Expert Team

The inspected Equipment were;

1. **Water Pressure Tester (with test pump) TR-HC - 5 pieces**

   The equipment were from Fuji Tecom Inc. company and their serial numbers were found to be;

   (a) 002954
   (b) 002952
   (c) 002955
   (d) 002953
   (e) 002956

   They all had manuals and their specifications were as shown in the attachment

NB – Equipment s/no – 002955 had had its gauge glass BROKEN as shown in the photo below;

2. <u>Portable Electronic Test Meter TR-IV</u> - 3 pieces

The equipment were from Aichi Tokei Denki company and their serial numbers were found to be;

(a) 075
(b) 108
(c) 109

} They all had manuals and their specifications were as shown in the attachment

3. <u>Pipe Locator for Metal pipes and cable for locating plastic pipes (PL-2000)</u> - 2 pieces

The equipment were from Fuji Tecom Inc. company and their serial numbers were found to be;

(a) 19102184

(a) 19102185

They all had manuals and their specifications were as shown in the attachment. The two equipment were also tested using the batteries and found to be in good working condition.

4. <u>Ground Microphone (Leak Detector) HG-10AII</u> - 2 pieces

The equipment were from Fuji Tecom Inc. company and their serial numbers were found to be;

(a) 010559

(b) 010560

They all had manuals and their specifications were as shown in the attachment. The two equipment were also tested using the batteries and found to be in good working condition.

5. <u>Pressure Data Loggers (DLS-HS)</u> - 3 pieces

The equipment were from Fuji Tecom Inc. company and their serial numbers were found to be;

(a) 20021318

(b) 20021319

(c) 20021319

They all had manuals, operational software in a CD Disk and a 4GB transcend and their specifications were as shown in the attachment. The three equipment were also tested using the batteries and found to be in good working condition.

6. <u>Listening Sticks</u> - 39 pieces

They were from Fuji Tecom Inc. and were all 1.5 meters long.

All the equipment were inspected as per the prescribed specifications as shown in the attachment in the accompanying email. It is notable from the specification list that some equipment did not meet the specifications given but they were supplied as indicated on the second column after specification indicated firm.

INSPECTION REPORT FOR NRW EQUIPMENT INSPECTED AT THE MWI&S STORES ON 6TH JULY 2021.

EQUIPMENT	QUANTITY	MODEL	SERIAL NUMBER	OTHER ADDITIONS	MISSING ITEMS/ACCESSORIES
ULTRASONIC FLOW METER	1	KATflow 210 Transducer type KIN - 2999	21000559	with manual	2no. Cables for each of the 3 equipments purchased. These are; (a) INPUT - OUTPUT cable (b) Communication cable
	2	KATflow 210 Transducer type KIN - 2999	21000562	with manual	
	3	KATflow 210 Transducer type KIN - 2999	21000558	with manual	
GROUND MICROPHONE (Leak Detecor)	1	FUJITECH DNR - 18	21023722	with manual and a detachable listening stick	
	2	FUJITECH DNR - 18	21023723	with manual and a detachable listening stick	
PRESSURE LOGGER	1	LOLOGOG - 450	53168		(a) Piping adapter (b) Software for downloading the information
PIPE LOCATOR	1	FUJITECOM F - 90M	8385		
	2	FUJITECOM F - 90M	8384		
	3	FUJITECOM PL - G(E)	21051005	with manual, cable for plastic pipe location and with an electric clamp and cable	3no. Earthings for each of the three machines
	4	FUJITECOM PL - G(E)	21051006	with manual, cable for plastic pipe location and with an electric clamp and cable	
	5	FUJITECOM PL - G(E)	21051007	with manual, cable for plastic pipe location and with an electric clamp and cable	

4) Presentation Materials for Sensitisation Workshop for County Governments

REPUBLIC OF KENYA

MINISTRY OF WATER, SANITATION AND IRRIGATION

Sessional Paper No. 1 of 2021 on National Water Policy

Presented by:

NON – REVENUE WATER UNIT

26TH May 2022, ROYAL HOTEL, EMBU

Background

The Constitution of Kenya 2010 :

Access to "clean and safe water in adequate quantities " is a constitutional right. (Section 43)

The national government is mandated to ensure progressive realization of all those rights. (Section 21)

Water resources as public land to be managed by the national government. (Section 62)The provision of water and sanitation services to be managed by the County governments.(Section 62/Fourth Schedule)

Vision 2030 and **Sustainable Development Goal No. 6** seek to ensure access to water and sanitation to all by 2030.

Background

- CoK 2010 - introduced extensive changes in the national governance framework, and wide-ranging human rights framework, and obligations specific to water sector governance. *Water became a concurrent function between the National and County governments, where water and sanitation services were devolved to the County Governments.*
- *Frameworks main objectives* - strengthen sustainable water resource management, promote development of water harvesting and storage infrastructure, **accelerate delivery of water and sanitation services towards progressive realization of the human right to water,** increase the areas under irrigation and reasonable standards of sanitation.

Background

- sessional paper No. 1 of 2021 prepared within the framework of the 2010 Constitution of Kenya.
- launched on 9th February 2022 - CS [Sicily K. Kariuki (Mrs), EGH]
- A blue prints to guide all aspects of water affairs at both the national and county levels.
- read and understand the policy to enhance undertaking of the various responsibilities prescribed therein;
- will ensure the country achieves its collective objective of universal access to water and reasonable standard of sanitation by the year 2030.

Challenges Addressed in Framework:

- **Water scarcity & disparity** in distribution countrywide
- **water resources management** - loss, depletion and degradation affecting the quantity and quality of water. Un-determined and unutilized ground water resources.
- **water and sanitation services** - increasing water demand due to rising population and expansion of economic activities across sectors. Low Sewerage coverage, high NRW due to inefficiency in operations of WSPs
- **Mis-alignment of the water sector with the constitution 2010**.
- **Response to emerging issues relevant to the development of the water sector** e.g SDG 2030, Kenya vision 2030, and National Climate Change Action Plan.

Policy on Water Supply Services

WSS Policy statement:

"The ministry will promote the progressive realization of human right to water towards universal access and ensure there is equitable access to the water for economic uses including irrigation and industrial production,

by creating effective and efficient human, institutional, infrastructure and management capacities, as well as putting in place required standards to promote consumer protection by all cadres of WSPs".

Sector Context

Constitution Foundation:

- access to clean and safe water is a fundamental human right
- Constitution devolved water service provision to the 47 county governments
- The National and county governments are concurrently obliged by the constitution to protect, respect and fulfil the human right to water.

Devolution

- devolved county public works and services
- County governments are at different levels in implementing the water service delivery function, with the disparity impacting on the quality of service delivery
- Inadequate county government capacity gaps in terms of water sector professionals and institutional systems and practices.

Sector Context

Performance of water supply service sub-sector:

- water supply service connection is still low and needs to be increased
- Performance of WSPs need to be improved to reduce high levels of NRW and increase hours of service.
- Full coverage of O&M costs and debt obligations remain a challenge

Human right to water:

- Counties have not achieved the **constitutional threshold** on the right of access to water supply services **(availability, quality and safety, affordability, accessibility and acceptability)**

Sector Context

Compliance and enforcement of regulations and standards

- Compliance is required in terms of staffing ratio, NRW, asset development, O& M, and hours of supply, etc

Governance

- Lack of security of tenure of BODs and senior staff
- Political interference
- Lack of ring-fencing of revenues

Sector Context

Loss of water through theft and leakages (NRW):

- High levels of non-revenue water affecting majority of WSPs;
- Due to system losses, commercial losses and governance challenges such as lack of integrity, corruption, illegal connection and theft with collusion by staff and cartels
- Needs to be addressed through enhanced management and through O&M systems
- Affects the pricing of water, quality of service and commercial viability of WSPs
- Makes it difficult to fulfil the human right to clean water in adequate quantities

Sector Context

Security of water installations and infrastructure

- Damaged infrastructure during road construction and maintenance mainly due to poor mapping of existing infrastructure and lack of coordination with road agencies on standard methods of installation of water and sewerage pipes under roads.

Policy direction and key outcomes

No.	Policy direction	Key policy outcome(s)
1.	Develop and implement a national methodology with parameters and standards for fulfilling the right to water	Attainment of universal access to drinking water
2.	Develop and implement a national financing and resource mobilization strategy for all investments including PPP for various project sizes	Community WSPs regulated for improved service delivery
3.	Strengthen regulator (WASREB) capacity to institute compliance and enforcement for water service standards	Established, operational and effective national water services regulator (WASREB established)

Policy direction and key outcomes

No.	Policy direction	Key policy outcome(s)
4.	Sensitize water consumers and public on participatory evaluation of WSP performance	Improved WSP accountability and transparency to consumers and public
5.	Develop and implement NRW implementation plan for all categories of WSPs including public dissemination of results	Progressive reduction of NRW by WSPs
6.	Develop and effect regulations and standards to enhance good governance and sustainable management of publicly and privately owned WSPs	Improved WSPs compliance for consumer protection and service delivery

Policy direction and key outcomes

No.	Policy direction	Key policy outcome(s)
7.	Put in place a firm regulatory framework to entrench the autonomy of WSPs, including through security of tenure of BODs and performance based on terms of service for senior management staff	WSP regulatory framework protects autonomy, board tenure
8.	Define and effect progressive measures and sanctions towards progressive enforcement on non-compliance to set water supply service regulations and standards by all cadres of WSPs.	Measures and standards for water supply defined and effected.
9.	Enhance coordination between WS institutions and other utilities on appropriate methods for mapping installations and marking of water and sewerage pipelines infrastructure development	Water & sewerage pipelines safeguarded by infrastructure development utilities

Key Points of the (new)

NRW Management Guideline and Handbook

(Old) NRW Standards

- Guideline -for WSBs
  (WSBs reassigned to WWA - Water Act 2016)
- Manual -for WSP management & senior staff
- Handbook -for WSP field staff
- Case Studies -Meru, Embu & Narok

Key Points of the (New) NRW Management Guideline

- Meant for the management & senior staff of WSPs
- Compiled from:
  Revised (old) NRW Guideline
  +
  Revised (old) NRW Manual
  +
  Adding new NRW reduction content from the experiences in the current JICA Project

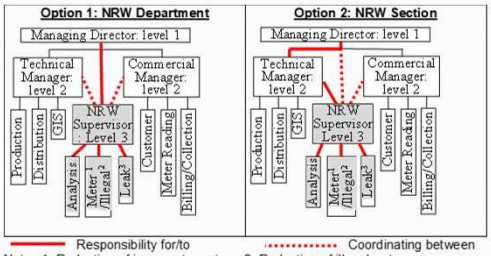
Table 1.1: The Five Stages of NRW Reduction Measures

Stage	Approx. Range of NRW %	Recommended NRW Reduction Measures (Note: GIS development and NRW monitoring are not listed here, but they are required as support for NRW reduction measures)
Stage1	Red NRW ratio≧40% (or unknown or unreliable)	◆ Determine the accuracy of production meters by testing & calibrating, and replacing if faulty or inaccurate (Mo-1). ◆ Eliminate major commercial losses by servicing & testing (& replacing faulty) customer meters and, identifying illegal uses (starting with large & then medium customers). (Co-1, Ma-1) ◆ Install meters for unmetered customers and identify unbilled customers through Customer Identification Survey (CIS) & issue them with bills. (Co-2, Ma-1, Ma-2) ◆ Reduce the time taken to repair bursts, surface leaks & overflows (Ph-1)
Stage2	Yellow 30%< NRW ratio <40%	◆ Intensify Stage-1 measures by e.g. establishing routines, etc. ◆ Isolate distribution zones & district metered areas (DMAs) with accurate bulk meters and do NRW monitoring. (Mo-2) ◆ Reduce underground leaks by step testing, acoustic survey & pressure reduction in priority areas (this leak reduction can be carried out as a pilot project) (Ph-2) ◆ Map bursts & leaks and monitor their recurrences (Ma-3, Ma-4) ◆ Introduce better pipe materials and fittings for new pipelines and service connections (e.g. HDPE or uPVC-D/E), and ◆ Minimize commercial losses (including at small customers & data handling errors) by improving meter reading & billing systems, and their uses (Co-3, Co-4)
Stage3	24%< NRW ratio ≦ 30%	◆ Intensify Stage-2 measures listed above. ◆ Reduce underground leaks in other areas (Ph-3, Mo-3) ◆ Start replacing pipes which are prone to bursts & leaks (Ph-3) Green
Stage4	20%< NRW ratio≦ 24%	◆ Intensify Stage-3 measures listed above. ◆ Accelerate and complete pipe replacement (Ph-3) Blue
Stage5	≦20%	◆ Intensify Stage-4 measures listed above. ◆ Maintain the facilities and skills to sustain the achieved low NRW ratio (Ph-3) Purple

Note-1: Table is Based on Experience in WSPs in Kenya

Note-2: The approx. percentage range of NRW for each stage corresponds to that of commercial viability criteria for each level included in WASREB Guideline on Clustering of WSPs (August 2018).

Organizational Options NRW Reduction Activities



Notes 1: Reduction of inaccurate meters, 2: Reduction of illegal water use, 3: Reduction of physical water losses

NRW Unit requirements

- Permanence in organization chart
- Relevant and adequate staff
- Fully operational
- Support from management – especially MD
- Support from other staff
- Suitable job descriptions
- SOPs

Staffing environment requirements

- Sensitized staff (all other) on NRW
- SOPs for all staff
- Incentives for NRW reduction initiatives
- Inter-departmental committee on NRW with regular coordination meetings
- NRW policy

Strategic Implementation of Coordinated NRW Reduction Activities

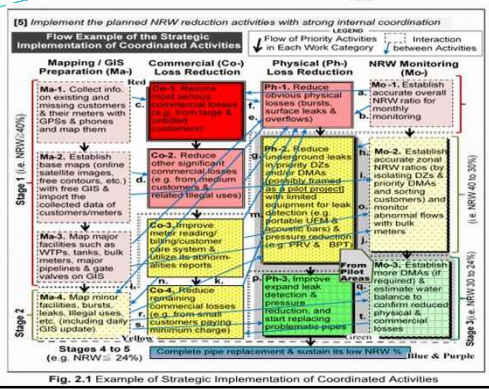


Fig. 2.1 Example of Strategic Implementation of Coordinated Activities

Plan-Do-Check-Adjust Cycle

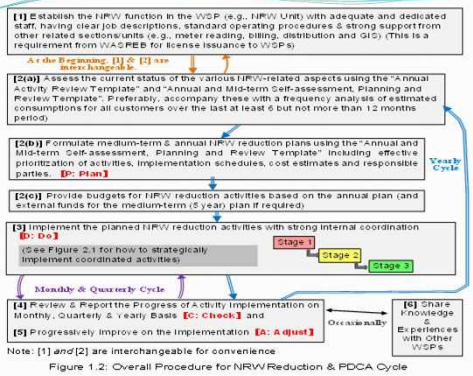


Figure 1.2: Overall Procedure for NRW Reduction & PDCA Cycle

Key NRW reduction tools developed/ recommended under current JICA project

- NRW Reduction - Capacity Self-Assessment, Planning, Monitoring & Review Template
- Meter reading and billing analysis template (for assessing commercial loss status)
- NRW monitoring sheet
- Kobo collect (or similar) data collection & transmission free software - recommended

Guidance on customer meter sizing

- Undersize meters can result in huge NRW if used for large customers because of under-registering during low flowrate periods.
- Proper sizing (or resizing) of meters very important especially for large, and medium non-domestic customers

Meter Sizing based on Maximum Monthly Consumption that Each Meter Size Can Handle

Meter Size (DN)		Nominal Flow (m^3/hr)	Meter Capacity (m^3/hr)	Maximum Monthly Consumption (m^3/connection/month) that Each Meter Size Can Handle for Each Assumed Total Time of Passing W Listed Below						
				Assumed Total Time Each Customer Takes Water Through Me (Heavily Intermittent ← Common Intermittent → Continuo						
inch	mm	ISO: Qn (or OIML: Q3)	Required Qmax (or Q4) [5]	0.5 hr/day [3]	0.75 hr/day	1 hr/day [2]	1.5 hr/day	2 hr/day	4 hr/day [4]	8 hr/d
1/2	15	1.5 (2.4)	3 (3.125)	45	68	90	135	180	360	72
3/4	20	2.5 (4)	5 (6)	75	113	150	225	300	600	1,2
1	25	3.5 (6.3)	7 (7.875)	105	158	210	315	420	840	1,6
1.25	32	6 (10)	12 (12.5)	180	270	360	540	720	1,440	2,8
1.5	40	10 (16)	20 (20)	300	450	600	900	1,200	2,400	4,8
2 (m) [1]	50	15 (25)	30 (31.25)	450	675	900	1,350	1,800	3,600	7,2
2 (u)	50	25 (40)	50 (50)	750	1,125	1,500	2,250	3,000	6,000	12,0
3 (m,u)	80	40 (63)	80 (78.75)	1,200	1,800	2,400	3,600	4,800	9,600	19,2
4 (m,u)	100	60 (100)	120 (125)	1,800	2,700	3,600	5,400	7,200	14,400	28,8
6 (m,u)	150	150 (250)	300 (312.5)	4,500	6,750	9,000	13,500	18,000	36,000	72,0
8 (m,u)	200	250 (400)	500 (500)	7,500	11,250	15,000	22,500	30,000	60,000	120,0

Notes 1: The values for meter size 2-inch (50mm) and larger are for flanged mechanical (m) bulk mete (specifically Woltmann type) and ultrasonic (u) bulk meters.
Note 2: 1 hr/day is recommended as the period a non-domestic customer takes water under intermitte (rationing) water conditions that is common in Kenya. During this period, non-domestic customers re their water receiving tanks within a limited time when water becomes available after the daily rationi period. Since meter size 0.5 inch (15mm) is sufficient for almost all domestic customers, this table is r very relevant for sizing domestic customers' meters. However, 1 hr/day can also be recommended domestic customers if the following daily water use is assumed: showering 5 persons x 5 mins, cloth flushing 5 persons x 3 mins, dishwashing 2 times x 5 mins, laundry and cleaning 10 mins (i.e., total hour/day).
Note 3: 0.5 hr/day may be applied for non-domestic customers under water rationing conditions such getting water for a limited time every two days; hence, they have to fill their water tanks quickly within very limited time every two days before the supply to their area ends.
Note 4: 4 hours/day may be applied for non-domestic customers under continuous water supp conditions in which they may take water from the distribution network for 4 hrs/day (i.e., half of Bhrs, t common business operating hours).
Note 5: If a high-performance meter capable of measuring higher than the standard value of Qmax used, then meter sizing should be based on the actual Qmax. E.g., the Qmax of electromagne flowmeters can be much higher than the standard values shown in the table, hence calculate t maximum monthly consumption which the meter can handle based on the actual Qmax of such a me (i.e., maximum monthly consumption the meter can handle (m^3/month) = Actual Qmax (m^3/hr) x hours taking water (hr/day) x 30 (days/month)).

Chapter 13

- Provides experiences from the JICA project
- It shows that NRW reduction requires continuous analysis of the situation and coming up with innovative ideas based on the local conditions

Key Points of the (New) NRW Management Handbook

- Describes the obligation of every actor in NRW reduction – see Chapter 1.
- Contains all most of the NRW reduction field activities
- It is meant for field staff.
- It is a step-by-step guide on how to undertake the various NRW reduction tasks – it should be carried to the field.
- Simple language used - easy to understand by field staff.

Key Points of the (New) NRW Management Handbook

- Has many figures and tables for illustration and explanation – its interesting to read.
- Introduces simple and low cost ideas to tackle NRW – encourages local innovation – e.g. meter accuracy test using calibrated bucket.

Use of free software

Checking accuracy of bulk meter using smartphone with time stamp camera and potable UFM

(Old) Case Studies -Meru, Embu & Narok

- Excluded from the (new) NRW Guideline & Handbook.
- Case studies replaced by:
  - KEWI training.
  - Benchmarking – WASPA, peer to peer, etc.
  - Visits to Industries.

Conclusion

- Need to effectively coordinate NRW activities to avoid:
  - None or little progress in NRW reduction.
  - Staff frustration.
  - Revenue loss.
  - Unending customer complaints.

Conclusion

- WSP management should read both (new) NRW Guideline and Handbook, ensure effective coordination of NRW activities.
- WSP field staff should read and apply the (new) NRW Handbook for effective NRW reduction.

Conclusion

- Management and field staff to seek for assistance:
  - KEWI training
  - Benchmarking

Thank You

Presentation on the New Course

Proposed Name

Innovative Approach to Management of Non-Revenue Water

26th May, 2022

KENYA WATER INSTITUTE
Fountain of Water Knowledge

Overall Objective of the Course

To Introduce Participants to New Tools for Non-Revenue Water Reduction and Management

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Specific Objectives for Participants

To Introduce and apply the New Tools for Managing NRW:-

1. NRW Annual Review, Self Assessment Planning and Review template,
2. Meter Reading and Billing analysis,
3. Universal NRW Monitoring Sheet,
4. Kobo Toolbox.

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Need for the New Course

WASREB's Regulations in Addressing Non-Revenue Water as a licensing Condition where WSPs are required to:-

1. Establish a Non-Revenue Water Management Function
2. Establish an Asset Planning and Development Function
3. Management undertake NRW training and use of Newly Reviewed NRW Guidelines/Handbook
4. Ensure all existing connections are metered and meters meet National Standards
5. Maintain appropriate district Metering areas
6. Maintain Strategic Asset Management Techniques
7. Periodically Monitoring and Evaluate how facilities and systems are performing through Asset Management
8. Undertake Preventive Maintenance to ensure systems are working properly
9. Develop a NRW Reduction Plan
10. Prepare quarterly NRW Reports

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New Managerial Training for NRW Management Content

1. NRW Annual Review, Self Assessment Planning and Review template
2. Meter Reading and Billing analysis
3. Universal NRW Monitoring Sheet
4. Kobo Toolbox

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1. NRW Annual Review, Self Assessment, Planning and Review template

This is a new tool developed for WSPs to assist them to conduct the following

***Annual review*:-** to check on their achievements and obstacles encountered in the course of the year during implementation of their NRW reduction plan

Capacity Self Assessment:- to determine their current situation/performance on NRW reduction matters,

Planning:- come up with both Mid Term and Annual plans with a budget, implementation timelines and the person in-charge of the implementation of the various activities, set priority activities and targets for both one and five years time from then,

Review:- conduct quarterly reviews to monitor progress of the planned activities.

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Sheet:1 - Is the NRW Annual Review Sheet

This entails Annual report of NRW activities that includes:-

1. Main Achievements during the fiscal year
2. Good Practices and Knowledge to share with other WSPs
3. Main Obstacles e.g.
   - ✓Annual Ratio
   - ✓Completion Ratio of the Planned Activities
   - ✓Main Incomplete Activities Planned for the Fiscal Year
4. Records of presenting and discussing the Review Results at your WSP
   - ✓ NRW Unit/Section/Task Team
   - ✓ Head /Staff of Technical & Commercial Departments
   - ✓ Managing Director/ General Manager
   - ✓ Board of Directors

Sheet: 2 - Is the Capacity Self Assessment Sheet

This entails Capacity Self-Assessment on Current Conditions for NRW Reduction for the Year:-

This is divided in the following four (4) Main categories

1. Organization Structure (Staffing with essential Support and training)
2. Sensitization and Awareness Raising for Wider Support
3. PDCA Cycle (Plan-do-Check-Adjust)
4. Suitable, Sufficient and Timely Procurement

From the four (4) Categories they are split in to thirty three (33) Aspects

-Cont Sheet: 2 - Is the Capacity Self Assessment Sheet

Level of Assessment v/s Size of a WSP

- ✓33 Aspects are listed as (Essential, Basic and Very Basic) are for Large WSPs
- ✓ 15 Aspect (10 Basic and 5 Very Basic) are for Low Capacity WSPs
- ✓and (5 Aspect) are for Very Low Utilities

Sheet: 3 - Is the Result of CSA Graph Sheet

This entails the four Main Categories that is sub-divided to Sub-Category Achievements (Discuss the results on the graph and review the priority and targets if required):-

a) Organization Structure sensitization, PDCA Cycles and Procurement
- ✓Staffing with essential Support and Training
- ✓ Sensitisation & Awareness Raising for wider support
- ✓ PDCA Cycles (Plan-Do-Check-Adjust)
- ✓ Suitable, sufficient and Timely Procurement

b) GIS, NRW Monitoring, Zoning Water Balance Analysis
- ✓ Mapping/GIS Development and utilization of Mapping Software
- ✓ Monthly NRW Monitoring
- ✓ Abnormal flow Monitoring & Water Balance Table

-Cont Sheet: 3 - Is the Result of CSA Graph Sheet

c) Reduction of Commercial (Apparent) Water losses (i.e. Data Handling and Water Accuracy error & Illegal Uses)
- ✓ Starting from large Customer (e.g. by NRW section)
- ✓ Activities for New & Various Problematic Customers (e.g. By Selection installing service connections and customer meters)
- ✓ System-related and procedural/internal improvements (e.g. By the section in change of meter reading and billing)

d) Reduction of Physical (Real) Water losses (i.e. Burst, Leaks and overflows)
- ✓ Physical losses reduction measures applicable without isolating DMAs
- ✓ Underground Leak Detection in a priority DMAs and or Expansion over DMAs
- ✓ If Required: Pressure management and pressure reduction management without large investments (e.g. PRV and BPT)
- ✓ If Required: Leak reduction with large investments (e.g. Pressure reduction with reservoirs and replacement of many pipes)

Sheet: 4 - Is the NRW Reduction Plan Sheet

This entails update and preparation of medium-term and annual NRW reduction plans and Quarterly Monitoring:-

- ✓Remarks on the implementation of planned activities
- ✓This will give results of the assessment for the year

Sheet: 5 - Is the highlights of the Plan Sheet

This entails the Annual Non-Revenue Water Reduction plan in Quarterly Monitoring through the following aspects:-

- ✓ Title (or brief description) of selected activity/Countermeasures
- ✓ By who
- ✓ By when
- ✓ End of 1st Q, 2nd Q, 3rd Q and 4th Q

2. Meter Reading and Billing analysis

This is a new tool developed for WSPs to assist them to reduce their Commercial losses by analyzing their meter reading and billing data and specially focusing on the *estimated consumptions*

Purpose:

a) To study ***how estimation is carried out*** in a WSP,

b) To study ***the frequency of estimation*** on the various connections billed on estimate over the period in question. e.g. an year, six months etc.

c) To assist a WSP to classify it's consumers into the various existing consumption brackets based on their consumption.

Table: Categorization of Customers for the Prioritization in NRW Reduction Activities (based on the meter reading/billing data of the last 12 months) – WSP

Customer Categories by Consumption Level and Times of Estimation (Jan – Dec 2022)	No Estimation / 12 months ◯		1 Estimation / 12 months 1		Several (2 to 5) Estimations / 12 months 5		6 or More Estimations / 12 months M		Total		
	Num. of Customers	Percentage	Num. of Customers	Percentage	Num. of Customers	Percentage	Num. of Customers	Percentage	Num. of Customers	Percentage	
C1: > 300 m3/month	42	40%	18	17%	30	29%	15	14%	105	0%	Very Large Customer
C2: 101-300 m3/month	157	39%	87	21%	119	29%	42	10%	405	1%	
C3: 51-100 m3/month	355	34%	196	19%	308	30%	179	17%	1,038	2%	Large Customer
C4: 21-50 m3/month	1,595	30%	831	16%	1,667	32%	1,142	22%	5,235	12%	
C5: 7-20 m3/month	5,251	26%	2,919	15%	5,937	30%	5,926	30%	20,033	48%	Medium Customer
C6: 0-6 m3/month	5,341	35%	2,544	17%	4,683	31%	2,662	17%	15,230	36%	Small Customer
Total	12,741	30%	6,595	16%	12,744	30%	9,966	24%	42,046	100%	

3. Universal NRW Monitoring Sheet

It is a new tool developed for WSPs to assist them to understand their NRW trends better over time by combining all the parameters that affect NRW into one graph. e.g. supply, billed values (both volume and monetary values), average tariff etc

Purpose:

a) To study the NRW trend over time and get to understand the causes for the monthly fluctuations,

b) To study the relationship of the above indicated parameters to each other and how they affect the NRW ratio,

c) To assist a WSP to correctly compute it's NRW on a monthly and annual basis,

d) To assist a WSP to keep the correct NRW records and also possibly analyzed reasons for the fluctuations over a long period of time which helps them to make well informed decisions.

-Cont Universal NRW Monitoring Sheet

This entails a Transition and Interrelation of Monthly NRW Volume, NRW Ratio, Billing, Average Tariff and Potential revenue loss.

1. Monthly Volumetric Analysis
   - ✓ Fiscal Year
   - ✓ Monthly
   - ✓ Total Supplied Volume
   - ✓ Total Billed Volume
   - ✓ Universal NRW Ratio of WSP %
2. Yearly Universal NRW Ratio
   - ✓ Total billing water supply charges only
   - ✓ Average Tariff
   - ✓ Potential revenue loss

4. Kobo Toolbox

KoBo Toolbox is a free open-source tool for mobile data collection, available to all. It allows you to collect data in the field using mobile devices such as mobile phones or tablets, as well as with paper or computers.

The adaptation of KoBo Toolbox for use was a joint initiative between UN Office for the Coordination of Humanitarian Affairs,

H Harvard Humanitarian Initiative (HHI)

and the

Inter national Rescue Committee (IRC).

ADVANTAGES

- **It is much faster.** Data does not need to be transcribed from paper to computers before it can be analyzed. Some analyses can be applied within minutes of the data being collected.
- **It is much more accurate.** Enumeration errors are minimized because of the data validation that can occur in real time as data is collected. Transcription errors are entirely eliminated.
- **It is optimized for field work.** It works offline, is easy to use (requires no technical knowledge to manage and enumerators can be trained within minutes), and can be rolled out rapidly in even the harshest or remotest situations. If all else fails, paper forms can be used as a backup and integrated with other data

KEWI

Together we can Manage and Reduce Non-Revenue Water to Acceptable Levels

THANK YOU

NON REVENUE WATER REDUCTION SUCCESS STORY-RUIRU-JUJA WSP IN COLLABORATION WITH JICA

COUNTY SENSITIZATION WORKSHOP ON NON-REVENUE WATER

ABOUT RUIRU-JUJA WSP

Background Info

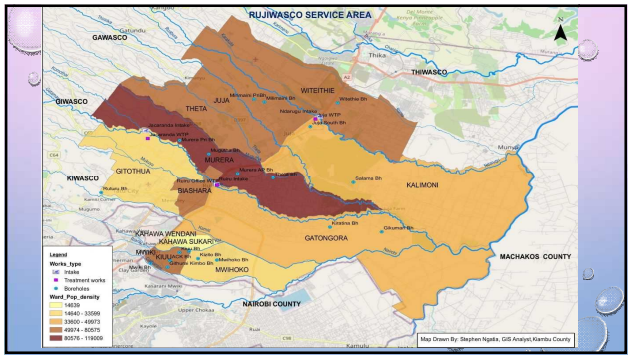
- Company was incorporated in march, 2006, as a private company under the companies act, cap 486 and started operation in October 2006
- Licensed to provide water and sewerage services to residents of Ruiru and Juja Sub Counties of Kiambu County.

Vision statement:

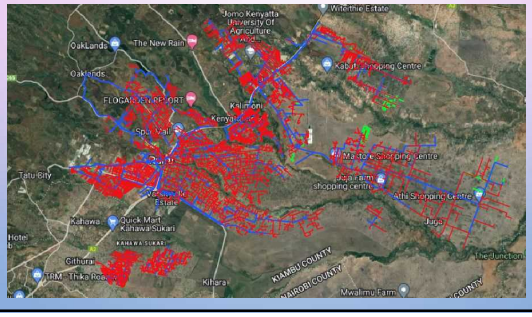
To be a world class provider of water and sewerage services.

Mission statement:

To provide quality and reliable water and sewerage services by embracing high standards of professionalism and integrity in service delivery.



WATER SUPPLY SCHEME



KEY PERFOMANCE DATA

- PRODUCTION DATA (M3)
- BILLED VOLUMES (M3)
- BILLING AMOUNTS (IN KSH)
- NRW DATA

NON REVENUE WATER REDUCTION STRATEGIES

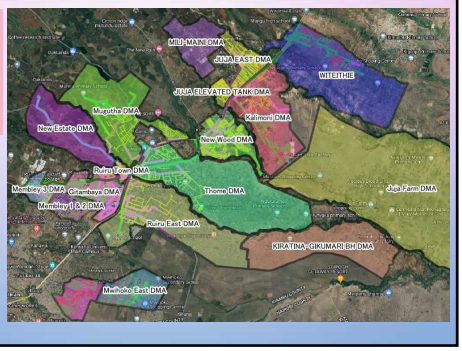
- **PIPELINE REALIGNMENT** AND **REPLACEMENT OF OLD PVC** PIPES TO **HDPE** PIPES
- CONDUCTING ROBUST **UNDERGROUND LEAKAGE SURVEYS** TO MINIMIZE PHYSICAL LOSSES
- **SUBDIVIDING DMAS INTO SUB-DMAS** FOR EASY AND EFFICIENT MANAGEMENT
- **CALCULATION** AND ANALYSIS OF **NRW PER DMA** AND **DAILY MONITORING**
- **CUSTOMER IDENTIFICATION SURVEY** TO ESTABLISH METERING STATUS AND IRREGULAR WATER CONNECTIONS
- **RELOCATION OF HIGH CONSUMER METERS** FROM OWN PREMISES TO IMPROVE ON METER READING EFFICIENCY
- **BILLING ANALYSIS** TO CHECK ON THE **ANOMALIES** SUCH AS LOW METER READINGS, REVERSED METERS OR FAULTY/STACK METERS
- MEASUREMENT OF **MINIMUM NIGHT FLOWS (MNF)** TO ESTABLISH THE INVISIBLE LEAKS
- **METER REPLACEMENTS** AND RESIZING

NRW REDUCTION ACTIVITY 1.

1. CREATION OF DMAS

- ESTABLISHED 19 NO. DMAs IN RUIRU, JUJA AND GITHURAI AREAS
- CONDUCT DAILY NRW ANALYSIS AND MONITORING
- RECOMMEND NRW REDUCTION STRATEGIES FOR EVERY DMA

ESTABLISHMENT OF 19 DISTRICT METERED AREAS (DMAS) IN RUIRU & JUJA



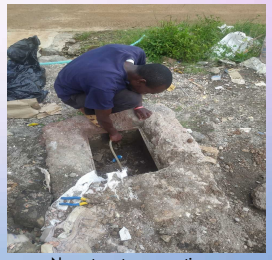
NRW REDUCTION ACTIVITY 2
- DOOR TO DOOR SURVEY

COMMERCIAL LOSSES

Mostly Through Water Theft

Commercial losses through water theft

Connection By-passed meter



No meter at a connection

USE OF LISTENING STICK

CHECKING CUSTOMER METER STATUS

USE OF LISTENING STICK

LEAKAGE AT GATE VALVE

PHYSICAL LOSSES

BURST AND LEAKS DURING LINE PATROL

NRW REDUCTION ACTIVITY-MINIMUM NIGHT FLOW AND STEP TEST

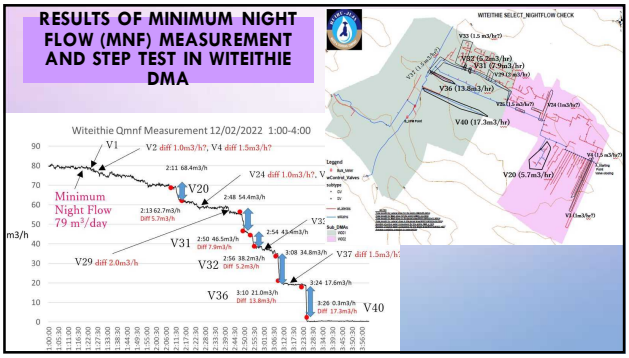
CASE STUDY: WETEITHIE DMA

FINDINGS THROUGH LEAK DETECTION ACTIVITIES- WETEITHIE DMA

- AS THE RESULT OF LEAK DETECTION ACTIVITIES, WE FOUND 13 LEAKAGES.
- BEFORE THE LEAK DETECTION, NRW RATIO IN WITEITHIE WAS 46%. AFTER THE ACTIVITIES NRW RATIO BECOME 19%, IT MEANS PHYSICAL LOSSES (LEAKAGE) WERE REDUCED.
- WITHIN 13 LEAKAGES, MOSTLY IT WAS VISIBLE LEAKAGE (GATE VALVE / FITTINGS).
- SERIOUS LEAKAGE BELOW UNDERPASS WAS TERMINATED AND UNKNOWN INTERCONNECTION WITH THIKA WSP WAS DISCONNECTED.
- MOST OF CUSTOMER (EVEN METER READERS) NEVER REPORT SUCH A SMALL LEAKAGE.
- RUIWASCO STAFF CAN CATCH THE SOUND OF LEAKAGE VERY WELL WITH LISTENING STICK AT CUSTOMER METER.

RESULT OF STEP TEST AFTER LEAK REPAIRS IN WEITEITHIE

RESULTS OF MINIMUM NIGHT FLOW (MNF) MEASUREMENT AND STEP TEST IN WITEITHIE DMA



Overall Results of NRW Reduction at the 9 Pilot WSPs

Assisting the Implementation at Each Pilot WSP		Baseline Year	Baseline NRW %*	Approx. Results (2021-22 so far) Current NRW%*	Diff. in NRW%	Revenue ↑ ** (Mill KSh/year)
From Phase 1	Meru	2016-17	24%	Around 17%	7% ↓	17 Mill KSh/y
	Embu	2016-17	Not credible	Around 40%	Gradually decreasing	Cannot estimate due to the lack of reliable baseline.
From Phase 2	Kisumu	2017-18	36%	Around 28%	8%↓	[illegible] KSh/y
	Nakuru	2017-18	35%	Around 31%	4%↓	[illegible] KSh/y
	Nyahururu	2017-18	42%	Around 40%	2%↓	8 Mill KSh/y
	Ruiru-Juja	2018-19	54%	Around 33%	21%↓	187 Mill KSh/y
	Eldoret	2018-19	44%	Around 39%	5%↓	62 Mill KSh/y
From Phase 3	Mavoko	2018-19	41%	Around 35%	6%↓	16 Mill KSh/y
	Kilifi-Mariakani	2019-20	57%	Around 49%	8%↓	78 Mill KSh/y

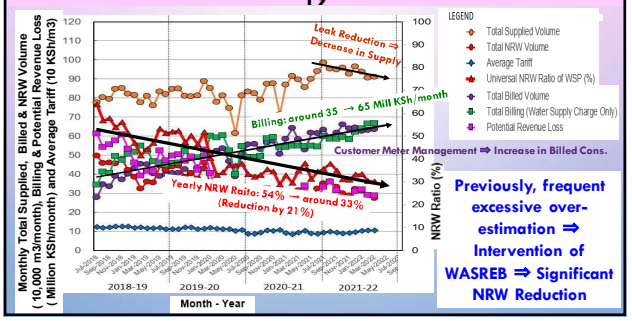
Getting Closer to Nyeri's 15%

* Based on the yearly universal NRW ratio calculated in the universal NRW monitoring sheet
* Roughly estimated by "Turnover in 2019-20 / (100 - Current NRW%) x Diff. in NRW%"

SUMMARY

ITEM		2018/ 2019	2021/ 2022
TOTAL SUPPLIED VOLUME (M3)	↑	774,819	951,864
TOTAL BILLED VOLUME (M3)	↑	279,246	635,601
TOTAL NRW VOLUME (M3)	↓	495, 573	274,495
TOTAL BILLING FOR WATER SUPPLY (KSH)	↑	34,482,972	66,567,393
POTENTIAL REVENUE LOSS (KSH)	↓	61,196,328	28,748,250

IDEAL REDUCTION OF NRW AT RUIRU-JUJA WSP SINCE 2018-19



Previously, frequent excessive over-estimation ⇒ Intervention of WASREB ⇒ Significant NRW Reduction

Reduction of the Frequency of Estimating Billed Consumption at RUJUWASCO

Table 1: Categorization of Customers for the Prioritization in Commercial Loss Reduction Activities (12 Months in 2017-18 (2017.6 to 2018.5))

Customer Categories by Consumption Level, and Frequency of Estimation 12 Months in 2017-18 (2017.6 to 2018.5)	No Estimation Num. of Customers	No Estimation Percentage	1 or 2 Estimations Num. of Customers	1 or 2 Estimations Percentage	3 or More Estimations Num. of Customers	3 or More Estimations Percentage	Total Num. of Customers	Total Percentage
C1: > 300 m3/month	5	26%	10	53%	4	21%	19	0.1%
C2: 101-300 m3/month	59	27%	80	37%	80	37%	219	1.0%
C3: 51-100 m3/month	140	20%	189	27%	372	53%	701	3.3%
C4: 21-50 m3/month	349	12%	720	26%	1,727	62%	2,796	13.3%
C5: 7-20 m3/month	813	6%	2,376	16%	11,386	78%	14,575	69.3%
C6: 0-6 m3/month	494	18%	1,065	39%	1,162	43%	2,721	12.9%
Total	1,860	9%	4,440	21%	14,731	70%	21,031	100%

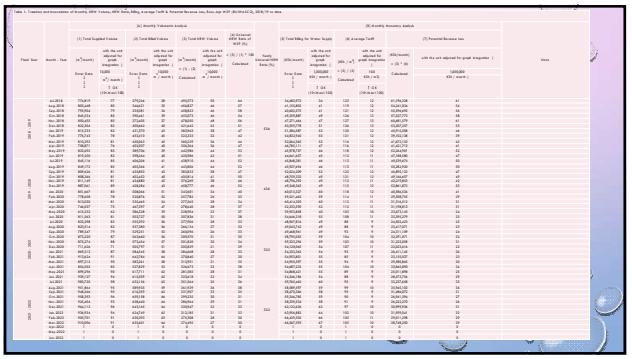
Only 9% of the customers did not experience any estimation over the 12 months.

SIGNIFICANT IMPROVEMENT after the Intervention of WASREB

Table 2: Reduced Frequency of Estimated Billed Consumption (Recent 12 Months from 2020.12 to 2021.11)

Customer Categories by Consumption Level, and Frequency of Estimation Recent 12 Months (2020.12 to 2021.11)	No Estimation Num. of Customers	No Estimation Percentage	1 or 2 Estimations Num. of Customers	1 or 2 Estimations Percentage	3 or More Estimations Num. of Customers	3 or More Estimations Percentage	Total Num. of Customers	Total Percentage
C1: > 300 m3/month	40	63%	13	20%	11	17%	64	0.2%
C2: 101-300 m3/month	369	61%	147	24%	92	15%	608	1.7%
C3: 51-100 m3/month	645	47%	342	25%	392	28%	1,379	3.9%
C4: 21-50 m3/month	2,406	42%	1,332	23%	1,969	35%	5,707	16%
C5: 7-20 m3/month	5,033	38%	3,226	24%	4,978	38%	13,237	37%
C6: 0-6 m3/month	2,730	19%	2,635	18%	9,368	64%	14,733	41%
Total	11,223	31%	7,695	22%	16,810	47%	35,728	100%

Many large and medium customers are still frequently receiving their bills based on estimated consumption.



NRW MONITORING OF ALL DMAS IN RUIRU-JUJA (RANKING)

DMA		1 RUIRU TOWN	2 GITAMBAYA	3 RUIRU INDUSTRIAL	4 NEW ESTATE	5 RUIRU EAST	6 KIRATINA KIRUMWA	7 MUGUFH A	8 THOME	9 NEW WOOD	10 MEUMAN I	11 KALIMON I	12 JUJA EAST	13 JUJA FARM	14 JUJA ELEVATED TANK	15 MWMBLY 1&2	16 MWMBLY 3	17 MWHOK O EAST	18 MWHOK O WEST	19 WETHIE
NRW Ratio (%)	NOVEMBER 2021	5%	36%	42%	60%	30%	-99%	64%	37%	-4093%	39%	46%	16%	-836%	5%	38%	24%	7%	38%	27%
	DECEMBER 2021	16%	48%	40%	50%	15%	50%	68%	24%	-120%	39%	71%	37%	33%	31%	35%	22%	7%	28%	31%
	JANUARY 2022	29%	39%	47%	62%	29%	29%	56%	32%	-92%	43%	64%	52%	16%	43%	38%	16%	11%	41%	40%
	Latest Ranking	13	10	5	2	14	15	3	12	19	6	1	4	17	7	11	16	18	8	9
Potential Revenue Loss (1000 KSh/month)	NOVEMBER 2021	123	2,964	868	1,167	2,601	168	4,907	4,771	-3,019	216	2,948	880	- 546	175	1,623	425	125	1,211	805
	DECEMBER 2021	357	5,493	828	803	1,212	351	5,150	3,442	-2,094	160	8,025	2,485	245	1,244	1,838	466	119	737	1,037
	JANUARY 2022	620	3,641	930	1,374	2,154	237	4,795	3,870	-1,567	216	6,957	2,990	157	1,386	1,336	260	199	1,242	1,626
	Latest Ranking	13	4	12	9	6	15	2	3	19	16	1	5	18	8	10	14	17	11	7
% of Estimated Billed Amount	NOVEMBER 2021	11%	19%	8%	14%	21%	24%	25%	20%	19%	46%	9%	8%	4%	36%	14%	5%	34%	29%	19%
	DECEMBER 2021	13%	24%	10%	15%	23%	69%	53%	22%	25%	99%	35%	10%	6%	73%	14%	7%	45%	39%	26%
	JANUARY 2022	9%	21%	9%	12%	30%	17%	22%	26%	24%	80%	12%	9%	8%	32%	23%	13%	41%	36%	16%
	Latest Ranking	18	10	16	14	5	11	9	6	7	1	15	16	19	4	8	13	2	3	12
Average Tariff (KSh/m3)	NOVEMBER 2021	132	95	132	93	97	81	88	93	98	79	91	101	75	104	92	141	87	87	92
	DECEMBER 2021	131	96	137	93	96	77	84	94	93	70	105	100	69	102	96	160	82	84	94
	JANUARY 2022	125	91	131	91	91	84	89	89	90	73	98	92	79	96	92	144	84	83	94
	Latest Ranking	3	9	2	11	10	16	14	13	12	19	4	7	18	5	8	1	15	17	6

CHALLENGES OF NRW

- AGED DILAPIDATED PLASTIC PIPES THAT REQUIRES REPLACEMENT
- VANDALISM OF PIPES AND METERS
- CONDUCTING MNF IN SOME DMA DUE TO RATIONING
- ILLEGAL CONSUMPTION LIKE METER BYPASS, METER TAMPERING
- ONGOING ROADS PROJECTS WORKS ARE A MAJOR CAUSE OF PIPE DAMAGES

LESSONS LEARNT AND GOOD PRACTICES

- **INVOLVEMENT OF ALL STAFF IN NON REVENUE WATER MANAGEMENT SUCH REPORTING OF LEAKS, BURST, ILLEGAL CONNECTIONS, ETC.**
- **ADOPTION OF NEW TECHNOLOGIES IN NRW REDUCTION MEASURES SUCH AS USE OF SMART METERS, LEAK DETECTION, ULTRASONIC FLOW METERS**
- **GOOD DATA MANAGEMENT IN BILLING ANALYSIS OF CONSUMPTION AND FLOWS**
- **SENSITIZATION AND TRAINING OF ALL STAFF ON NRW REDUCTION MEASURES**
- **FORMULATION AND ADOPTION OF CORPORATE POLICIES FAVORABLE TOWARDS REDUCTION OF NRW- METERING POLICY, CODE OF CONDUCT IN HR POLICY**

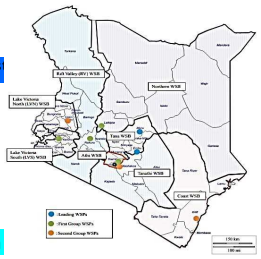
WSP's FINANCIAL LOSS MITIGATION MEASURES

BY: MAINGI CHARLES – JICA EXPERT TEAM
26TH MAY – EMBU

Project for Strengthening Capacity in Non-Revenue Water Reduction in the Republic of

Sharing the Experiences at the End of our NRW Project

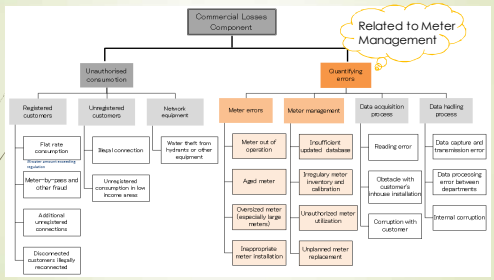
- JICA's 2nd Capacity Development Project for NRW Reduction in Kenya (2016-2022)
- New Approach Different from JICA's 1st Capacity Development Project for NRW Project in Kenya (2010-2014)
- JICA ⇔ 9 Pilot WSPs (Meru, Embu, Nakuru, Kisumu, Ruiru-juja, Nyahururu, Eldoret, Kilifi-Mariakani) and Kenyan Institutions (the Ministry, WASREB, KEWI & WASPA)
- Vision: the 9 Pilot WSPs → the Kenyan Institutions → **Other many Kenyan WSPs** (& **Other developing countries**)



Support Mechanism for WSPs

- **NRW Unit of the Ministry**: Procurement of NRW Equipment, Editorial Committee of NRW Handbook and Guidelines, Annual Report, Sensitization & Awareness Campaign, etc.
- **WASREB**: Editorial Committee of NRW Handbook and Guidelines, Dissemination & Promotion of the Documents, Commenting for the Preparation of Templates, Licensing Conditions regarding NRW, etc.
- **KEWI**: Editorial Committee, New Practical, Management and Advanced NRW Courses, etc.
- **WASPA**: Editorial Committee, Bimonthly Meetings, Benchmarking Workshops, Training on NRW, etc.

How do Commercial Losses occur ?

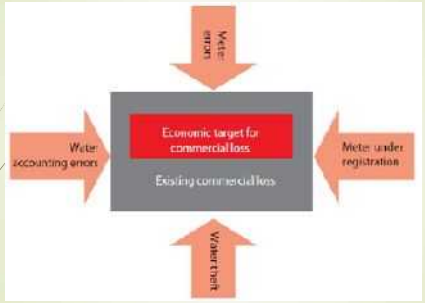


What is Meter Management ??

- Metering of Water

  Purpose ;
  - Produce revenue to operate the utility
  - To make sure each customer is charged equitably for water use
  - Encourage limited water resources conservation

Water Meter



Correction to commercial losses

- meter reading practices
- Handling of reversals of over-estimation
- Processes used for dealing with complaints about high bills
- Customer leaks
- Estimation of consumption
- Meter change-outs
- Tracking inactive accounts
- The processes for the identification and rectification of stuck meters.

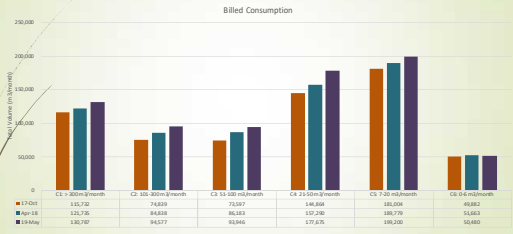
Table: Categorization of Customers for the Prioritization in NRW Reduction Activities (based on the meter reading/billing data of the last 21 months) – NAKURU WSP

Customer Categories by Consumption Level and Times of Estimation (Aug 2016 - Apr 2018)	No Estimation / 21 months ○		1 Estimation / 21 months 1		Several (2 to 5) Estimations / 21 months S		6 or More Estimations / 21 months M		Total		
	Num. of Customers	Percentage	Num. of Customers	Percentage	Num. of Customers	Percentage	Num. of Customers	Percentage	Num. of Customers	Percentage	
C1: > 300 m3/month	42	40%	18	17%	30	29%	15	14%	105	0%	Very Large Customer
C2: 101-300 m3/month	157	39%	87	21%	119	29%	42	10%	405	1%	
C3: 51-100 m3/month	353	34%	196	19%	308	30%	179	17%	1,038	2%	Large Customer
C4: 21-50 m3/month	1,595	30%	831	16%	1,667	32%	1,142	22%	5,235	12%	
C5: 7-20 m3/month	5,251	26%	2,919	15%	5,937	30%	5,926	30%	20,033	48%	Medium Customer
C6: 0-6 m3/month	5,341	35%	2,544	17%	4,683	31%	2,662	17%	15,230	36%	Small Customer
Total	12,741	30%	6,595	16%	12,744	30%	9,966	24%	42,046	100%	

SAMPLE Impact of water meters replaced.

No	Account No.	Before (m³)	After (m³)	Variance
1	05600920	295	453	158
2	07211590	140	281	141
3	00200500	220	338	118
4	07211400	80	193	113
5	00302311	80	200	120
6	00300743	300	570	270
7	00301071	240	350	110
8	01600004	230	383	153
9	00302340	140	180	40
10	00700530	230	560	330
11	00701980	137	311	174
12	04304851	71	220	149
13	04900960	67	150	83
14	01200250	324	682	358
15	09223950	101	379	278
16	01200230	20	150	130
17	01200250	324	430	106
18	05600920	74	300	226
19	09120950	150	263	113
20	02100071	235	382	147
21	02608030	41	162	121
22	02611150	40	154	114
	TOTAL	3539	7091	3552

EXAMPLE GRAPH FROM NAKURU WSP SHOWING THE INCREASE IN BILLED VOLUMES OVER TIME



Amazing Reduction of the Billing on Estimation in Eldoret

No Estimation: 31% ⇓ 37% ⇓ 87%

Frequent Estimation: 46% ⇓ 40% ⇓ 2%

Table 1: Categorization of Customers for the Prioritization in Commercial Loss Reduction Activities (First 12 Months from 2017.2 to 2018.1)

Customer Categories by Consumption Level, and Frequency of Estimation (First 12 Months (2017.2 to 2018.1))	No Estimation Num. of Customers	No Estimation Percentage	1 or 2 Estimations Num. of Customers	1 or 2 Estimations Percentage	3 or More Estimations Num. of Customers	3 or More Estimations Percentage	Total Num. of Customers	Total Percentage
C1: > 300 m3/month	65	57%	24	11%	23	17%	112	0.2%
C2: 101-300 m3/month	192	65%	66	7%	55	9%	313	0.5%
C3: 51-100 m3/month	388	67%	165	5%	135	12%	688	1.2%
C4: 21-50 m3/month	1,834	62%	931	8%	779	14%	3,544	6.0%
C5: 7-20 m3/month	6,972	49%	3,774	9%	3,755	27%	14,501	24.3%
C6: 0-6 m3/month	9,263	41%	8,284	10%	22,854	48%	40,401	67.8%
Total	18,714	31%	13,244	22%	27,601	46%	59,559	100%

SOME IMROVEMENT OVER THE 1.5 YEARS

Table 2: Reduced Frequency of Estimated Billed Consumption (Baseline Year from 2018.7 to 2019.6)

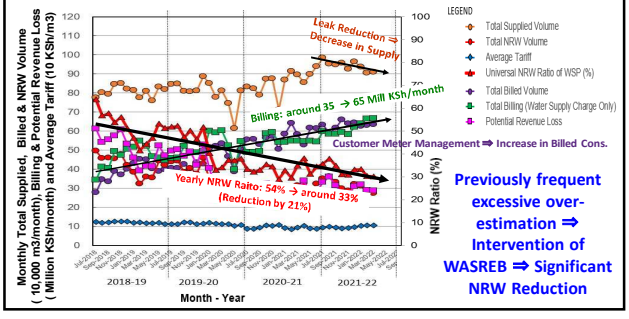
Customer Categories by Consumption Level, and Frequency of Estimation (Baseline Year (2018.7 to 2019.6))	No Estimation Num. of Customers	No Estimation Percentage	1 or 2 Estimations Num. of Customers	1 or 2 Estimations Percentage	3 or More Estimations Num. of Customers	3 or More Estimations Percentage	Total Num. of Customers	Total Percentage
C1: > 300 m3/month	65	54%	42	35%	14	12%	121	0.2%
C2: 101-300 m3/month	197	54%	128	35%	41	11%	366	0.6%
C3: 51-100 m3/month	584	66%	212	24%	88	10%	884	1.4%
C4: 21-50 m3/month	2,835	63%	1,054	24%	590	13%	4,479	7%
C5: 7-20 m3/month	9,400	57%	4,776	26%	2,736	17%	16,912	26%
C6: 0-6 m3/month	10,215	25%	9,226	22%	21,866	53%	41,307	65%
Total	23,296	37%	14,938	23%	25,335	40%	63,569	100%

HUGE IMROVEMENT OVER THE 3 YEARS

Table 3: Reduced Frequency of Estimated Billed Consumption (Last 12 Months from 2021.4 to 2022.3)

Customer Categories by Consumption Level, and Frequency of Estimation (Last 12 Months (2021.4 to 2022.3))	No Estimation Num. of Customers	No Estimation Percentage	1 or 2 Estimations Num. of Customers	1 or 2 Estimations Percentage	3 or More Estimations Num. of Customers	3 or More Estimations Percentage	Total Num. of Customers	Total Percentage
C1: > 300 m3/month	115	82%	23	16%	2	1%	140	0.2%
C2: 101-300 m3/month	327	78%	81	19%	13	3%	421	0.7%
C3: 51-100 m3/month	885	87%	112	11%	15	1%	1,012	1.6%
C4: 21-50 m3/month	4,541	90%	427	8%	90	2%	5,058	8%
C5: 7-20 m3/month	15,721	90%	1,535	9%	288	2%	17,544	28%
C6: 0-6 m3/month	34,387	86%	4,566	11%	1,055	3%	40,008	63%
Total	55,976	87%	6,744	11%	1,463	2%	64,183	100%

Ideal Reduction of NRW at Ruiru-Juja WSP since 2018-19



Previously frequent excessive over-estimation ⇒ Intervention of WASREB ⇒ Significant NRW Reduction

Data Handling and Accounting Errors

- The success of meter reading, billing and collecting revenues depends on accuracy, check & balances and diligence. The goal is:

1. to ensure that all people who use water are connected and in the utility's information system,
2. that usage is metered accurately,
3. that the meter readings result in accurate bills to customers and
4. That the billed amounts are collected on a timely basis.

- At any step in this process, inaccuracies or errors will result in NRW.

Actively Checking the Customer Billing System

- Sometimes connections are made legally, but the billing department is not notified of the new connection; therefore, the customer is never billed.
- These unregistered customers can be detected during the regular meter reading cycle when diligent meter readers find meters that are not in their reading book.
- Note:- this process may not identify all the errors in the billing system.

How to Avoid Corrupt Meter Readers

- Corrupt meter readers can significantly impact a utility's monthly billed consumption. For instance, the same meter reader who walks the same route for an extended period of time, thus becoming familiar with the customers and their monthly billed consumption, may collude with those customers to record lower meter readings in exchange for a monetary incentive.
- To reduce this risk, the manager needs to rotate meter readers to different routes on a regular basis.

How to Reduce Water Theft

- People steal water when they make an illegal connection to the network or tamper with the meter. The techniques one can use in order to reduce water theft include:

1. **Use tamper resistant meters (see Meter** Reading Errors) **or install seals** that indicate tampering has occurred.
2. **Remove meter by-passes**. A bypass pipe is often buried and very difficult to detect. This type of unauthorized consumption is usually committed by industrial and commercial premises, where only a small volume of the consumption goes through the meter and the rest through the bypass pipe. The discrepancy will show up when the utility conducts a flow balance analysis.
3. **Find and reduce illegal connections.** They can occur during the installation of a new supply connection, or sometimes the customer's supply is cut off after non-payment he or she cannot afford, or does not want to pay, to be reconnected.
4. **Prevent illegal use of fire hydrants**. Some use them illegally to fill tankers (normally at night) or to provide water supply to construction sites. Encourage customers to report cases of illegal uses of fire hydrants.

Meter Reading Errors

- The success of meter reading, billing and collecting revenues depends on accuracy, check & balances and diligence. The goal is-:

1. to ensure that all people who use water are connected and in the utility's information system,
2. that usage is metered accurately,
3. that the meter readings result in accurate bills to customers and
4. That the billed amounts are collected on a timely basis.

- At any step in this process, inaccuracies or errors will result in NRW.

How to Improve Accuracy and Eliminate Errors:

- Conduct customer identification surveys to make sure that every user is a registered customer and that the utility's records are accurate as to address, name of owner, customer number and meter information.
- Analyze flows in areas of suspected high commercial losses, in order to pinpoint problem areas.
- Compare the usage metered to the usage billed for each billing cycle.
- Ensure that all amounts that are billed are collected.
- Arrange the functions (metering, billing and collection) so that one person is not responsible for all of them.
- A **robust billing database** is one of the key elements of minimizing accounting errors. State-of-the-art billing software has built-in analysis functions that can identify potential data handling errors, zero readings, and report them for verification

Examples of New Skills for Implementation

- Yearly PDCA Cycle (Capacity self-assessment, annual planning+5-year bar chart, implementation, quarterly monitoring, annual review)
- Monthly Universal NRW Monitoring & Inter-departmental Meetings
- Zoning into Distribution Zones/DMAs & Monthly Zonal NRW Monitoring
- Analysis of Meter Reading & Billing Data
- Efficient Actions against Meter Reading Anomalies (Large Customers first, etc.)
- Meter Accuracy Test (with Handmade Bench, Buckets & UFM & Potable Testers)
- Customer Identification & Meter Reading Routes
- Patrol, Plastic Seals against Illegal Water Use & Abnormal Flow Monitoring
- Active Leak Reduction (Step Test, House-to-house Listening Stick Survey, etc.)
- Use of Kobo Collect, QGIS (3 WSPs newly prepared GIS data), QField Cloud, etc.

Overall Results of NRW Reduction at the 9 Pilot WSPs

Assisting the Implementation at Each Pilot WSP		Baseline		Approx. Results (2021-22 so far)		
		Year	NRW %**	Current NRW%**	Diff. in NRW%	Revenue↑ (Mill KSh/year)*
From Phase 1	Meru	2016-17	24%	Around 17%	7%↓	17 Mill KSh/y
	Embu	2016-17	-	Around 40% (41%→39%→37%)	Gradually decreasing	Cannot estimate due to the lack of reliable baseline.
From Phase 2	Kisumu	2017-18	36%	Around 28%	8%↓	93 Mill KSh/y
	Nakuru	2017-18	35%	Around 30%	5%↓	72 Mill KSh/y
	Nyahururu	2017-18	42%	Around 41% (39%→40%→39%)	Gradually decreasing	4 Mill KSh/y
	Ruiru-Juja	2018-19	54%	Around 34%	20%↓	181 Mill KSh/y
From Phase 3	Eldoret	2018-19	44%	Around 41%	3%↓	39 Mill KSh/y
	Mavoko	2018-19	41%	Around 37%	4%↓	11 Mill KSh/y
	Kilifi-Mariakani	2019-20	57%	Around 49%	8%↓	78 Mill KSh/y

* Roughly estimated by "Turnover in 2019-20 / (100 - Current NRW%) x Diff. in NRW%" ** based on the universal NRW monitoring

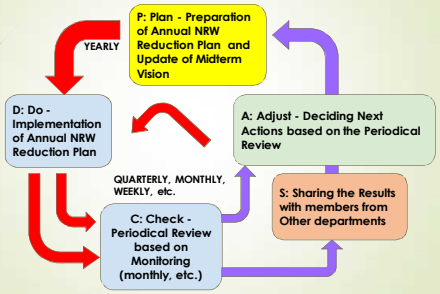
Way Forward for the reduction of commercial losses

- 1) 100% Metering and Meter Reading
- 2) Analysis of Meter reading and Billing data to understand the conditions of existing customer meters.
- 3) Additional Focused Management of Large and medium Customers (meter servicing, proper sizing, testing and replacement).
- 4) Reduction of Unbilled Unmetered and Illegal water uses based on CIS and targeting of suspicious customers

Way Forward for the reduction of commercial losses

- 5) Preventive measures at the Installation of Service connections and customer meters
- 6) System related & Procedural/Internal Improvements for Meter Reading & Billing
- 7) Procedural/Internal Improvements against Illegal Water uses.
- 8) PDCA cycle implementation

PDCA Cycle (Plan-Do-Check-Adjust & Share



Water is life !!

THANK YOU FOR YOUR ATTENTION

5) Letter of Formulation of Editorial Committee to NRW Management Standards

Letter of formulation of editorial committee to NRW management standards

REPUBLIC OF KENYA
MINISTRY OF WATER AND SANTATION
OFFICE OF THE PRINCIPAL SECRETARY

MAJI HOUSE
NGONG ROAD
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REF: WD/3/3/1338/ VOL. II (104)

DATE: 6th March 2018

RE: FORMULATION OF EDITORIAL COMMITTEE TO REVIEW NON-REVENUE WATER MANAGEMENT STANDARDS.

As you are aware, the Project for Strengthening Capacity Development in Non-Revenue Water Reduction under Technical Cooperation between Kenya and Japan is being implemented in nine (9) Water Service Providers in the country. Output 2 of the project is to revise and disseminate NRW standards the mandate of Water Services Regulatory Board (WASREB). To achieve the efficient delivery of this output the following technical officers have been nominated to form the technical editorial committee; -

1. David N. Mabonga - Ministry of Water and Sanitation
2. Anderson Kioi - Ministry of Water and Sanitation
3. Daniel Ngugi - Water Services Regulatory Board
4. Water Moseti - Kenya Water Institute

In this regard, Water Services Regulatory Board (WASREB) is hereby appointed to head the committee to ensure the smooth successful implementation and delivery of this output. Please note that committee will be facilitated adequately to carry out the task.

Yours

Joseph Irungu, CBS
PRINCIPAL SECRETARY

6) Program of Validation Workshop for Revision of NRW Management Standards

COMMENTS VALIDATION WORKSHOP - REVISION OF NRW STANDARDS

Ministry of Water, Sanitation and Irrigation

Dates: **Monday, 25th November 2021**

Venue: **Bontana Hotel, Nakuru Town**

TIME	ACTIVITY/ TOPIC	PRESENTER/ FACILITATOR
8.00 - 8.30AM	Arrival and Registration	MWS&I Secretariat
8.30 - 9.00AM	Welcoming Remarks, Introductions, Workshop Objectives & Climate Setting	MWS&I
9.00 - 10.00AM	Validation of NRW Handbook (Group work)	KEWI
10.00 - 10:30AM	Plenary Discussion	WASPA
10.30 - 11.00AM	HEALTH BREAK	
11.00 - 12:00PM	Validation of NRW Guidelines (Group work)	MWSI
12.00 - 12.30PM	Plenary Discussion	WASPA
12.30-1.00PM	Organization of the NRW Unit	WASREB
1.00 - 2.00PM	LUNCH BREAK	
2.00 - 3.00PM	Meter Sizing	JICA EXPERT TEAM
3.00 - 3.30PM	Plenary Discussion	WASPA
3.30 - 4.00PM	HEALTH BREAK	
4.00 - 4.30PM	Way forward & closure	WASREB & MWSI
	CLOSURE	

7) KEWI Revised Practical Training Course on NRW Reduction (including Instructional Outline)

INTERNAL INFORMATION

6th All Lesson Plans for CLASSROOM Training (#1~#20)

KENYA WATER INSTITUTE **R-3 019/05/31**

Non-Revenue Water Reduction Course (No. 6)

Venue: KEWI Conference Room **Date:** 3rd – 7th June 2019

CLASS ROOM PROGRAMME

Time	Topic	Facilitator
Day 1 (Monday) 3rd June 2019		
8:30 – 8:45 am	Registration	
8:45 – 8:55 am	Self Introductions/ Opening remarks	(DD/AA) Mr. D. Ngetich
8:55 – 9:10 am	Course Introduction Pre simple test/ Comments survey	Mr. W. Moseti
9:10 – 10:30 am	Introduction to Non-Revenue water Reduction R-2 (#1) 1:20min	Mr. W. Moseti
10:30-11:00 am	**Tea Break**	
11:00 –1:00 pm	Typical Water Supply Facilities R-1 (#2) 2:00min	Mr .A. Karisa
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 3:30 pm	How to conduct a Water Balance R-1 (#3) 1:30min	Mr. W. Moseti
3:30 – 4:30 pm	Work Ethics (#17) 1:00min	Eng. Karugendo
Day 2 (Tuesday) 4th June 2019		
8:30 – 9:30 am	How to Manage Water Distribution Network R-1 (#4) 1:00min	Mr. Moseti
9:30 – 10:30 am	Introduction to NRW in Distribution Reservoirs, Hydraulic Concept (#16) 1:00min	Mr. A. Karisa
10:30 –11:00 am	**Tea Break**	
11:00 –12:00 pm	Physical Water Losses Management R-1 (#5) 1:00min	Mr. W. Moseti
12:00 – 1:00 pm	Pipe Materials Used in Water Supply Networks (#19) 1:00min	Mr. W. Moseti
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 3:00 pm	Basic Concept of leakage Prevention Works R-2 (#6) 1:00min	Mr. T. Walela
3:00 – 4:30 pm	Water leakage Survey Methods R-2 (#7) 1:30min	Mr. T. Walela
Day 3 (Wednesday) 5th June 2019		
8:30 – 10:30 am	Use of Non-Revenue Water Investigation Equipment R-3 (#8) 2:00min	Mr. Walela/Mr. Maina
10:30 –11:00 am	**Tea Break**	
11:00 – 12:00pm	Commercial Water Losses Management (#9) 1:00min	Mr. J. Kihara
12:00 – 1:00 pm	How to Improve Billing in Water Utilities R-1 (#10) 1:00min	Mr. J. Kihara
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 4:30pm	How to manage customer water meters R-1 (#11) 2:30min	Mr. Moseti
Day 4 (Thursday) 6th June 2019		
8:30 – 9:30 am	Work flow approach (ODK) 1:00 min	Mr. Charles
9:30 – 10:30 am	How to use Water Meter Test Bench R-1 (#12) 1:00min	Mr .Walela/Mr. Maina
10:30 – 11:00 am	**Tea Break**	
11:00 – 1:00 am	Introduction to Rehabilitation plan of piping network Useful lifespan (#20 New) 2.00min	Mr. Moseti/ Kande
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 3:30pm	How to Identify Leak by Water Quality Test R-2 (#13) 1:30min	Ms. B. Maundu
3:30 - 4:30 pm	Simple Excises (1.2.3.4 and 5) 30min	Mr. Moseti
Day 5 (Friday) 7th June 2019		
8:30 – 9:30pm	NRW Water Standards 2014/ Impact report (WASREB) (#18) 1:00min	Eng. Ngugi
9:30 – 10:30 pm	Planning and Implementing a NRW Reduction Strategy R-1 (#14) 1:00min	Eng. Ngugi
10:30 – 11:00 am	**Tea Break**	
11:00-12:00pm	Introduction of OJT Programme & Textbook R-3 (#15) 1:00min	Mr. Moseti
12:00 –12:30 pm	Discussion on how to improve future NRW courses 30 min	All
12:30 – 2:00 pm	**Lunch Break**	
2:00 – 4:30pm	Course completion simple test/ comments survey ... Course Evaluation ... Closing remarks	All

CLASS ROOM PROGRAMME

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 1 (Day-1)	2019 3rd June 9:10 – 10:30 am (1:20 hr)	KEWI	W. Moseti	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**INTRODUCTION TO NON-REVENUE WATER REDUCTION (R-2 #1)**			
	Presentation Materials	… PowerPoint presentation … Flip chart, Writing material and pen			

Date/ Time	Training topics	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day-1) 9:10 – 10:30 am (1:20 hr)	Introduction to Non-Revenue Water Reduction #1 **(CR3-1)**	① Understand the concept of Non-Revenue Water Reduction.	Concept of Non-Revenue Water Reduction	2. Introduction	5	Text book
		② Understand the components of Non-Revenue water	components of Non-Revenue water	4. What is Non-Revenue Water?	10	
		③ Understand Vicious circle.	Vicious circle.	5. Components of Non-Revenue Water	10	
		④ Understand Virtuous circle	Virtuous circle	6. Challenges	10	
		⑤ Understand the benefits of NRW management.	Benefits of NRW management.	7. Impacts of Non-Revenue Water	15	
				8. Benefits of Non-Revenue Water management	15	
				9. Addressing Non-Revenue water	15	
				Total	1:20 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 2 (Day-1)	2019 3rd June 11:00 – 1:00 pm (2:0 hr)	KEWI	A. Karisa	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Typical Water Supply Facilities (R-1 #2)**			
	Presentation Materials	… PowerPoint presentation … Flip chart … Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics	Time (min)	Hand out/etc.
(Day-1) 11:00 –1:00 pm (2:0 hr)	Typical Water Supply Facilities #2 **(CR3-2)**	① Understand objectives of water supply	Objectives of water supply	4. Objectives of water supply	10	Text book
		② Understand components of Typical Water supply facility	Concept of Water service equipment	5. System description	20	
		③Understand concept of Water service equipment	Components of Typical Water supply facility	6. Components of water supply Facilities.	20	
		④ Understand functions of the distribution System	Functions of the distribution System	7. What is role of water distribution facility?	20	
		⑤ Understand the life of the Water Supply facility	Useful life of the Water Supply facility	8. Life of the Water Supply facility?	20	
		⑥ Understand typical miss connection of service line in housing area	Avoid cross-connection	9. Review exercise	30	
				Total	2:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 3 (Day-1)	2019 3rd June 2:00-3:30 pm (1:30 hr)	KEWI	A. Karisa	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.

Teaching methodology	Preparation of teaching materials to be used	
… Lecture … Discussions.	Textbook	How to Conduct Water Balance (R-1 #3)
	Presentation Materials	… PowerPoint presentation … Flip chart … Writing material and pen

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics	Time (min)	Hand out/etc.
(Day-1) 2:00-3:30 pm (1:30 hr)	How to Conduct Water Balance **#3 (CR3-3)**	① Understand objective of water balance	Objective of water balance	1. Introduction	15	Text book
		② Understand components of the Water Balance	Components of the Water Balance	2. What is water balance analysis?	30	
		③ Understand Water Balance Terms.	Water Balance Terms.	3. Water Balance Terms.	15	
		④ Understand how to calculate NRW ratio	Calculate NRW ratio	4. What is an index on water balance analysis?	15	
			Outline	5. What is an index on water balance analysis	5	
				6. Point to note in water balance analysis	5	
				7. What is the insensitive water volume of water meter?	5	
				Total	1:30 hrs	

N0. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 17 (Day 1)	2019 3rd June 3:30-4:30 am (1:0 hr)	KEWI	Eng. Karugendo	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Work Ethics (#17)**			
	Presentation Materials	… PowerPoint presentation … Flip chart, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 1) 3.30-4:30 am (1:0 hr)	Work Ethics (#17) **(CR3-17)**	① Understand the necessity of Work Ethics ② Understanding the item of ethics of engineers ③ Understanding ethics items of Water company ④Understanding the cause of ethics violations	COMPLIANCE GOVERNANCE	2. Introduction 4. What is the difference between Governance and Compliance? 6. Activities to comply with compliance	60	Text book
		Total			1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 4 (Day 2)	2019 4th June 8.30-9:30 am (1:0 hr)	KEWI	W. Moseti	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.

Teaching methodology	Preparation of teaching materials to be used	
… Lecture … Discussions.	Textbook	**How to Manage Water Distribution Network (R-1 #4)**
	Presentation Materials	… PowerPoint presentation … Flip chart, Writing material and pen … Demonstrations

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 2) 8.30-10:30 am (1:0 hr)	How to Manage Water Distribution Network **#4 (CR3-4)**	① Understand the role of the distribution network ② Understand water distribution management ③ Understand the structure of the pipeline that constitutes the water supply facility.	Manage Water distribution network	2. Introduction	10	Text book
		④ Understand the layout of water distribution network ⑤ Understand role and managing of water distribution network	General information	4. General information 4-1 What is the facility function (role) of the water distribution network? 4-2 What is the meaning of management of water distribution network? 4-3 General distribution system 4-4 Status of laying pipeline 4-5 Points to keep in mind when planning the placement of water distribution facilities	20	

		⑤ Understand the challenges of managing water distribution networks in Kenya	What are the challenges in Kenya	5. Challenges in Kenya 5-1 Limit of piping network system function 5-2 Items that should be focused on improving maintenance function of piping network 5-3 Points to remember to remediate occurrence of the unfair balance of water distribution	30	
		Total			1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 16 (Day 2)	2019 5th March 9.30-10:30 am (1:0 hr)	KEWI	Mr. A. Karisa	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.

Teaching methodology	Preparation of teaching materials to be used	
… Lecture … Discussions.	Textbook	**Introduction to NRW in Distribution Reservoirs and Hydraulic Concept (N #16)**
	Presentation Materials	… PowerPoint presentation

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 2) 9.30-10:30 am (1:0 hr)	Introduction to NRW in Distribution Reservoirs and Hydraulic **#16 (CR3-16)**	① Understand the typical Inflow and Outflow patterns ② Understand the type of Non-Revenue Water caused from distribution reservoir	Manage Water distribution reservoirs	2. Introduction 3.Key words definitions 4.What is the function of the distribution reservoirs	10	Text book
		③Understand the concept of how to investigate Non-Revenue Water in distribution reservoir ④Understand the Roles of flow meters and water gauges.	Distribution reservoir flow monitoring	6.Outline of Distribution 7.Outline of the Flow meter & Water Level Gauge used in the Survey 8 Survey Methods 9.Evaluation of Monitoring Function of Water Distribution / Water Level Management	20	

		⑤Understand the concept of how to investigate the change in the Inflow volume hourly ⑥Understand the concept of how to investigate the change in the water level hourly	Distribution reservoir design	10.The Validation Method of Current Design Parameters 11.Implementation of function evaluation of outflow pipe	30	
		Total			1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 5 (Day-2)	2019 4th June 11:00-12:00 am (1:0 hr)	KEWI	Mr. W. Moseti	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Physical Water Losses Management (R-1 #5)**			
	Presentation Materials	… Power Point presentation … Flip chart, writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 2) 11:00-12:00 am (1:0 hr)	Physical Water Losses Management **#5 (CR3-5)**	① Understand how reduction of physical losses	Manage physical losses	2. Introduction	5	Text book
		② Understand the components of physical losses	Components of physical losses	4. Component of Physical (Real) losses	10	
		③ Understand the sources of physical losses	Sources of physical losses	5. Some Sources of Physical Water Losses	10	
		④ Understand the causes of physical losses	Courses of physical losses	6. Some Causes of Physical Water Loses	10	
		⑤ Understand the factors that influence leakage occurrence	Leak occurrence influencers	7. Factors that influence leakage occurrence	5	
		⑥ Understand the layout of water facilities	Distribution facilities	8. Installation status of water distribution facilities	10	
		⑦ Understand the importance of leak records	Importance of leak records	9. Record of the number of water leaks	5	
		⑧ Understand on how to detect water leakages	Importance leak detection	10. How to detect water leakage	5	
		Total			1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 19 (Day-2)	2019 4th June 12:00-1:00 pm (1:0 hr)	KEWI	Mr. W. Moseti	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Pipe Material Used in Water Supply Network (#19)**			
	Presentation Materials	… Power Point presentation … Flip chart, writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 2) 12:00-1:00 m (1:0 hr)	Pipe Material Used in Water Supply Network (#**19**) **(CR3-19)**	~~① Understand how reduction of physical losses~~	~~Manage physical losses~~	~~2. Introduction~~	5	Text book
		~~② Understand the components of physical losses~~	~~Components of physical losses~~	~~4. Component of Physical (Real) losses~~	10	
		~~③ Understand the sources of physical losses~~	~~Sources of physical losses~~	~~5. Some Sources of Physical Water Losses~~	10	
		~~④ Understand the causes of physical losses~~	~~Courses of physical losses~~	~~6. Some Causes of Physical Water Loses~~	10	
		~~⑤ Understand the factors that influence leakage occurrence~~	~~Leak occurrence influencers~~	~~7. Factors that influence leakage occurrence~~	5	
		~~⑥ Understand the layout of water facilities~~	~~Distribution facilities~~	~~8. Installation status of water distribution facilities~~	10	
		~~⑦ Understand the importance of leak records~~	~~Importance of leak records~~	~~9. Record of the number of water leaks~~	5	
		~~⑧ Understand on how to detect water leakages~~	~~Importance leak detection~~	~~10. How to detect water leakage~~	5	
		Total			1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 6 (Day-2)	2019 4th June 2:00-3:00 pm (1:0 hr)	KEWI	Mr. W. Walela	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to prevent leaks and reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
... Lecture ... Discussions.	Textbook	**BASIC CONCEPT OF LEAKAGE PREVENTION WORK (R-2 #6)**			
	Presentation Materials	.. PowerPoint presentation ... Flip chart ... Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 2) 2:00-3:00 pm (1:0 hr)	Basic concept of leakage prevention work **#6** **(CR3-6)**	①Understand what is Leak prevention work	Leak prevention work	2. Introduction	5	Text book
		② Understand Main basic countermeasure work against leakage	Countermeasure work against leakage	4. Objectives of Basic concept of leakage prevention work	5	
		③ Understand Concept of Leakage Recurrence	Leakage Recurrence	5. Leak prevention works	10	
		④ Understand Concept of compositional unit of total water leakage	compositional unit of total water leakage	6. Outline of leak prevention work	10	
		⑤ Understand Concept of Record sheet of leakage survey	Record sheet of leakage survey	7. Case study of leak occurrence (surface leakage)	10	
				8. Capture the actual condition of leakage and keep records	10	
				Total	1.00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 7 (Day-2)	2019 4th June 3:00-4:30 pm (1:0 hr)	KEWI	Mr. W. Walela	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to **survey** leaks and reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Water Leakage Survey Methods (R-2 #7)**			
	Presentation Materials	… PowerPoint presentation … Flip chart, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 2) 3:00-4:30 pm (1:15 hr)	Water Leakage Survey Methods **#7** **(CR3-7)**	① Understand why reduce leakage?	Basic Know and reduce leakage	2. Introduction	10	Text book
		② Understand concept of how to identify leak location	NRW reduction investigation procedure Approach of leakage investigation	4. Procedure of the NRW reduction measures		
		③ Understand type of noise	Characteristic of leakage sound Pseudo leakage sound	5. Specificity of leakage noise		
		④ Understand type of leakage detectors	Procedure for water leakage survey Necessity of acoustic noise detection survey	6. How to apply leakage detectors	10	
		⑤ Understand general purpose of Preliminary survey	What is preliminary survey Implementation of site survey by Acoustic noise survey / How to verify leakage points	7. Preliminary survey method with leak detectors	10	
		⑥ Understand general purpose of flow rate survey of MNF	Procedure of leak detection by flow rate	8.Implementaion of Main survey	10	

		⑦ Understand measuring method of the amount of leakage	Method to collect leak volume at site by volume and /or weight	9. Method to collect leak volume at site by volume and /or weight	10	
		⑧ Understand concept of relationship between leakage and pressure	Conduct Exercises	10. Prediction method of leakage by calculation from pipe size and/or water-pressure	10	
				Total	1:00 hr.	

No. of Joint training	**Date/Time**	**Venue**	**Who (lecturer)**	**Whom (Target)**	**Purpose target**
# 8 (Day-3)	2019 5th June 8:30-10:30 pm (2:0 hr)	KEWI	Mr. W. Walela/ Maina	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to **survey** leaks and reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Use of NRW Investigation Equipment (R-2 #8)**			
	Presentation Materials	.. PowerPoint presentation … Flip chart … Writing material and pen			

Date/ Time	**Training topic**	**Objective of topic (Output)**	**Focus on**	**Sub-topics (Table of Contents)**	**Time (min)**	**Hand out/etc.**
(Day 3) 8:30-10:30 pm (2:0 hr)	Use of NRW Investigation Equipment **#8 (CR3-8)**	① Understand concept of pipelines locating / tracing equipment	Principle of operation and application of typical Metallic and Non-metallic pipe locators	4. Pipelines Locating/ Tracing Equipment	30	Text book
		② Understand concept of pipelines leak detecting equipment	Principle of operation and application of typical Acoustic detectors and	5. Leak detecting equipment	30	

			leak noise correlator			
		③ Understand concept of flow measurement equipment	Principle of operation and application of typical Electromagnetic and ultrasonic flow meters	6 Flow Rate Measurement Equipment	30	
		④ Understand concept of water pressure measuring equipment	Principle of operation and application of typical mechanical and data-logger	7. Pressure Measuring Equipment	30	
				Total	2:00 hr.	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 9 (Day-3)	2019 5th June 11:00-12:00 pm (1:0 hr)	Conference room in KEWI	Mr. J. Kihara	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Commercial Water Losses. To develop a positive attitude and work culture for managing commercial water losses.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	Commercial Water Losses Management **(R-1 #9)**			
	Presentation Materials	… PowerPoint presentation … Flip chart, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 3) 11:00-12:0 pm (1:0 hr)	Commercial Water Losses Management **R-1 #9** **(CR3-9)**	① Understand the concept of water loss Management	- Objective s of water loss management - Reasons for using the water balance format - Unbilled authorized consumption (UAC) -Apparent losses (AL)	2. Introduction 4. Water Balance and Apparent Losses	10	Text book
			- Cause of losses	5. Reducing Apparent Losses		
		② Understand concept of various methods to minimize commercial water losses	- Customer metering policy - Dealing with inaccuracies	6. Controlling Apparent / Non-physical / Commercial Losses	10	
			- How to address customer meter errs - How to reduce water theft - How to avoiding corrupt meter readers	7. Meter Errors	10	
			- How to improve accuracy and eliminate errors	8. Actively Checking the Customer Billing System	10	

			- Important point at the time of commercial management implementing	9. Data Handling and Accounting Errors 10 Key Messages	10	
		③ Discussion about pictures	- What is your comment from pictures	11. Learned lessons	10	
				Total	1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 10 (Day-3)	2019 5th June 12:00-13:00 pm (2:30 hr)	Conference room in KEWI	Mr. Kihara	Managers, Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Commercial Water Losses. To develop a positive attitude and work culture for managing commercial water losses.
Teaching methodology	**Preparation of teaching materials to be used**				
... Lecture ... Discussions.	Textbook	**How to Improve Billing in Water Utilities (R-1 # 10)**			
	Presentation Materials	... PowerPoint presentation ... Flip chart ... Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 3) 12:00-13:00 pm (1:00 hr)	How to Improve Billing in Water Utilities **#10 (CR3-10)**	① Understand objectives of billing system	Concept of billing system	2. Introduction 4. Objectives of billing system	10	Power point Text book
		② Understand importance of revenue collection	Necessity of revenue / money collection	5. Why is effective billing and collection necessary 6. Billing and revenue strategies	25	
		③ Understand how to avoid wrong meter reading	Concept of how to collect revenue	7.Introduction of advanced technologies 8. Outsourcing the Billing and Collection Function 9. Incentives for Meter Readers 10. Regular and On-Time Payments 11. Delinquent / Erroneous Accounts/ Debt	25	
				Total	1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 11 (Day-3)	2019 6th June 2:00-4:30 pm (2:30 hr)	KEWI	Mr. M. Moseti	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
... Lecture ... Discussions.	Textbook	**How to Manage Customer Meters (R-1 #11)**			
	Presentation Materials	... PowerPoint presentation ... Flip chart ... Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)		Hand out/etc.
(Day 3) 2:00-4:30 pm (2:00 hr)	How to Manage Customer Water Meters **#11 (CR3-11)**	① Understand how to manage customer water meters	Water Meter Management	2. Introduction	10	Text book
		② Understand maintenance of water meter	Water Meter Maintenance	4. What is maintenance management of the water meter	10	
		③ Understand the role of water meter	General meter requirements	5. Roles as a water meter	30	
		④ Understand the concept of water meter installation of water meters	Meter Installation and testing	6. Concept of meter installation standards	40	
		⑤ Understand the calibre of selecting a water meters	Meter Selection	7. How to determine the caliber of a water meter	20	
		⑥ Understand the maintenance status of water meters in Kenya	Meters conditions	8. Management status of water meters in Kenya	10	
		⑦ Understand on how you read meters	Meter reading and pressure	9. Exercises	30	
		Total			2:30 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 12 (Day-4)	2019 6th June 9:30-10:30 am (1:00 hr)	KEWI	Mr. W. Walela/ Maina	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
... Lecture ... Discussions.	Textbook	**How to Use Water Meter Test Bench? (R-1 #12)**			
	Presentation Materials	... Power Point presentation ... Demonstration, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 4) 9:30-10:30 am (1:00 hr)	How To Use Water Meter Test Bench? **#12** **(CR3-12)**	① Understand the test standard	The test standard in water meter test bench is ISO-4064-1993, because of old.	2. Introduction	5	Text book
		② Understand purpose of water meter accuracy test	- Purpose of the test - How to determine meter insensitive water rate - Items of commercial loss	4. Why is water meter test bench necessary?	10	
		③ Understand outline of ISO 4064-1993 test methodology	- Introduction of Kenya standard - Concept of ISO 4064-1993 standard	5. Standards of water meter accuracy test	5	
		④ Understand water meter test bench method by volume-capacity method	- Outline of several types of survey methods -Outline of volume-capacity method	6. Various types of meter test methods in field	10	
		⑤ Understand concept of the test method (ISO 4064-1993)	- Component of the Test bench - Confirmation of water meter specification to be inspected (Class) - Condition of performance test	7. Implementation of the meter accuracy test by water meter test bench	10	
		⑥ Understand how to record on the data sheet	- Concept of error calculation method - Example of acceptance criteria - Recording data Allowable tolerance	8. How to evaluate test result	10	

			- Composition of items to data sheet			
		⑦ Understand how to analyse test result	- Evaluation of test result	9. Analysis of output from water meter test bench training	10	
		Total			1:00 hr	

No. of Joint training	Date/Time	Venue	Who (lecturer / assistant number)	Whom (Target)	Purpose target
# 20 (Day-4)	2019 6th June 11:00-1:00 pm (2:00 hr)	KEWI	Mr. Moseti/Mr. Kande	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to **survey** leaks and reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Introduction of Rehabilitation plan of Pipe network (#20)**			
	Presentation Materials	… Power Point presentation … Flip chart, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 4) 11:00-1:00 pm (2:00 hr)	Introduction of Rehabilitation plan of Pipe network **#20 (CR3-20)**	① Understand the concept of Rehabilitation	- Rehabilitation of pipe network	Objective Introduction, Map works of Network	10	Chalk board Text book
		② Understand the improvement methodologies	- Concept of improving old pipes	Examination procedure of rehabilitation plant	50	
		③ Understand the mechanisms of corrosion	- Corrosion mechanisms and prevention	Metallic pipe corrosion	20	
		④ Understand the jointing procedure of PVC and PE pipes	- Pipe jointing procedure - Pipe characteristics (Large size of PE pipes)	Classification of non metallic pipes and jointing methods and procedures	20	
		⑤ Understand useful life of equipment	- Useful life of equipment	Necessity of setting improvement standard (Useful life of equipment)	20	
		⑥ Evaluation method of cost effectiveness	-Evaluation of rehabilitation by cost and benefit	Concept of operating funds and financial management index		
		Total			2:00 hrs.	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 13 (Day-4)	2019 6th June 2:00-3:30 pm (1:30 hr)	Chemical – analysis room (KEWI)	Ms. B.Maundu	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**How to Identify Leak by Water Quality Test (R-2 #13)**			
	Presentation Materials	… Demonstration … Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out/etc.
(Day 4) 2:00-3:30 pm (1:30 hr)	How to Identify Leak by Water Quality Test **#13 (CR3-13)**	① Understand impact knowledge and skills to trainees on how to carry out water quality test as a tool for leak detection and water theft in visitation	- About the responsibility for WSP is to supply safety and have Know-how how to identify whether illegal connection or not	2. Introduction	10	Text book
		② Understand determination of residual chlorine by colorimetric method collect representative samples,	- Collect representative samples - Implementation of accurately analyses samples using appropriate equipment,	4. Method of water quality analysis and Equipment	60	
		③ Understand interpret laboratory test Results.	- Properly record		20	
		④ Understand determination of soil pH	- What to prepare - Examinant method	5. Soil pH	20	

		⑤ Understand concept of danger prevention equipment	- Introduction	6. Equipment to prevent danger	10	
		Total			1:30 hrs.	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 18 (Day-5)	2019 7th June 8:30-9:30am (1:00 hr)	KEWI	Eng. Ngugi	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Introduction of NRW Standards 2014 / Impact Report (WASREB)**			
	Presentation Materials	… Power Point presentation … Demonstration, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out
(Day 5) 8:30-9:30 am (1:00 hr)	Introduction of NRW Standards 2014 / Impact Report (WASREB) **#18 (CR3-18)**	①Understand objective of NRW standard	Table of contents	Introduction	30	Text book
		②Understand objective of Impact report	Table of contents	Introduction	30	
				Total	1:00 hr.	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 14 (Day-5)	2019 7th June 9:30-10:30am (1:00 hr)	KEWI	Eng. Ngugi	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.
Teaching methodology	**Preparation of teaching materials to be used**				
… Lecture … Discussions.	Textbook	**Planning and Implementing a NRW Reduction Strategy**			
	Presentation Materials	… Power Point presentation … Demonstration, Writing material and pen			

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)	Time (min)	Hand out
(Day 5) 9:30-10:30 am (1:00 hr)	Planning and Implementing a NRW Reduction Strategy **#14 (CR3-14)**	①Understand objective of planning and implementing NRW reduction Strategy	Objective of planning and implementing NRW reduction Strategy	2. Introduction	10	Text book
		② Understand steps in developing and implementing NRW reduction plan.	Steps in developing and implementing NRW reduction plan.	4. Planning and implementing a NRW reduction strategy	10	
		③Understand concept of self-assessment plan	Concept of self-assessment plan	5. Analysis / Self-assessment and Action schedule	10	
		④ Understand WASREB tools for NRW reduction plan by WSPs	Concept of action schedule	6. Contents and layout of NRW reduction plan	30	
				Total	1:00 hr.	

No. of Joint training	Date/Time	Venue	Who (lecturer)	Whom (Target)	Purpose target
# 15 (Day-5)	2019 7th March 11:00-12:00 pm (1:00 hr)	KEWI	Mr. M. Moseti	Supervisors and technicians involved in Non-Revenue Water Reduction activities in WSPs.	To impart knowledge and skills necessary to reduce Non-Revenue Water.

Teaching methodology	Preparation of teaching materials to be used	
… Lecture … Discussions.	Textbook	**Introduction of OJT Programme & Textbook (R-3 #15)**
	Presentation Materials	… PowerPoint presentation … Flip chart … Writing material and pen

Date/ Time	Training topic	Objective of topic (Output)	Focus on	Sub-topics (Table of Contents)		Hand out/etc.
(Day 5) 11:00-12:00 pm (1:00 hr)	Introduction of OJT Programme & Textbook **#15 (CR3-15)**	① Understand how to manage customer water meters	Water Meter Management	2. Introduction	1:00 hr	Text book
		② Understand maintenance of water meter	Water Meter Maintenance	4. What is maintenance management of the water meter		
		③ Understand the role of water meter	General meter requirements	5. Roles as a water meter		
		④ Understand the concept of water meter installation of water meters	Meter Installation and testing	6. Concept of meter installation standards		
		⑤ Understand the calibre of selecting a water meters	Meter Selection	7. How to determine the caliber of a water meter		
		⑥ Understand the maintenance status of water meters in Kenya	Meters conditions	8. Management status of water meters in Kenya		
		⑦ Understand on how you read meters	Meter reading and pressure	9. Exercises		
		Total			1:00 hrs.	

-END-

6th All Lesson Plan for OJT Training (OJT-3-1~15)

KENYA WATER INSTITUTE **R-1(2019/05/26)**

Non-Revenue Water Reduction Course (No. 6)

Venue: Embu Water and Sanitation Company Ltd (EWASCO) **Date:** June 17th – 22nd 2019

OJT TRAINING PROGRAMME (R- #15)

Time	Topic	Facilitator
Day 1 (Monday) 17th June 2019		
8:00 am	Participants meet at EWASCO office	KEWI/ EWASCO
9:00 – 9:15 am	Registration	KEWI
9:15 – 9:30 am	Self Introductions/ Opening remarks	EWASCO/ KEWI
9:30 – 9:45 am	OJT Training objectives and Grouping	KEWI/ Mr. Moseti
9:45 – 10:30 am	Area drawings over view and orientation	EWASCO
10:30-11:00 am	**Health Break**	
11:00 – 12:00 pm	Course Introduction Pre simple test/ Comments survey	KEWI/ Moseti
12:00 – 1:00 pm	Hearing ability	KEWI Dr. Sumba
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 3:00 pm	Visit for overview of the site area	EWASCO
3:30 – 4:30 pm	Visit to EWASCO Treatment works	
Day 2 (Tuesday) 18th June 2019		
8:30 – 9:30 am	Install of UFM/ Digital Pressure data logger	EWASCO/KEWI
10:00 am	Start Measurement at UFM (interval set at 5 min)	EWASCO/KEWI
10:00 – 12:30 am	Start Customer meter reading (No. 1)	EWASCO/KEWI
12:30 – 1:30 pm	**Lunch Break**	
1:30 – 2:30 pm	Customer meter testing for accuracy using potable meter tester	KEWI /EWASCO
2:30 – 4:30 pm	Practice using Listening sticks and Digital leak detector	KEWI /EWASCO
Day 3 (Wednesday) 19th June 2019		
8:30 – 10:00 am	Practice on - leak measurements / forest - Water Quality Analysis from leaks and Equipment	KEWI /EWASCO
10:00 – 12:50 pm	End Customer meter reading	EWASCO/KEWI
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 4:30 pm	Practice on Pipe tracing ➢ Using Non-Metallic pipe locators	KEWI /EWASCO
Day 4 (Thursday) 20th June 2019		
8:30 – 12:30 am	Meter test by test bench for accuracy **4:00 min** Bulk meter assessment	KEWI /EWASCO
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 4:30 pm	Practice in ➢ locating leaks using Noise leak correlator ➢ Tracing Metallic pipe locator	KEWI /EWASCO
Day 5 (Friday) 21st June 2019		
8:30 – 10:30 am	Data Analysis (Customer Meters)	EWASCO/ KEWI
10:30 – 11:00 am	**Health Break**	
	Data Analysis (Water Meter Test Bench)	EWASCO/ KEWI
1:00 – 2:00 pm	**Lunch Break**	
2:00 – 4:30 pm	Data Analysis (Minimum Night Flow Graph)	EWASCO/ KEWI
Day 6 (Saturday) 22nd June 2019		
8:30 – 9:30 am	Course completion Post simple test/ comment survey	KEWI/ Mr. Moseti
9:30 – 10:30am	Action plan Formulation **1:00 min**	
10:30 – 11:00 am	**Health Break**	
11:00-12:00 pm	Discussion on how to improve future NRW courses	KEWI/ Mr. Moseti
12:00 – 1:00 pm	... Course Evaluation .. Issuing of certificate / Closing remarks	KEWI/ EWASCO Mr. D. Ngetich
1:00 pm	**Lunch Break and Participants leave at their own pleasure**	

Lesson Plan for Field On-the-Job Training (EMBU)

Number of Joint training	Date	Venue	Who (lecturer / assistant number)	Whom (Target)	Purpose target
	2019/06/17~ 06/22	EMBU WSP	KEWI: Mr. Moseti (Total:3) EWASCO: Mr.Mina (Total:4)	NRW Reduction Activators	Learning basic knowledge related to NRW reduction management

Teaching methodology	Preparation of teaching materials to be used					
Cramming (teaching method) And	Textbooks	Presentation / Map	Training Equipment / Demonstration Machine to be used	Exercises	Data recording paper	Evaluation of achievement level
	Manual for Field technician	DMA's Map	Listening sticks、Electronic listening sticks、Road surface digital noise leak detectors、Leak nose correlators、Vibration-wave water detectors、Ultrasonic flow meters、Portable electronic test meter, Eater pressure data loggers、Water quality equipment、Water meter test bench and others	NA	（Described in textbook） ① Leak survey ② Pressure test ③ Checking of Customer meter reading ④ Meter condition ⑤ Accuracy survey of customer meter with Master meter ⑥ Water meter test bench ⑦ Water quality test ⑧ Measurement of flowing from water Tap ⑨ Measurement of flowing water ⑩ Measurement of leaking water	① Simple test ② Questionnaire

6th Joint Training Lesson Plan （OJT） 2019 June

Date/ Time	No.T	Training topics	Objective of topics	Sub-topics contents (main teachings)	Handouts Issued/Result
Day-1 Orientation (09:00 to 16:30) (2019-06-17)	Orientation **OJT3-1**	1) Description of On-site Training Objectives (Person in charge)	(1) Make sure to understand how to practice on-site training	(a) Schedule of the training (b) Confirmation of on-site training items (c) Role sharing of students (d) Selection of group leaders	① Distribution of OJT textbooks（R3 ＃15） ② Distribution of DMA map
		2) Description of **the direction of preliminary confirmation work**	(2) Make sure to confirm the consistency of drawing information and site conditions. (3) Make sure to confirm each group need to check the area of the DMA in charge.	(a) Implementation of On-site exploration (b) Check the place location of the flow meter (c) Function check of DMA isolation valves (d) Confirmation of place location of pressure gauge (e) Confirmation of Water supply district / block confirmation in DMA	③ Reflect on-site inspection result on pipe network map
		3) Description of physical loss survey equipment	(4) Make sure to understand the use of water leakage survey equipment. (5) Make sure to understand the use of the route exploration equipment of the water supply pipe.	(a) Leakage sound and digital waveform (b) Buried water pipe detection (c) Measurement method of nighttime minimum flow rate	④ Review of OJT textbook
		4) Description of Commercial Loss Survey Equipment	(6) Make sure to understand of the importance of survey on water meters actual condition. (7) Make sure to confirm the Importance of the metrological accuracy survey of the water meter.	(a) Survey measurement and function of water mete (b) Meter accuracy confirmation by portable electronic test meter and by water meter test bench (c) Water quality survey method	

	Orientation **OJT3-1**	5) Description of Importance of creation of training data	(8) Make sure to understand items of recording paper understand to be used	(a) Physical loss investigation method i) Pressure test ii) Recording method of minimum night flow measurement (b) Commercial loss investigation method i) Accuracy survey of customer meter with Potable electronic test meter ii) Water meter test bench, Water quality test iii) Measurement of flowing water /leaking water	⑤ Description of data sheet (Attached document of textbook)
		6) Simple test and Comments surveys (Pre)	(9) Make sure to understand the purpose of the survey. (10) Make sure to understand how to fill in the survey form	(a) Simple test (Pre） (b) Commitments / questionnaire survey(Pre）	
	Hearing ability **OJT3-2**	7) Introduction hearing ability	(11) Understand of aged human's hearing ability	-	Dr. Sumba
	Visit for EWASCO WTP **OJT3-3**	8) Visit for EWASCO Treatment works	(12) Make sure to understand the how to measure distribution amount /Water quality management facilities, maintenance management situation.	(a) Study for flow meters, Water quality an analysis work, monitoring panel of water system and etc.	⑦ EWASCO inspection

Day-2 **Practical learning** (09:00 to 16:30) (2019-06-18)	1nstation of UFM/ data logger **OJT3-4**	9) Confirm 1nstation of UFM/ data logger	(13) Confirm the points to be noted in the measurement work of DMA's water distribution by ultrasonic flowmeter. (14) Measure minimum night water volume (1 day)	(a) Input of the setting value of the data logger. (b) Necessary installation distance (about 10 D). (c) Check the installation surface of the sensor (d) Pressure gauge installation (e) Close Isolation Gates in DMA.	⑧ Recording data i) UFM measurement start time ii) Water pressure iii) Start time
	Customer meter reading **OJT3-5**	10) Practice in Customer meter study （reading）	(15) Make sure to experience field survey of all customer meters in DMA by group.	(a) Working situation of water meters (b) Easiness of the water meter inspection (c) Existence of whether leakage of water (d) Record of the numerical value of meters	⑨ Record data i) Arrangement of a customer list ii) Measurement of water supply iii)
	Potable electronic test meter **OJT3-6**	11) Practice in Customer Meter testing / accuracy using Potable electronic test meter	(16) Make sure to experience how to connect a portable Meter tester and a faucet (meters in use)	(a) Record of the present meter value (b) Record of Potable electronic test value at start (c) Record of the meter value after an inspection (d) Record of the Potable electronic test after an inspection (e) Compare the meter value with Potable electronic test value	⑩ Record data. i) The meter value before and behind an inspection ii) Passage amount of water of the portable electronic test meter iii) Calculation of the accuracy of the inspected meters

	Listening sticks and Digital Leak **OJT3-7**	12) Practice in using Listening sticks and Digital Leak Detectors	(17) Make sure to experience listening comprehension of the leaking noise from buried pipe in DMA. (18) Make sure to experience listening comprehension of leakage noise from service pipes / meters / valves. (19) Make sure to identify the water leakage locations.	(a) While walking, investigate by Road surface digital noise leak detectors. (b) Insert Listening sticks into the earth (c) Contact an audio-sensor on meter/valve directly. (d) Confirm the point of leakage by excavate (e) Measurement of the amount of leakage of water (f) Check of the source of leakage of water by chloric reaction color examination	⑪Write water leak location on the map)
	Measure of water running **OJT3-7**	13) Practice in Measure of water running from faucets	(20) Make sure to experience measure the running water from a faucet to increase the ability to predict water leakage at the site.	(a) Measure the amount of water from a water tap with a container. (b) Measurement of collection time (	Record data.: i) Measurement time ii) Water pressure at the time of measurement/ iii) Calculation of amount of water (Assume leaked water)
Day-3 **Practical learning** (09:00 to 16:30)	-	14) Confirm Open Isolation gates	(21) Make sure to understand of important matter after data collection of DMA (22) Make sure to clean the used UFM equipment and storage work	(a) The recovery way of the measured data (b) Open the isolation gates of DMA (c) Cleaning way of the adhering mud (d) Store correctly to an exclusive box	⑫ Data download and analysis of the minimum night flow

(2019-06-19)	Leak measurement **OJT3-8-1**	15) Practice in leak measurement	(23) Make sure to experience water leakage collection and water volume calculation method.	(a) Measured with a measuring cup / bucket (b) Measurement by weight (use Weighing scale)	⑬ Record data. i) Measurement time ii) Leakage / Weight
	Water quality **OJT3-8-2**	16) Practice in Water quality analysis from leaks	(24) Make sure to experience how to check leakage water source.	(a) Sampling method. (b) Survey of color identification by chlorine	
	Customer meter reading **OJT3-9**	17) Practice in Customer meter reading (after One day)	(25) Same as above; **Refer to (16)**	(a) Working situation of water meters。 (b) Existence of whether leakage of water (c) Record of the numerical value of meters	⑬ Record data. i) Arrangement of a customer list ii) Measurement of water supply iii) Arrangement of results of an investigation
	Pipe Locators and Non-	18) Practice in using Metallic buried pipe locators	(26) Make sure to experience handling of pipe route survey instruments.	(a) Induced magnetic field type Metallic Iron pipe locators (b) Investigation of buried pipe route	

	metallic **OJT3-10**	19) Practice in using Non-metallic buried pipe locators	(27) Make sure to experience handling of pipe route survey instruments.	(a) Pulse-generation type pipe route detectors (b) Investigation of buried pipe route	
Day-4 **Practical learning** (09:00 to 16:30) (2019-06-20)	Water meter test bench and Bulk meter assessment **OJT3-11**	20） Practice in Water meter test bench for accuracy	(28) Make sure to experience handling of resin water meter test bench to make sure the error of the meter brought by the WSP. (29) Make sure to experience procedure of meter 's instrumental inspection	(a) Difference in errors due to water usage (aging) (b) Difference in error due to meter type (c)Arrangement of results of an investigation	⑭ Record data i) Inspect accuracy at 3 points water level ii) Confirm the meter loss rate
		21) Bulk meter assessment	(30) Make sure to how to assessment	(a) Experience of maintenance Work	⑮ Confirmation of a mechanism/structure
	locating leaks O**JT3-12**	22) Practice in locating leaks using Noise leak correlator	(31) Make sure to experience understand of the system of the Leak nose correlators (32) Make sure to experience check the water leakage signal at the water leakage point.	(a) Data entry work on transmitter with measurement distance / caliber / type of pipeline information/installation (b) Confirmation of the dial tone at the leak point on foot by following the pipeline route	－
		23) Practice in metallic pipe line	(33) Make sure to experience understand of using metallic detector to find out the pipe line.	(a) How to handling.	－

Day-5 **Consultation learning** (09:00 to 16:30) (2019-06-21)	Data analysis **OJT3-13-1**	24) Practice in Data Analysis (Customer meter study)	(34) Make sure to experience organize the collected data. (35) Make sure to experience evaluate the analysis data.	Data to be collected ① Customer meter reading ② Meter condition ③ Accuracy survey of customer meter with Potable electronic test meter, etc.	i) Calculation of quantity (l/sec) ii) Change of the amount of water by a momentary pressure variation
	OJT3-13-2	25) Practice in Data Analysis (Water meter test bench)	(36) Make sure to experience organize the collected data. (37) Make sure to experience evaluate the analysis data.	① Water meter test bench	i) Calculation of water leakage per minute ii) Forecast of loss amount.
	OJT3-13-3	26) Practice in Data Analysis (MNF graph)	(38) Make sure to experience organize the collected data. (39) Make sure to experience evaluate the analysis data.	① Minimum night flow rate, Others	
Day- 6 Consultation learning (09:00 to 13:00) (2019-06-22)	Course Completion	27) Implement Course completion survey (Post)	(40) Make sure to experience survey of a result achievement level is conducted (Post).	(a) Simple test（Post） (b) Comments / questionnaire survey（Post）	① Recovery of survey data→ and then Implement data analysis
	Action Plan Formulation **OJT3-14**	28) Practice in Development of NRW Action plan by WSP.	(40) Make sure to experience make simple NRW reduction plan by each WSP participate.	(a) Setting of the targeted value/period in the range of an participants' special field of study	① Result of NRW reduction action manages itself. ② May follow-up those Achievements.

	Discussion **OJT3-15**	29) Others	(41) Make sure to experience discussion on how to improve future NRW courses (42) Make sure to experience Course Evaluation	(a) Recognition of the importance of self-study	

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8) Retrospective of Activities from Pilot WSPs at the End of the Project

Opinions of the pilot WSPs upon the completion of the project (These are answers against the question delivered to each pilot WSPs in April, 2022.)

Items of questionnaires	Ruiru - Juja WSP	Kilifi・Mariakani WSP	Embu WSP	Nyahururu WSP	Eldoret WSP	Mavoko WSP	Nakuru WSP	Meru WSP	Kisumu WSP
1. What have you been able to perform during the project? Or what else is lack in implementing the NRW reduction activities	1. Establishment of DMAs, Evaluation and Monitoring of water supply in DMAs and subsequent calculation of NRW per DMA. 2. Further subdivision of DMAs into sub-DMAs for easy management of NRW. 3. Learned how to carry out MNF, plotting graphs, interpreting data from MNF results. 4. Monitoring and Evaluation of billing data. 5. Use of NRW equipment i.e. leak detectors, listening sticks in combating NRW.	-Establishment of Nrw unit- fully functional - Establishment of Nrw Committee- in place and working - Full utilization of Review and planning Template -Meter reading and Billing data analysis after every billing cycle and addressing all the anomalies captured. - Leak Detections surveys by use of listening sticks and ground microphones - Use of Gis technologies .I.e Kobo-Collect, Qfield, hand-held GPS and Qgis. - Monthly Nrw meetings- with head of departments and NRW committee - Utilization of UFM to test Bulk meters and mobile meter testing gadgets to test small. customer meters. **Pending** - Customer Identification survey - Formulation of DMAs but it is ongoing	Conduct MNF and interpretate the data, formulation and review of the New plan, Use of various equipment's.	• Establishment/use customer identification surveys (door to door) as a strategy for NRW reduction/ management using acoustic equipment such as listening sticks to check both physical and commercial losses • Development of GIS system, publishing of GIS layers on QGIS Could and day to day use of the online map on computers and smartphones of relevant staff. • Establishment of elevation difference within each hydraulically Isolated DMA and pressure zones on GIS • Development of standard operation procedures for NRW Team done and implementation of NRW guideline. • Establishment of school campaigns programs for primary schools on reduction of water wastage and reporting of water pipe bursts. • Training on billing data analysis and implementation of the same as a strategy for reduction of commercial losses • Field training on use of NRW equipment such as UFM, pressure loggers and listening sticks for physical loss reduction and implementation of strategies such as MNF and step tests to narrow down on problematic areas. • The use of abnormal flow monitoring template on google drive as a quick alarm system for water flows in DMAs. • Staff sensitization on their vital role in NRW management	・ Large scale replacements of dilapidated pipeline a distance of 250km ranging from 20mm to 315mm in diameter. ・ Replacements of large customer with ultrasonic flow meters and EMM meters 90% complete. ・ Carrying out MNF measurements at chepkanga and Chepkoilel. ・ Mapping and zoning of distribution network which resulted to creation of 18 DMAs. ・ Permanent solution to areas prone to frequent leaks and bursts a distance of 70km. ・ Universal analysis of monthly NRW. ・ Standardization of service connections. ・ Meter reading and billing analysis. ・ Capacity development by conducting 2 times in-house training for plumbers and staff from other sections. ・ Carrying out leak survey using NRW equipment.	As a company we've been able to create a strong NRW team that is able to carry out non revenue water reduction activities. We've mapped over 80% of our customers through GIS. We've been able to prepare annual and mid-term NRW reduction plan by using the planning template. Improved analysis of our meter reading & billing data and acting on issues observed. Able to use NRW equipments for leak detection i.e. UFM, Noise leak detector, listening sticks Conducting interdepartmental meetings regularly increasing collaboration on NRW activities.	・ Coming up with proper leak detection program covering southern zone (Manyani, Kanyon, Bondeni and NAKA) and also parts of Northern zone (Tiriki avenue). With implementation of these activities a significant amount of physical water losses have been reduced ・ By application of billing analysis concept; over 1500 meters (Large and Medium consumers meters), were replaced and there was a huge improvement in billing and significant reduction in NRW reduction.	• We have been able to adopt HDPE as our Primary pipeline material. This has helped in reducing physical leakages. • our definition of NRW has evolved from M3 lost to the monetary value for water lost • We have been able to use billing analysis to identify consumer meters that need to be changed. • We have been able to make informed decision by use Kobo Toolbox in data collection. • We have improved out step test and MNF activities, through incorporating ILI and Connection leakage index. • We have reduced our NRW ratio from 26% at project start to an average 19% last FY. • Monitoring of NRW is easier via the universal NRW monitoring sheet. • Classification of our consumer into C1 to C6 has made it easier to monitor large consumers. • Preparation of annual and long-term NRW reduction plans • Use of PDCA sheets has been in instrumental in evaluating measures which work and don't work in NRW reduction efforts.	- Preparation of Feasible annual and mid term NRW reduction plan by use of the template and quarterly review. - reduction of the commercial losses by analyzing meter reading & billing data, - reduction of the physical losses by training leakage detection technologies on the ground, - recording of correct data on customer identification and works attended by the staff related in NRW reduction activities by using Kobo tool Box, a free application and - conducting periodically inter-departmental meetings for a smooth implementation of NRW related works and confirmation on effectiveness of the works done, etc.
2.What are your challenges in NRW reduction activities and what is the way forward?	1. Water shortage in DMAs due population increase causing water ration, this affects carrying activities like MNF (not very ideal for areas with intermittent water supply) Way Forward- company is planning to increase ground water catchments like plants and boreholes	**Challenges** - Dilapidated Infrastructure - Lack of adequate meters for replacement - the cost of meters -Intermittent water supply - Water theft- illegal connection -Inadequate finances - unmet water demand - this challenge prompt people to vandalise our systems **Way forward** - Rehabilitation and general overhaul of old infrastructure - Acquisition of meters through partnership with the ministry and other donors	Commercial part on the sorting slowing meter, Zoning and billing data analysis and the actions on the found anomalies.	• Financial constraints related to COVID-19 pandemic period caused some budgeted activities to be stopped. • Insufficient equipment for use during implementation of NRW activities to be rolled out to the entire service area. • Aged g.i. and asbestos pipelines with the service area which are capital investment projects The above challenges may be solved by planning, budgeting and support from the government.	・ Lack of adequate funds for major overhaul of dilapidated distribution pipeline and replacement of aged water meters. ・ Road works by the County government and other roads and fibre agencies resulting in damaged pipelines ・ Illegal connections and water theft	Lack of enough number of staff to carry out all the planned activities within the specified period. The company is planning to recruit two more staff to assist in the activities. Supply shortage-we are not into 24HRS supply hence difficult in carrying out some activities	・ The challenge has been the presence of invisible leaks, but with the support from JICA on leak detection equipment, we are on course in up-scaling leak detection activities across the entire network. ・ Intermittent water supply which is hampering leak detection activities. ・ Dilapidated network in some areas which require upgrading.	High cost of financing/implementing. NRW activities. I.E. bulk meter of 150 mm averagely costs 100,000 KES and 10 of them in a FY is 1,500,000 without the cost of fittings and chambers. To solve this the WSP is phasing the implementation of DMAs.	- Inadequate staffing. the company is in the process of adopting the organogram as provided by the NRW guideline.
3. How will your WSP contribute in dissemination of the NRW reduction activities?	1. Implement what was taught during JICA training sessions. 2. Implement the NRW management Guideline and Hand book 3. If given the chance, we will share with other WSPs on what we have learnt.	- By sensitizing staff and all stakeholders - Capacity building of the relevant Nrw staff through workshop and trainings - By conducting school campaigns, customer care clinics and random questionnaires - Fliers, bulk sms, radio talk shows etc.	・ Conduct in-house training, formulation of the NRW committee to evaluate the activities of Nrw and advice the Management. ・ Utilization of the developed Nrw Guidelines and the handbook at various levels in the organization. ・ Do annual Nrw Reduction Plan and regular review of same.	• In house training of staff on NRW reduction and management strategies. • Using the DMA approach to train zonal managers and other field staff on the use of NRW equipment. • Incorporation of NRW management as an agenda during public meetings (Barazas).	・ In-house training of company staff on issues of NRW which entails theory and field work. ・ Organizing of workshops and seminars which bring together neighboring WSPS. ・ The company has started an initiative #lindamaji mtaani that educate the public on water conservation and to report on illegal water use.	Currently we are training more staff internally to be more conversant with the NRW Equipments and other NRW related issues. We are ready to train staff from other WSPs on matters NRW reduction and also we can lend out the equipments whenever required.	・ Contacting monthly inter-departmental meetings to discuss on emerging issues. ・ Allocating more resources to NRW activities. ・ Equipping NRW staff with necessary skills and tools ・ Application of PDCA cycle time to time	• Peer to Peer Learning: Our WSP will always be open for other WSPs to come and learn the best practices absorbed over the project period to all interested WSPs. • WASPA Benchmarks: peer discussion via WASPA benchmarks will provide opportunities for other WSPs to learn from our WSP on techniques gained. • NRW symposiums held by bodies like KEWI or WASREB where our WSP has been invited to share good practices will help other WSPs learn and provide Q/A sessions on our adopted practices.	- To entrench some of the operation practices acquired during the project in our daily maintenance and operation manual. - Implement all the recommendations made by JICA technical experts team. - Share all the knowledge acquired during the project to other neighboring WSP.
4. Any other issue	We would like to appreciate JICA, Ministry and other partners for all trainings and advice rendered. We are grateful for this chance to learn NRW Management.	-The expertise assistance by the JICA team has been a milestone in KIMAWASCO and we still require their support. We shall highly appreciate if the Project period is extended so that we can maximise more since we lost a lot during the COVID-19 period and we still need their support and training on GIS related issues, Water Balance, MNF, use of UFM amongst others.	・ Continuous use equipment's and addition of more when need arises. ・ Regular benchmarking with other WSPs to learn and exchange ideas on NRW reduction.	The ministry's NRW unit should be strengthened and mandated to follow up and provide support on NRW activities being conducted at the WSPs.	・ The project was mostly affected by covid 19 pandemic which resulted less physical interaction with JICA expert team thus hindering the transfer of knowledge and skills, therefore we humbly request for extension of project period. ・ Request for funding of NRW activities i.e. replacement of dilapidated asbestos pipes and large customer meter replacements.	Training in Japan and maybe to have a chance to feel some of the things practically.	Requesting JICA to consider revisiting the WSPs in the near future for more support, since NRW levels are still at higher levels and more.	Extension of the project period. As much as the WSPs in the project have improved and reduced their NRW ratios there is still need to maintain the project to help the WSPs lower their losses to below 15%. They can then be used as models for all the other WSPs country wide.	- Quarterly meetings amongst the 9WSPs should be arranged to ensure continuity. This will also assist in WSPs to periodically share achievements and challenges in order to advance on skills to reduce NRW.
Feedbacks and Suggestions from the Expert team	Experts Team: The expert team is pleased to confirm that all the pilot WSPs have acquired a lot of new technologies as mentioned above through the project activities with the assistance of both the experts and our local staff. The team also appreciates all the pilot WSPs for recognizing their own challenges so as to improve their water system and facilities. We therefore expect that the pilot WSPs will continue with the NRW reduction activities and skills learnt from the project. We will also share with you a reality that the dissemination of NRW activites across Kenya is a big challenge after the project. The expert team has made a dissemination mechanism which consists of the revision of NRW Reduction Standards, which were re-edited into NRW Management Guideline & Handbook, new licensing condition of WASREB, and KEWI's training course so as to cope with the new WASREB's licensing conditions. In this system the pilot WSPs are also expected to play a key role for leading other WSPs which are joining the movement soon. We therefore request the members of pilot WSP, to please continue contributing in NRW reduction and offering quality water services to the customers in your service area, region and Kenya at large.								

Retrospective of Activities from Pilot WSPs at the End of the Project

9) Presentation Materials of the C/Ps for WURP (Water Utility Regional Partnerships) Workshop, in Embu

REPUBLIC OF KEYA

Ministry of Water, Sanitation and Irrigation

WATER SECTOR MANAGEMENT

Some facts about Kenya:

- Location: Africa continent, member - East African community.
- Boundaries: Tanzania, Ethiopia, South Sudan, Uganda and Somalia. Indian Ocean is the sixth boundary.
- 582,646km^2 total area of which about 97% is land and the remaining 3% is water. More than 80% of the land area is classified as arid and semi-arid land (ASAL).
- Independent - 1963 from Britain.
- Our official national languages - English and Kiswahili.
- Administratively, the government of Kenya comprises of the National Government which is headed by President Uhuru Kenyatta and 47 county governments which are headed by governors at local level.

Some facts about Kenya:

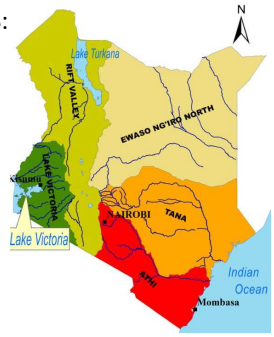
- Kenya has a tropical climate along the coast and an arid climate in the highlands. The Great Rift Valley is found in the interior of the country and a fertile high plateau in the western parts of the country. About 50% of the country is used for agriculture.
- The largest national park in the country is Tsavo National Park at the border to Tanzania.
- Lake Victoria is shared with Uganda and Tanzania and is also the second largest freshwater lake in the world.

Some facts about Kenya:

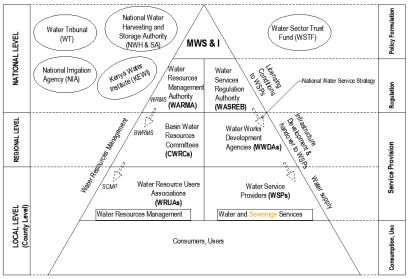
- Internationally, Kenyan athletes are known for their dominance in distance running.
- National parks and Reserves: The annual wildebeest migration is best observed at the Maasai Mara National Reserve. Amboseli National Park lies at the foot of Mt. Kilimanjaro. Marsabit National Park and Reserve is famous for its populations of large mammals such as lions, elephants, rhinoceroses, zebras, and giraffes. Tsavo E&W National Parks are famous for their abundant wildlife and diverse landscapes. Mzima Springs provide ideal conditions for viewing hippopotamuses, crocodiles, and fish.

WATER RESOURCES:

5 MAIN BASIN AREAS



Water Sector Management



Ministry of Water Sanitation & Irrigation:

Roles and responsibilities:

- Development of legislation, policy and strategy formulation, sector coordination and guidance, and monitoring and evaluation
- Overall sector investments planning and resource mobilization

National Institutions:

1. Water Services Regulation Authority **(WASREB)**
- Regulation and monitoring of service provision (Water Services Providers)
- Issuing of licenses to Water Services Providers
- Setting standards for provision of water services
- Developing guidelines (water tariffs etc.)

2. Water Sector Trust Fund **(WSTF)**
- Financing provision of water and sanitation to disadvantaged groups (pro-poor) as water poverty fund

National Institutions:

4. Kenya Water Institute **(KEWI)**
- Training and research

5. National Irrigation Authority **(NIA)**
- Develops, improves and controls irrigation schemes

6. Water Tribunal **(WT)**
- Arbitration of water related disputes and conflicts between institutions and organizations

National Institutions:

3. Nation Water Harvesting and Storage Authority **(NWH & SA)**
- Develops water storage infrastructure

7. Water Resources Management Authority **(WRMA)**
- Management of water resources

Regional Institutions:

1. Basin Water Resources Committee **(BWRC)**
   - Develops a Basin area water resources management strategy (Basin WRMS)

2. Water Works Development Agencies **(WWDAs)**
   - Plans and constructs water and sanitation facilities

Local Institutions:

1. Water Resource Users Associations **(WRUAs)**
   - Prepares a Sub-Catchment Management Plan (SCMP)

2. Water Service Providers **(WSPs)**
   - Provision of water and sanitation services, ensuring good customer relation and sensitization, adequate maintenance of assets and reaching a performance level set by regulation

Note: WSPs are owned by county governments.

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REGULATORY CONTRIBUTION TO THE HUMAN RIGHT TO WATER.

LESSONS FROM KENYA.

10TH MAY 2022
KEWI, NAIROBI.
By
Eng. Peter Njaggah
Director Licensing, standards and and advocacy

WASREB
Water Services Regulatory Board

KENYA VISION 2030

ISO 9001:2015 CERTIFIED COMPANY

CONTENT

- BACKGROUND-objective of water sector reforms
- Regulatory Contribution to HR to water.
- COK- Role of duty bearers
- REGULATORY INSTRUMENTS.
- RISK AREAS FOR KENYA
- ADAPTING TO THE IMPACT OF CLIMATE CHANGE
- CONCLUSION.

Water Sector Reforms

Background

In Kenya, The National Water Policy of 1999 and the Water Act 2002 (Act) triggered extensive reforms to Kenya's water sector, bringing it in line with international best practice.

Objectives of the water reforms

- To **improve** water resources management.
- Meet **growing demand for water services and attract more professionals** into the sector.
- Attract **greater investment**, and create **a modernized sector** that was more robust and more capable of responding to the emerging challenges such **as climate change** and **rapid urbanization**.

Key features of the reforms

- Separation of **policy formulation, regulation and services provision** function.
- Increased **user participation** and enhanced **pro poor orientation**.
- Introduced **socially responsible commercialization** in the provision of water supply and sanitation services.
- **Conflict resolution** was conferred by the act to the Water Appeals Board as an alternative to legal procedures.

Why the reforms: challenges before the reforms

- Inadequate sector funding
- Over centralization of authority
- Poor governance and lack of accountability
- Conflicting, unclear institutional roles and **inadequate legal framework**
- Poor services
- Consumer with no voice

Result was a growing discontent among water users

Regulatory contribution to Human Right to Water; challenges after the reforms?

Making the new water services institutions functional

- Challenge that they were all formed at the same time – sequencing could be better
- Phased recruitment and building of capacity when all still on a learning curve

Thinking in a business like way

- Shedding away of past practices

Assign and manage assets

Staff harmonization

- Diversified workforce; different working cultures
- Do not forget: change of staff mindset – don't assume all simply fall in line

Fill void of inadequate/absence of relevant regulatory tools

The Constitution of Kenya 2010

- In 2010, Kenya promulgated a new constitution – the Constitution of Kenya 2010 (CoK 2010).
- Fundamental to the new constitution was the creation of two levels of government; **the national government and devolved governments (County governments)**.

Role of duty bearers

- **National government assigned role of:**
  - Ownership of national public works
  - Regulation of water resources
  - Regulation of water services
- **County governments assigned role of:**
  - Water service provision
  - Sanitation management
  - Catchment protection
  - County public work
- **Shared functions:**
  - Planning
  - Monitoring and enforcement
  - Development of infrastructure
  - Storage
  - Flood control

The Constitution of Kenya (CoK) and human right to water

- The CoK 2010 entrenched the right to water and sanitation in the bill of rights, effectively making **water and sanitation a human right**.
- These development created the need to **align the Water Act 2002 to the CoK 2010**.
- Consequently, a new act - the **Water Act 2016** come into effect in April 2017 conferring to the **regulator** among others the **mandate of direct licencing of Utilities and making regulation on water services and asset development with a view to ensuring the progressive realization of the right to water**.

The human right to water and role of regulation

- The role of regulation in this arrangement is to ensure the progressive realization of this right within a framework that **protects consumers and the environment and helps to reconcile the social and economic interests**.
- It also involves **monitoring of Utility operations according to set standards, enforcing the licenses issued to them and reporting their performance to the public**, all this so as to ensure compliance and progressive improvement in service provision.

Regulatory instruments

Monitoring and evaluation Utilities

- **A key part of regulation is the determination and evaluation of whether the Utilities are fulfilling their obligation.**

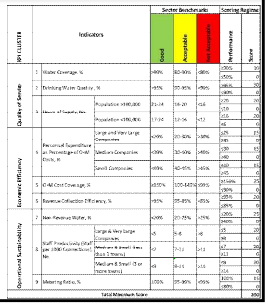
Performance assessment

- Carried out on the basis of 9 KPIs:
  - Water Coverage
  - Drinking Water Quality
  - Hours of Supply
  - O+M Cost Coverage
  - Personnel Expenditure as a % of O+M Costs
  - Revenue Collection Efficiency
  - Non-Revenue Water
  - Staff Productivity
  - Metering Ratio
- The choice of the 9 KPIs was based on the main goals of the sector: **quality of service, economic efficiency and operational sustainability**.
- The Figure shows the weights allocated to the clusters goals.

Weights for the indicator clusters

Developing incentives for quality improvements, cost containment and network/service expansion

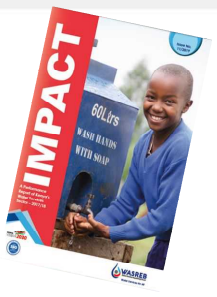
- The provision of water services is largely monopolistic in nature, therefore comparative performance reporting is a means to **spur competition**.
- It is crucial that good performance is incentivized while poor performance is sanctioned.
- The **role of incentives** in this case being to **promote, encourage, motivate or obligate** the actors to exercise their mandates with clear objectives.
- Wasreb has developed sector benchmarks for the KPIs that considers three stages of performance: **good, acceptable and not acceptable**.
- The limits for each performance level has been defined based on international good practice while considering the current status of the Kenyan water sector.
- The sector benchmarks are dynamic and reviewed on the basis of performance improvement of the sector.



KPI CLUSTER		Indicators		Sector Benchmarks			Scoring Regime	
				Good	Acceptable	Not Acceptable	Performance	Score
Quality of Service	1	Water Coverage, %		>80%	60-80%	<60%	>50%	30
							<50%	0
	2	Drinking Water Quality, %		>95%	85-90%	<85%	>85%	30
							<85%	0
	3	Hours of Supply, No.	Population >1Mil/day	21-24	16-20	<16	>20	30
							<20	0
			Population <1Mil/day	17-24	12-16	<12	>16	20
							<16	0
Economic Efficiency	4	Personnel Expenditure as Percentage of O+M Costs, %	Large and Very Large Companies	<30%	30-40%	>40%	≤35	15
							>35	0
			Medium Companies	<30%	30-40%	>40%	≤30	15
							>30	0
			Small Companies	<35%	40-45%	>45%	≤40	10
							>40	0
	5	O+M Cost Coverage, %		>100%	100-84%	<84%	≥100%	25
							<100%	0
	6	Revenue Collection Efficiency, %		>95%	85-85%	<85%	≥95%	20
							<95%	0
Operational Sustainability	7	Non-Revenue Water, %		<20%	20-35%	>35%	≤25%	25
							>25%	0
	8	Staff Productivity (Staff per 1000 Connections) No.	Large & Very Large Companies	<5	5-8	>8	≤5	20
							>5	0
			Medium & Small Companies (Rural Schemes)	<2	2-3.5	>3.5	≤3.5	10
							>3.5	0
			Medium & Small Co-operative Societies	<5	5-11	>11	≤8	20
							>8	0
	9	Metering Ratio, %		>95%	85-90%	<85%	≥95%	10
							<95%	0
Total Maximum Score								200

Incentives and sanctions regulations

- The use of incentives and sanctions drives Utilities to perform beyond their commitments in **Minimum Service Level (MSLs)** which is part of their condition for licensing.
- Incentives regulation by Wasreb takes the form of faming the Utility in its annual IMPACT report, granting the Utility an enhanced tariff incorporating minor investments and allowing it to leverage on the tariff to access blended financing.
- Sanctions would take the form of naming the Utility in the IMPACT report, penalties, fines, denying the Utility a tariff increase, to putting it under a Special regulatory regime (close monitoring).



Specifically for Kenya, the risk areas remains:

Rapid Population increase with projections as follows 13 Million (2010), 46m(2030) and 65m(2050). This will likely lead to more pollution where sanitation coverage is low.

- Governance structure changed to devolution- 47 counties- this will lead to concentration of persons leading to centre of high urban water demand and wastewater production.
- Rural areas: Most households without access to improved water sources are rural. The majority of rural dwellers will collect their drinking-water from community sources such as protected /unprotected wells.
- Water suppy impacts: There are a wide range of potential climate change impacts on water supply technologies, including flood damage to infrastructure, increased contamination,deteriorating water quality, increased treatment requirements and reduced availability.

Therefore installing services with a greater resilience to the impacts of climate change will rely in turn on improved management of water resources.

Adapting to the Impact of Climate Changes:

Going forward and as part of adapting to the impact of climate change, we need to:

- Improved water governance
- Focus on sustainability of water sources.
- Set higher targets for water service provision
- Use appropriate technologies
- prescribe appropriate water service delivery models for Rural/Community water services provision for sustainability
- Better water management- reduce on Non Revenue Water
- Changes in Policy and planning skewed toward water catchment protection ,water storage(large reservoirs and ground water).

Conclusion

Conclusion(1)

- The right to water is best achieved in a sector operating under uniform norms and standard on governance, quality, service delivery, cost recovery and protection of consumers.
- National Reporting and monitoring is key to the progressive realization of the SDG 6 goal on water.
- Modern water sector reforms will require separation of oversight and operation well anchored in the legal and regulatory framework.
- Regulation ensures formalisation of WASH service provision for all, in line with Human Right (price, quality, service reliability, etc.).

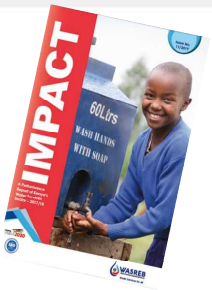
CONCLUSION(2):Wasreb Regulatory Adjustment to Climate Change Effects .

Wasreb has embedded measures on mitigating the impact of climate change as licence condition followed up by **sensitization of the public on conservation and protection of the water catchment areas of stakeholders during licence public consultation meetings.**

Finally lets all embrace the Japanese spirit of ' **MOTTAINAI**' ***(What a waste)*** by learning to:

- **Reduce**
- **Recycle**
- **Reuse**

To all of us, Planet Earth is What we call home



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THANK YOU

WASREB
Water Services Regulatory Board

KENYA VISION 2030

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References

- The Constitution of Kenya 2010
- Water Act 2016
- Impact report- Performance report of Kenyan water sector

Kenya Water Institute (KEWI)

Training, Research, Innovation, Consultancy and Outreach Services in the Water, Sanitation and Irrigation Sector

Walter M. Moseti
N0n-Revenue Water Coordinator (KEWI)

KEWI Background

- Kenya Water Institute (KEWI) is a State Corporation under the Ministry of Water, Sanitation and Irrigation (MWS&I) established by the Kenya Water Institute Act No. 11 of 2001
- To promote standards of service in the Water, Sanitation and Irrigation sector through human resource development, research, consultancy and outreach.

Cont-1 :- KEWI Background

- The Institute falls under the Environment, Water, Sanitation and Irrigation sector whose goal is to attain a clean, secure and sustainable environment by2030.
- Kenya Water Institute started in 1960 as a unit in the Hydraulic Department of Public Works to train water supply operators.

Cont-2:- KEWI Background

- The unit was upgraded to a training section under the same Department in 1970.
- When the Water Department was transformed to a fully fledged Ministry of Water Development in 1974, the training section became the Water Development Staff Training School.

Cont-3:- KEWI Background

- In 1985 the Staff Training School was transformed into a National Water Training Institution and thus the name Kenya Water Institute.
- KEWI has been involved in providing Training, Research Consultancy and Outreach services for the entire Water sector.

KEWI: Mandate

The mandate of KEWI as outlined in the Kenya Water Institute Act, No. 11 of 2001 is:

- **1.** To provide directly or in collaboration with other institutions of higher learning, services in human resource development, Consultancy, Research and Development in the water sector on a commercial basis to the public sector, state corporations, local authorities, the private sector and all other persons (local or foreign) who may request for such services from the Institute.

Cont-1:- KEWI Mandate

- **2.** To provide training programmes, seminars and workshops and produce publications aimed at maintaining standards in the water sector.
- **3.** To provide a forum for effective collaboration between the public and private sectors and other interested parties for the development of the water sector.
- **4.** To conduct examinations and award diplomas, certificates and other awards to successful candidates.

KEWI: Mission, Vision and Care Values

- **Mission**

  A Technical Centre of Excellence in Training, Research, Innovation and Consultancy in the Water, Sanitation and Irrigation Sector.
- **Vision Mission**

  To offer Competency-Based Training, Research, Innovation, Consultancy and Outreach Services in the Water, Sanitation and Irrigation Sector for sustainable development.
- **Core Values**

  Good Corporate Governance Professionalism Customer focus Innovativeness Inclusivity Patriotism Integrity

KEWI BRANCHES

- Nairobi Main Campus
- Chiakariga Campus
- Kisumu Campus
- Kitui Campus

REGULAR COURSES OFFERED IN KEWI

- **Diploma**

  Water Engineering
  Water Resources Technology & Management
  Waste Water Laboratory Technology
  Information & Communication Technology
  Irrigation & Drainage Engineering

Cont-1:- Regular Courses

- **Certificate**

  Water Engineering
  Water Resources Technology & Management
  Waste Water Laboratory Technology
  Information & Communication Technology
  Irrigation & Drainage Engineering

Cont-2:- Regular Courses

- **Artisan**

  Water Supply
  Meter Reading
  Plumbing Pipefitting
  Sewerage Operators

SHORT TERM COURSES

- Non-Revenue Water Management
- Meter Installation and Service Connection
- Leak Detection and Repair Techniques
- Operation and Maintenance of Water Supply Networks
- Operation and Maintenance of Water Treatment Plants
- Pump Selection Installation and Maintenance
- Plumbing Pipefitting and Solar Water Heating
- Instrumentation for Water and Wastewater Systems
- Application of GIS for Water Utilities

Cont-1: Short Term Courses

- Use of Earth Observation tools and GIS for Water Resources Management
- Water Governance, Management and Technology
- Drilling Techniques
- Water Quality Sampling and Testing
- Microbiological Water Quality Assessment
- Intergrated Water Resources Management
- Customer Care & Public Relations

Tailor made courses requested by a particular customer or Client

Cont-1:- Non-Revenue Water Reduction (Basic Course)

Course Structure

1. WSP Management Sensitization (1 day)
2. Class room training at KEWI (5 days)
3. On Job training at the leading WSP Embu (6 days)
4. On Job training at respective WSP facility (5 days)
5. Certificate after completion of sessions 2,3 or 4
6. Follow up after training (2 days)

Cont-2:- Non-Revenue Water Reduction (Basic Course)

Course Target Groups

- Technical and commercial managers and their assistants
- Officers assigned NRW management tasks within a water utility
- Distribution technicians
- Billing and customer care personal

Cont-3:- Non-Revenue Water Reduction (Basic Course)

Course objectives and outline

This course is intended to equip the trainees with knowledge, skills and positive attitudes:

1. Typical water supply facility
2. Non-Revenue Water outline
3. Water balance analysis
4. Physical water losses
5. Factors of leak occurrence and prevention concept
6. Non-Revenue water investigation equipment
7. Pressure management and mapping
8. Leak detection and management
8. Managing commercial losses
9. Water metering
10. Water Quality Analysis from leaks and Equipment

Cont-4:- Non-Revenue Water Reduction (Basic Course)

Expected Competencies

At the end of this Course, the trainees should be able to:

1. Understand the Basic Concepts of NRW Reduction Management
2. Describe the Fundamental Measures in NRW Reduction
3. Understand the Concept of Water Balance
4. Understand the Components and Measures of Physical Losses
5. Operate and use the Non-Revenue water investigation equipment
6. Appreciate the Importance of Leak Prevention
7. Perform Water Pressure Monitoring and Mapping
8. Undertake Leak Detection and Management
9. Manage commercial losses
10. Install, Read and Test Water meters
11. Undertake Water Quality Analysis from leaks

2. Non-Revenue Water Reduction (Managerial Course)

Data Analyses

1. Annual Review Template, Self Assessment, Planning and Review template,
2. Meter Reading Data and Billing analysis,
3. Universal NRW Monitoring Sheet,
4. Use of Kobo Toolbox.

Cont-1:- Non-Revenue Water Reduction (Managerial Course)

Course Structure & Target Groups

- **Phase 1:** This phase involves a five (2) days face to face training either at Kenya Water Institute or a location acceptable to both parties.(MD, TM, CM, NRW Head)
- **Phase 2:** This phase involves a five (5) days face to face training either at Kenya Water Institute or a location acceptable to both parties, targeting middle level management/supervisors involved in the applying the tools.
- **Phase 3:** This phase involves a follow-up of a minimum of six (6) months with the water company after the face to face training.

Cont-3:- Non-Revenue Water Reduction (Managerial Course)

Course objectives and outline

This course is intended to equip the trainees with knowledge, skills and positive attitudes:

1. The establishment of a Non-Revenue Water Management Function
2. Asset Planning and Development
3. The application of New Revised NRW Guidelines
4. Monitoring connections to ensure they are all are metered to required National Standards
5. Maintaining appropriate district Metering areas
6. Maintain Strategic Asset Management Techniques
7. Periodically Monitoring and Evaluation of facilities and systems performance
8. Ensuring that preventive Maintenance is undertaken to ensure systems working optimally
9. Developing a NRW Reduction Plan
10. Preparation of quarterly NRW Reports

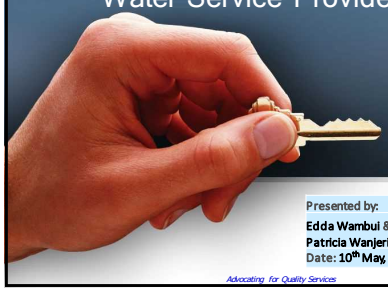
Humble Request

We Kindly requesting you to continue supporting KEWI in improving and upgrading training materials available and knowledge/skills transfer to the water sector

THANK YOU VERY MUCH
W. Moseti, NRW Coordinator (KEWI)
Contact: ***wmoseti@gmail.com*** *and* *(+254) 720809680*

WATER UTILITY REGIONAL PARTNERSHIP WORKSHOP

Water Service Providers Association (WASPA)



Presented by:

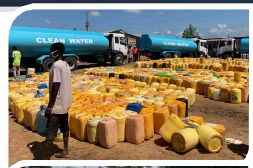
Edda Wambui & Patricia Wanjeri — WASPA Secretariat

Date: 10th May, 2022 — Venue: KEWI

Advocating for Quality Services

Presentation Outline

- Corporate Profile WASPA
- Enabling Laws & Goals
- Challenges facing WSPs
- Benchmarking
- Benefits of Benchmarking
- Roadmap to NRW Reduction/ Management
- Lessons Learnt & Good Practices Documentation.



Advocating for Quality Services

Corporate Profile

- Establishment.- 2002; Societies Act (cap 108)
- Registration- respective County Governments under Art. 77 of the Water Act 2016 and registered under the Companies Act 2015
- Membership -79 WSPs and 41 Associate members giving a total of 120 members

Advocating for Quality Services 3

Strategic Plan 2018-2022

- *Anchored on three pillars*
  - ❖ Organizational Capacity Development
  - ❖ Member Engagement & Development
  - ❖ Advocacy and Communication

Advocating for Quality Services 4

Mandate & Mission

Our Mandate

To provide a platform for members to advocate for and undertake issues pertaining to their development and sustainability.

Our Mission

To facilitate an enabling environment for Water Services Providers through capacity building, advocacy, networking, partnerships and promotion of best practices for provision of efficient, effective and sustainable water and sanitation services.

Advocating for Quality Services 5

CAPACITY DEVELOPMENT& NETWORKING

- Training Needs Assessment (TNA) for WSPs
- Partner with training institutions;
- Conferences & seminars

Advocating for Quality Services 6

ADVOCACY

- Multiple levies
- Preferential electricity tariff
- Cost effective tariff
- Conditional Liquidity Support Grant (CLSG)

STRATEGIC PARTNERS

WASREB, SNV, VEI, Netherlands Enterprise Agency, Vewin, german cooperation, giz, JICA, KENYA WATER INSTITUTE, BIWAC, bfz gGmbH, KENYA MARKETS TRUST Better Markets, Better Lives

ENABLING LAWS AND GOALS

SDG NO.6

Portable, affordable drinking water and safely managed sanitation.

Constitution 2010

43(1d) Access to safe and clean H2O

(1b) Reasonable standards of sanitation

Vision 2030

Social pillar implemented through MTPs

National Water Policy; Water Act 2016, Regulations and Standards

Challenges facing WSPs in KENYA

- High Electricity Tariffs
- Multiple Taxes and Levies
- Water and Sewerage and Non-Sewer Sanitation is TAX EXEMPT
- Free Water Narrative
- Non cost reflective Tariffs for Water
- Non Compliance with Corporate Governance Guidelines
- High NRW
- Low Sanitation Coverage – 29%
- Failure to involve WSPs in conceptualization of Infrastructure projects

BENCHMARKING

Benchmarking defined

"Benchmarking is the search for industry best practices that lead to superior performance."- Dr. Robert C. Camp

In the Kenyan water sector, Water Service Providers (WSPs) came together with an overall objective *to enhance performance improvement by improving their technical and financial capability through peer-to-peer learning*

& strengthen their capacity to implement the necessary performance improvements.

The platform helps Utilities:

- **Identify best/Leading practices** that will help improve their business performance by making comparisons over time across WSPs.
- Share experiences; the forum facilitates institutional development of ***"doing by learning"***
- Strengthening WSPs to **increase effectiveness** and achieve their goals and sustainability over time.

Advocating for Quality Services

Benchmarking journey

1. **Nyeri**
2. **Malindi**
3. **Muranga**
4. **Isiolo**
5. **Olooloiser**
6. **Kericho**
7. **Thika**
8. **Nzoia**
9. **Siaya Bondo (SIBO)**

2011: 9 utilities

ACP-EU Water facility project

2015: SWF PEWAK project (10WSPs)

2021: 40 utilities

2022: 50 utilities

Future … All Water Utilities

Advocating for Quality Services

Challenges before the Program

- Poor prioritization in Investment planning and technology selection
- High Non-Revenue Water (NRW)
- Low Cost recovery
- Low Tariff levels
- High Number of staff per 1000 connections
- Inadequate water supply volumes.

Advocating for Quality Services

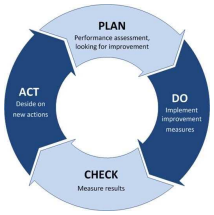
Benchmark Program Structure

- **Hybrid methodology'** including KPIs from WARIS (Kenya) and other (inter) national benchmarking methodologies
- **NRW, Cost Recovery , Service Level and Pro-poor 'Task Groups'** formed with one representative (mostly senior or mid-level manager) from each utility ⇨ **1 of the 4 appointed as the Benchmarking Coordinator (BCs)**
- BCs trained to spearhead data **collection** (at company level) and **validation** (workshop with other utilities)
- Benchmarking results disseminated prior to the first **Task Group meeting (yearly)**
- Leading Practices shared since 2013 to date
- **Performance Improvement Plans** (PIPs) developed by all WSPs highlighting contextualized 'Leading practices' and targeting 'low hanging fruits' i.e. reduction of commercial losses

Key Performance Indicators

The forum has 4 thematic areas each with specific Key Performance Indicators that address the 10 National Key Performance Indicators:

Performance area	WASREB	WASPA	Other Benchmarking methodologies	Total
NRW	3	11	3	17
O&M Cost Recovery	8	17	1	26
Service Levels	5	12	0	17
Pro-poor	0	20	0	20
Total	16/60	60	4	80



Advocating for Quality Services

KEY PERFORMANCE INDICATORS

Key Performance Indicators	2018/19	2019/20	Trend
Water Coverage, %	59	57	↓
Drinking Water Quality, %	96	92	↓
Hours of Supply, hrs/day	14	15	↑
Non- Revenue Water, %	43	47	↓
Metering Ratio, %	94	96	↑
Staff Productivity, Staff per 1000 Connections	7	7	→
Personnel expenditure as % of O+M Costs, %	50	49	↑
Revenue Collection Efficiency, %	92	89	↓
O+M Cost Coverage, %	105	103	↓
Sewered Sanitation Coverage, % *	17	15	↓
Sanitation Coverage, % *	81	88	↑

Good | Acceptable | Not Acceptable | Benchmark Varies

Program Management

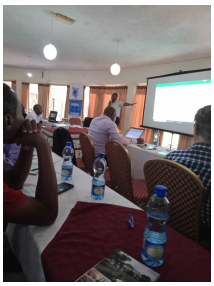
The Program is managed by the WASPA Secretariat, & supporting partners with assistance from Task Group Chairs drawn from the 4 thematic areas.

The methodology used: -

i. **Classroom Training:**

- Dissemination of the Results
- Sharing of Leading Practices
- Development of PIPs to address the underperformance in the KPIs
- PIPs incorporated in the WSPs budget, work-plan in-line with their strategic objectives.

Benchmarking



Program Management.

ii. **Field Training:**

- Training with problem-solving workshops
- Innovative education
- Real-life simulations
- Technical assistance

Advocating for Quality Services

Program Management

iii. **Networking** and partnering arrangements to pool expertise.

All these methodologies aim to touch on key areas like:

- Quality of service for all, including the poor
- Reliability of utilities
- Water quality
- Sustainability
- Finance
- Efficiency

Benefits of benchmarking

1. **Performance assessment** : Participating utilities have been able to conduct comprehensive analysis of their performance in comparison with peer utilities. Gives a clear picture of the performance of your utility ("dashboard");
2. **Performance improvement:** Offers WSPs an opportunity to improve by learning from good practices and innovations available from best performing utilities. Identify "performance gaps")
3. **Continuous process:** Not be a one-time effort.
   To eliminate weak/blind spots, a utility sets targets, defines & implements concrete improvement measures and monitor the effects of the measures over time (plan-do-check-act cycle).

Advocating for Quality Services

Benefits of benchmarking

4. General improvement in quality of service
5. Increased Customer satisfaction
6. Higher general return for the company
7. Basically higher operational efficiency
8. Optimal organization performance e.g. resources, productivity
9. Environment improvement

Advocating for Quality Services

Mindset for success Lessons learnt overtime

Humility: accept that there may be other WSPs with a better performance tho' under similar socio-economic environment & learn the changes that may arise from comparison.

Ambition/drive: introduce the necessary actions into the utility. Acknowledges that the required change (actions towards performance improvement) has to come from within

Effectiveness: Meant to complement the Regulatory exercise (performance ranking) IMPACT Reports by WASREB by working to accomplish the set targets

From PIPs to projects >> prepared, mostly focusing on NRW reduction...not surprising since ⇩NRW generally leads to ⇧CR + ⇧SL +PP⇨ SMART investments (e.g.better data capturing, consolidation & analysis, improved infrastructure & asset mapping acquisition of NRW management equipment which are requirements that WSPs should strive to invest from tariffs; commercial loans etc!

Advocating for Quality Services

Some of Good Practices

- **Non Revenue Water (NRW)**
  - Reduction & sustainability of Water losses to acceptable %, Nyeri Water thro' the DMA approach.
  - Improved billing efficiency through Customer Identification Survey, Ruiru-Juja
- **Services Level**
  - Improved relations between Kakamega Water and its customers
  - A good practice on how Kisumu Water managed to improve customer relationships
- **Pro poor Services**
  - A low - income service delivery model, Nakuru Water
  - Safe water through de-fluoridation and pro poor focus Naivasha
- **Cost Recovery**
  - Staff optimization Embu Water
  - Reduction of operations & maintenance costs thro' automation Eldoret Water

Advocating for Quality Services

Advocating for Quality Services

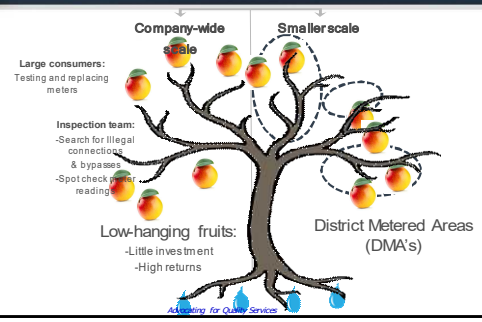
Advocating for Quality Services

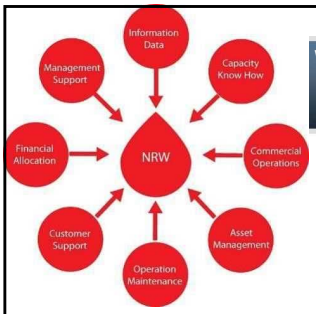
NRW REDUCTION / MANAGEMENT PUBLICATIONS

- NRW MANAGEMENT ROADMAP
- NRW STANDARDS (Jica/Wasreb)
- MINIMUM TECHNICAL GUIDELINES (Water Meters, Pipes, Valves and Pumps)
- GOOD / LEADING PRACTICES

Advocating for Quality Services

NRW reduction aproaches; Quick wins





WHO IS RESPONSIBLE FOR NRW?

NRW is a collective responsibility for-

- Managing director
- Technical manager
- Commercial manager
- Finance manager
- HR manager
- Procurement manager
- NRW managers
- Meter readers
- Operations Staff
- Administration staff
- Fleet Management staff
- Everyone

NRW management is not a one-off activity, but one requiring a long-term commitment and involvement of all water utility departments.

NRW MONITORING TOOLS

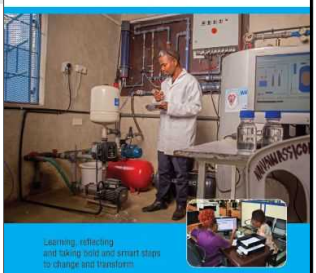
- Daily sustaining flows / (Daily Abnormal flow monitoring).
- Universal Zonal Monthly NRW Monitoring Sheet.
- Self assessment template
- Billing analysis excel Sheet.
- Opensource data collection softwares

DAILY SUSTAINING FLOWS

DMA	Month	Production Volume	Billed Volume	Volume Lost	NRW (%)	Sustaining Flow/ Month	Sustaining Flow/ Day	Index
CBD	April-2022	22295	14065	8230	36.91%	15628	521	7.39%
CCCR	April-2022	20541	18880	1661	8.09%	20978	699	1.49%
LAKEVIEW	April-2022	22578	7471	15107	66.91%	8301	277	13.56%
KABATI	April-2022	18882	14867	4015	21.26%	16519	551	3.60%
Site&Service	April-2022	8493	7476	1017	11.97%	8307	277	0.91%
Kamere	April-2022	5502	4411	1091	19.83%	4901	163	0.98%
Kayole	April-2022	13120	7117	6003	45.75%	7908	264	5.39%
		111411	74287	37124	33.32%			

Good Practices For Improved Performance

GOOD PRACTICES FOR IMPROVED PERFORMANCE OF WATER AND SANITATION COMPANIES IN KENYA



Email: waspa@africaonline.co.ke

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10) Presentation Materials of Keynote Speech at the workshop invited by WASREB & KMT (Kenya Markets Trust), JICA expert

NON-REVENUE WATER MANAGEMENT REFLECTION WORKSHOP
Venue: The Vic Hotel KISUMU
Date: 2/11/2021

Program Outline

Time	Session	Facilitator
0830–0845	Arrival and registration	WASREB
0845–0900	Introduction of Participants and Objectives of the Workshop • Welcome remarks o KMT o WASPA o WASREB	WASREB/KMT
0900-0930	1) Performance review of the water service sub sector – IMPACT 13 2) 2019-20 NRW Performance Overview – IMPACT 13 3) Lost Potential Revenue due to NRW 4) Discussions	WASREB
0930 - 1030	Enabling environment: a) Presentation by best Performing Utility – What were the contributing factors. b) Presentation by least improved Utility – What were the inhibiting factors.	Nakuru Migori/Gusii
1030 - 1100	• Paradigm Shift: Breaking Our Fixed Ideas to Reduce NRW in Kenya	JICA expert
11:00-11.30	**Health Break**	
1130 – 1200	Path to Recovery – Identification of Challenges and Mitigation measure: Group work Discussion.	WASREB
1200- 1230	Presentation of Group Work- 2 Groups	
1230- 1300	Highlights of NRW management guidelines	MWSI
1300 --1400	**Lunch Break**	
1230- 1300	• Performance Based Contracting in NRW Management.	WASREB/EARTH VIEW
1530- 1600	• Plenary session. • Suggestions on way forward – selected WSPs/ Budget consideration for NRW reduction • Q&A to regulator	WASREB/KMT
1600-1630	• Utility commitments (budgetary allocation and setting up of NRW targets)- Participating utilities to prepare an action plan and file with to WASREB	All
16.30-16.45	• NRW reduction technologies – KMT • Making utilities investment ready to tap on opportunities - KMT	KMT
16:45-17.00	Closing remarks and way forward	WASREB/KMT
1700	**TEA BREAK AND DEPARTURE**	ALL

NRW Management Reflection Workshop (WASREB & Kenya Markets Trust) in Kisumu on Nov. 2, 2021

Paradigm Shift: Breaking Our Fixed Ideas to Reduce NRW in Kenya

Presented by:
Eng. Mori, JICA Expert Team,
Project for Strengthening Capacity
in Non-Revenue Water Reduction

1

Triggers of the Paradigm Shift

Tri 1. Supply hours is getting shorter in many WSPs.

Tri 2. The average consumption of domestic customers is getting less and less significantly.

Tri 3: ICT including free software is improving rapidly with smartphone.

Let's Break Our Fixed Ideas!

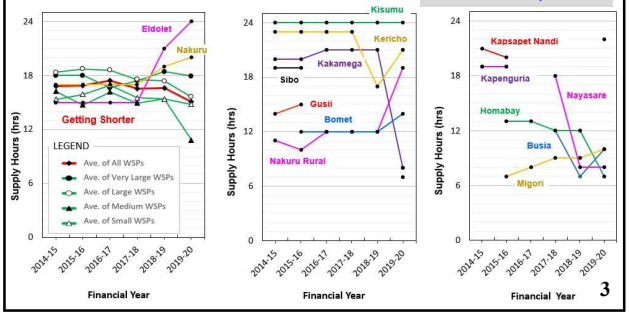
Can we call this "Paradigm Shift" if many WSPs join us?

Improve the Efficiency of NRW Reduction

2

Figure 1: Changes in Water Supply Hours over Years

Tri 1: Supply hours is getting shorter in many WSPs.

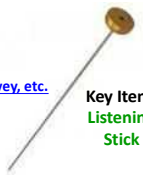


3

Effi 1: Leakage Reduction Suitable for Supply Conditions

Under Continuous Water Supply (like donor countries)

- Problem: More Leaks & Bursts
- Quick Response to Bursts & Surface Leaks
- Pressure Reduction & Zoning (distribution zones & DMAs)
- Minimum Night Flow (MNF) Measurement
- Step Test with Potable UFM followed by Listening Stick Survey, etc.



Key Item: Listening Stick

Under Intermittent Water Supply

- Problem: MNF Measurement is Not Possible
- Problem: Air going through Bulk Meters
- Quick Response to Bursts & Surface Leaks
- Pressure Control to Some Extent (distribution zones are probably enough)
- Step Test to Some Extent (possibly at the end of relatively long supply period with Time Stamp Camera & GOM Player)
- Listening Stick Survey for Active Leak Reduction (e.g. check all GI service pipes)

4

Figure 2: Changes in Water Coverage & Per Capita Domestic Water Consumption over Years

Tri 2: The average consumption of domestic customers is getting less significantly.

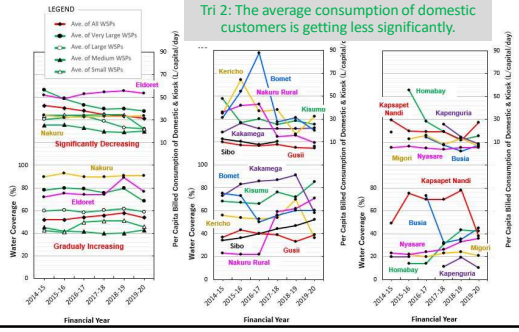


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Figure 3: Changes in Per Connection Monthly Billed Consumption of Domestic Customers over Years

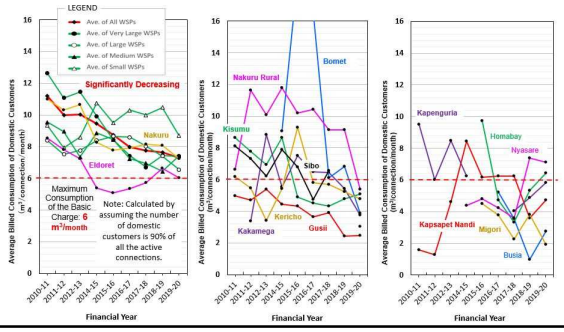

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Figure 4: Effect of the Increase of Metering Ratio on NRW Ratio

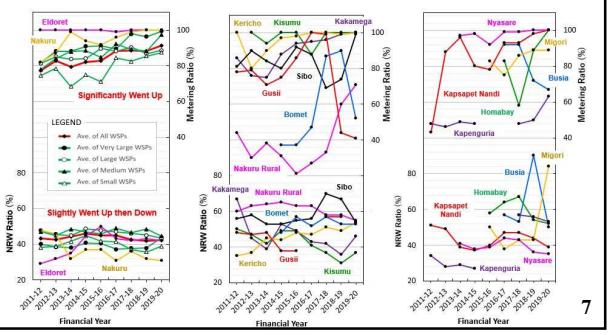

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Table 1: Base Information (Total Connection Number, Ratio of Non-Domestic Water Use, Expensiveness of Workforce, etc.) of the WSPs

Type of Average / Name of WSP	Number of WSPs / Size Category (Connections including both Active and Inactive)	Background Changes over 5 Years (before the Covid-19 Pandemic)												Expensiveness of Workforce			
		Production (1,000 m3/year)			Served Population (Num)			Domestic Billed Consumption (including Kiosk) (1,000 m3/year)			Non-Domestic Billed Consumption (other than Domestic + Kiosk) (1,000 m3/year)			Ratio of Non-Domestic Billed Consumption (Other than Domestic + Kiosk) (%)			Total No. of Staff	Staff Productivity (No. of Staff / 1,000 Active Conns.)	Ratio of Personnel Expenditure s to Total (O&M Cost) (%)	Personal Expenditure per Staff (KSh/month /capita)
	2019-20	2014-15	2018-19	Change	2014-15	2018-19	Change	2014-15	2018-19	Change	2014-15	2018-19	Change	2014-15	2018-19	Change	2018-19 (Normal Time before Covid-19)			
Average of All WSPs	91 WSPs (Ave. 23,460 conn.)	5,573	5,198	-7%	129,383	158,987	23%	2,011	1,941	-3%	1,155	894	-23%	36%	32%	-5%	132	15	43	66,922
Average of Western WSPs	15 WSPs (Ave. 27,210 conn.)	4,222	4,671	11%	137,289	204,530	49%	1,328	1,826	37%	513	897	75%	32%	35%	3%	136	11	38	44,297
Eldoret	Very Large (69,768 conn.)	12,857	15,123	18%	295,651	363,092	23%	5,606	7,356	31%	1,453	1,323	-9%	21%	15%	-6%	314	4	35	52,850
Nakuru	Very Large (65,525 conn.)	12,152	12,486	3%	415,999	481,595	16%	5,232	5,810	11%	2,378	2,703	14%	31%	32%	1%	245	5	34	100,331
Kisumu	Very Large (54,378 conn.)	10,164	10,003	-2%	280,462	333,799	19%	-	3,458	-	-	3,420	-	-	50%	-	328	6	35	65,884
Kakamega	Very Large (38,636 conn.)	4,742	5,366	13%	298,070	370,046	24%	2,006	2,893	44%	224	565	152%	10%	16%	6%	180	5	55	64,234
Kericho	Very Large (34,669 conn.)	2,830	4,554	61%	98,780	274,505	178%	1,263	1,679	33%	319	649	103%	20%	28%	8%	191	8	41	41,519
Nakuru Rural	Large (25,942 conn.)	8,356	8,487	2%	106,226	329,848	211%	1,405	1,887	34%	1,487	1,648	11%	51%	47%	-5%	152	10	40	57,190
Sibo	Large (10,977 conn.)	2,191	3,242	48%	142,069	217,601	53%	660	-	-	377	-	-	36%	-	-	106	11	29	21,849
Gusii	Large (22,102 conn.)	1,867	1,696	-9%	267,409	268,470	0%	968	495	-49%	194	239	23%	17%	33%	16%	128	8	48	49,842
Bomet	Large (16,463 conn.)	2,815	4,674	66%	88,254	78,561	-11%	1,001	893	-11%	471	1,282	172%	32%	59%	27%	89	9	30	49,046
Busia	Large (11,888 conn.)	-	1,207	-	-	107,505	-	-	80	-	-	45	-	-	36%	-	49	8	-	-
Homabay	Medium (8,486 conn.)	-	1,890	-	-	85,481	-	-	381	-	-	125	-	-	25%	-	113	21	23	15,106
Kapsabet Nandi	Medium (5,670 conn.)	687	1,093	59%	28,378	55,638	96%	302	236	-22%	130	389	192%	30%	62%	32%	51	10	55	56,163
Migori	Small (4,544 conn.)	-	619	-	-	48,992	-	-	236	-	-	119	-	-	34%	-	52	11	21	16,827
Kapenguria	Small (2,404 conn.)	305	291	-5%	15,799	16,786	6%	107	89	-17%	116	39	-66%	52%	30%	-22%	39	29	44	13,928
Nyasare	Small (1,202 conn.)	138	137	-1%	22,233	36,027	62%	44	70	59%	42	18	-57%	49%	20%	-28%	10	14	41	15,390

8

Figure 5: Increase in Total Billed Consumption vs Average Tariff/Turnover for Higher Amount of Billing

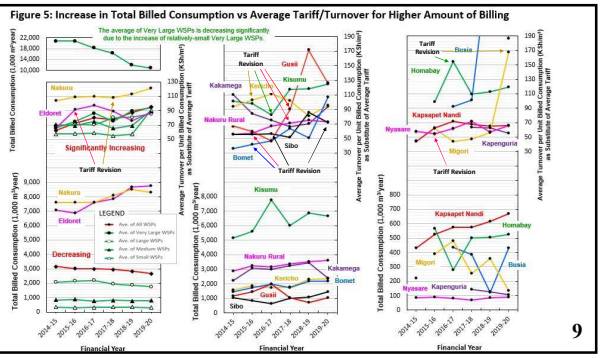

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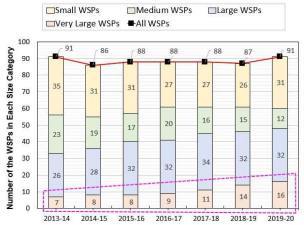
Figure 6: Change in the Number of WSPs in Each Size Category



The number of Very Large WSPs is significantly increasing. Therefore, the impact of the far largest WSP (Nairobi) on the average is getting less. That is the reason why the average values of some indicators (e.g. total billed consumption) for Very Large WSPs is getting low.

10

Effi 2. Prioritize Larger Customers All the Time for Commercial Loss Reduction (based on Analyses)

1. **Monthly Sorting of the Anomalies by Billed Consumption**
   (Prioritization: Large (e.g. > 100m³) **→Medium** (e.g. > 20m³) **→ Small)**
   - Stopped meters, buried meters, unreadable meters, etc.
   - Illegal reconnections, meter reversing, meter tampering (disconnected customers, zero & negative consumption, etc.)
   - Contact information & coordinates of customers for quick action
2. **Analysis of Meter Reading & Billing Data (at Least 12 months)**
   - Categorization of customers by average billed consumption
   - Frequency and continuity of estimation
   - Monitoring the increase of average tariff
   - Vague rules of estimation and tendency of underestimation
   - Gradual slow down of meters & suspicious fluctuations
3. **Other Check Points of Customer Information**
   - Meter size of large customers / Distribution zone, DMA, meter reading route / Outdated account status

Database of Billing Software
(customer info, meter reading & billing data, etc.)
↓
Key Item: SQL Statement (Monthly)
↓
Analysis using Excel
(sorting, filtering, vlookup, countifs, conditional formatting, etc.)

11

Effi 3: Use of Free Software (QGIS, QField, Web GIS, Kobo Toolbox/Collect, WhatsApp, etc.) for NRW Reduction

1. **Free GIS Solutions**
   - QGIS for the preparation & utilization of GIS data at Offices
   - QField (or MAPinr, etc.) on Smartphones
   - Web GIS/Could GIS accessible for anyone
   - Google Map for the navigation to customers
   - Free online satellite image, contours, etc.
2. **Other Survey & Communication**
   - Google Sheet for abnormal flow monitoring
   - Kobo Toolbox / Collect
     - Customer Identification Survey (CIS)
     - House-to-house Listening Stick Survey, etc.
   - WhatsApp for wide and easy communication

Tri 3: ICT including free software is improving rapidly.

Key Items:

Smartphone

+

Handheld GPS
(for mapping customer meters accurately)

12

Have Enough Fixed Ideas been Broken for the Paradigm Shift?

1. Pilot DMAs → Large Customers
2. Existing Anomaly Report → SQL Query & Excel (Sorting, Filtering, Monitoring, etc.)
3. Expensive NRW Survey Equipment→ Listening Sticks, Timestamp Camera, etc
4. Commercial GIS → Free GIS Solutions & Smartphones

What Else?

5. Technical Staff Only → Technical Dep. & Commercial Dep. under Strong Leadership of MD
6. PVC & PPR → HDPE (similar price up to 3 inch)
7. Expensive Meter Test Bench → Calibrated Bucket, 1.5-inch Volumetric Meter on Site & Hand-made Bench with UFMs
8. IWA's Detailed Water Balance Table ⇒ Universal Monthly NRW Monitoring (supply, billed cons., NRW, NRW ratio, average tariff)
9. O&M Zones ⇒ DMAs → ⇒Universal⇒Distribution Zones ⇒DMAs

13

Already Feeling the Paradigm Shift?

Tri 1: Hours of water supply is getting shorter in many WSPs. → Effi 1: e.g. Using listening sticks fully for active leak reduction

Tri 2: The average consumption of domestic customers is getting less significantly. → Effi 2: Focusing more on large (& medium) customers

Tri 3: ICT including free software for smartphone is improving rapidly. → Effi 3: Using mobile GIS, web GIS, etc. for locating facilities and customers, Kobo Toolbox/Collect for self CIS, WhatsApp for quick communication, etc.

Significant NRW Reduction with Efficient Efforts

14

Thank you for your attention.

Any questions?

15

11) Presentation Materials of Keynote Speech at the Symposium invited by KEWI & WSTF (Water Sector Trust Fund), JICA expert

KEWI Non-Revenue Water Symposium
on May 9-10, 2022

New approaches for Reducing NRW in Kenya

Presented by: Eng. Mori, JICA Expert Team

Project for Strengthening Capacity
in Non-Revenue Water Reduction in the Republic of Kenya 1

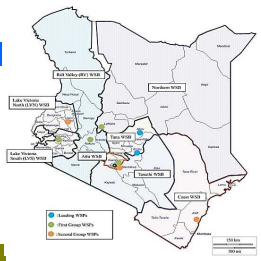
Contents of this Presentation

- Sharing our Experiences – the achievements
- Old Approaches of the Previous Projects
- New Approaches of this Project
- Last Words for Kenya

2

Sharing the Experiences at the End of our NRW Project

- JICA's 2nd Capacity Development Project for NRW Reduction in Kenya (2016-2022)
- New Approaches different from JICA's 1st Capacity Development Project for NRW Project in Kenya (2010-2014)
- JICA Experts ⇔ 9 Pilot WSPs (Meru, Embu, Nakuru, Kisumu, Ruiru-juja, Nyahururu, Eldoret, Eldoret, Kilifi-Mariakani) and Kenyan Institutions (the Ministry, WASREB, KEWI & WASPA)
- Vision: the 9 Pilot WSPs → the Kenyan Institutions → Other many Kenyan WSPs (& Other developing countries)



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Achieved Project Purpose : High Completion Ratio of Planned Activities (At least 6 WSPs achieve 60% or more for 2 years continuously.)

Pilot WSP	2016 -17	2017 -18	2018 -19	2019 -20	2020 -21	Evaluation
Meru	68%	70%	75%	43%	98%	3 years continuously + 1 year
Embu	40%	50%	60%	65%	70%	3 years continuously
Kisumu	55%	60%	69%	73%	72%	4 years continuously
Nakuru	82%	85%	90%	70%	80%	5 years continuously
Nyahururu	70%	90%	90%	70%	80%	5 years continuously
Ruiru-Juja	-	30%	20%	68%	74%	2 years continuously
Eldoret	50%	60%	65%	75%	80%	4 years continuously
Mavoko	40%	60%	48%	50%	50%	1 year (partly due to water shortage)
Kilifi-Mariakani	35%	60%	50%	40%	70%	1 year + 1 year (delayed org. imp.)
Average	55%	63%	63%	62%	75%	7 WSPs are successful.

4

Overall Results of NRW Reduction at the 9 Pilot WSPs

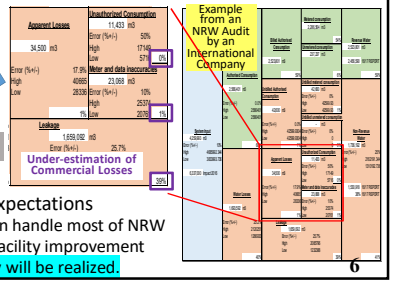
Assisting the Implementation at Each Pilot WSP		Baseline		Approx. Results (2021-22 so far)		
		Year	NRW %**	Current NRW%**	Diff. in NRW%	Revenue↑ (Mill KSh/year)*
From Phase 1	Meru	2016-17	24%	Around 17%	7%↓	17 Mill KSh/y
	Embu	2016-17	-	Around 40% (41%→39%→37%)	Gradually decreasing	Cannot estimate due to the lack of reliable baseline.
From Phase 2	Kisumu	2017-18	36%	Around 28%	8%↓	93 Mill KSh/y
	Nakuru	2017-18	35%	Around 30%	5%↓	72 Mill KSh/y
	Nyahururu	2017-18	42%	Around 41% (39%→40%→39%)	Gradually decreasing	4 Mill KSh/y
	Ruiru-Juja	2018-19	54%	Around 34%	20%↓	181 Mill KSh/y
From Phase 3	Eldoret	2018-19	44%	Around 41%	3%↓	39 Mill KSh/y
	Mavoko	2018-19	41%	Around 37%	4%↓	11 Mill KSh/y
	Kilifi-Mariakani	2019-20	57%	Around 49%	8%↓	78 Mill KSh/y

* Roughly estimated by "Turnover in 2019-20 / (100 - Current NRW%) x Diff. in NRW%" ** based on the universal NRW monitoring

5

Old Approaches of the Previous Projects

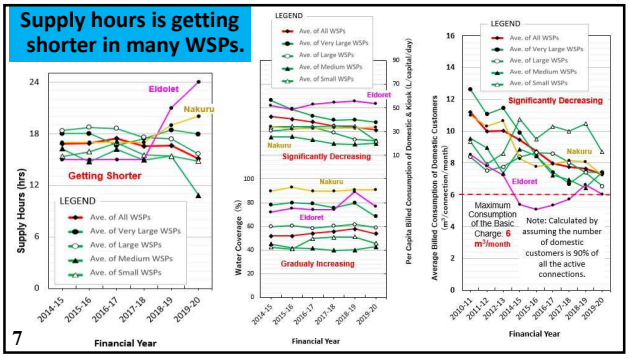
- Time-consuming Intensive Pilot Project targeting Small District Metered Areas (DMAs) as a Showcase
  - Misleading due to the seasonal fluctuation, etc.
  - DOES NOT WORK AT ALL!!
  - FAILED WISH: EXPANTION OF EFFECTIVE ACTIVITIES TO OTHER AREAS
- Preparing an Unreliable IWA Water Balance Table



- Underlying Unrealistic Expectations
  - Technical department can handle most of NRW
  - Substantial budgets for facility improvement
  - Continuous water supply will be realized.

6

Supply hours is getting shorter in many WSPs.



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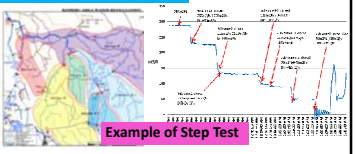
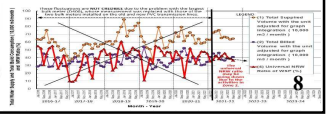
Under Intermittent Water Supply Conditions

- Minimum night flow measurement & step test are quite difficult. ⇒ Many small DMAs can be over investment (Distribution zones for each tank, etc. or large DMAs are enough at first.)



- House-to-house listening stick survey targeting a large number of customers, certain type of service connections (e.g. all GI service pipes), etc. can be most effective. ⇒ DMAs are not a prerequisite for this.
- The air going through bulk meters may cause huge erroneous seasonal fluctuations of NRW ratio.



8

New Approaches of the 2nd Project

9

1. **Table of Recommended Activities for Different Levels** (Having a Long-term Simple Vision)
2. **Plan-Do-Check-Adjust (PDCA) Cycle** (Update of Capacity Assessment, Annual Plan, Update of 5 year Bar Chart, Quarterly Monitoring & Annual Review)
3. **Under Monthly Universal (and Zonal) NRW Monitoring**
   - a. Various Analysis of Monthly Meter Reading & Billing Data and Prioritization of Large Customers
   - b. Monthly Joint Actions against Meter Anomalies, etc.
   - c. Regular Patrol, Abnormal Flow Monitoring & Active Leak Detection (e.g. Step Test)
   - d. Gradual Separation into Distribution Zones and DMAs
4. **Free GIS & Data Collection Software**

Target Timeline (long⇒year ⇒month)

Balance between Commercial & Technical

Balance between large, medium & small customers

Target Area (Whole ⇒ Priority Distribution Zone ⇒ Priority DMA)

Not to be expand by duplicating Pilot DMAs (all the service areas are already being dealt with)

Continuous Supply or Intermittent

1. Table of Recommended Activities for Different Levels (Having a Long-term Simple Vision)

Stage	Approx. Range of NRW %	Recommended NRW Reduction Measures (Note: GIS development and NRW monitoring are not listed here, but they are required as support for NRW reduction measures)
1	Red NRW ratio ≧ 40% (or unknown or unreliable)	◆ Determine the accuracy of production meters by testing and calibrating, and replacing if faulty or inaccurate (Mo-1). ◆ Eliminate major commercial losses by servicing and testing (and replacing faulty) customer meters and, identifying illegal uses (starting with large and then medium customers) (Co-1, Ma-1). ◆ Install meters for unmetered customers and identify unbilled customers through Customer Identification Survey (CIS) and issue them with bills. (Co-2, Ma-1, Ma-2). ◆ Reduce the time taken to repair bursts, surface leaks and overflows (Ph-1)
2	Yellow 30% < NRW ratio < 40%	◆ Intensify Stage-1 measures by e.g., establishing routines, etc. ◆ Isolate distribution zones and district metered areas (DMAs) with accurate bulk meters and do NRW monitoring (Mo-2). ◆ Reduce underground leaks by step testing, acoustic survey and pressure reduction in priority areas (this leak reduction can be carried out as a pilot project) (Ph-2). ◆ Map bursts and leaks and monitor their recurrences (Ma-3, Ma-4). ◆ Introduce better pipe materials and fittings for new pipelines and service connections (e.g., HDPE or uPVC-D/E). ◆ Minimize commercial losses (including at small customers and data handling errors) by improving meter reading and billing systems, and their uses (Co-3, Co-4).
3	24% < NRW ratio ≦ 30%	◆ Intensify Stage-2 measures listed above. ◆ Reduce underground leaks in other areas (Ph-3, Mo-3). ◆ Start replacing pipes which are prone to bursts and leaks (Ph-3). Green
4	20% < NRW ratio ≦ 24%	◆ Intensify Stage-3 measures listed above. ◆ Accelerate and complete pipe replacement (Ph-3). Blue
5	NRW ratio ≦ 20%	◆ Intensify Stage-4 measures listed above. ◆ Maintain the facilities and skills to sustain the achieved low NRW ratio (Ph-3). Purple

See the Revised NRW Management Guidelines of WASREB

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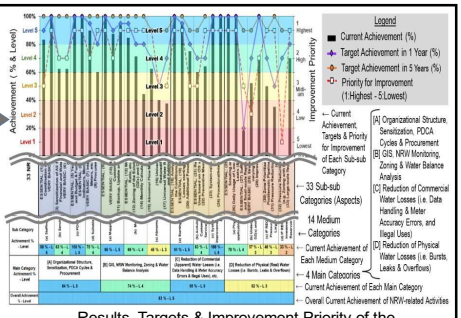
2. Plan-Do-Check-Adjust (PDCA) Cycle

(Update of Capacity Assessment, Annual Plan, Update of 5y Bar Chart, Quarterly Monitoring & Annual Review)



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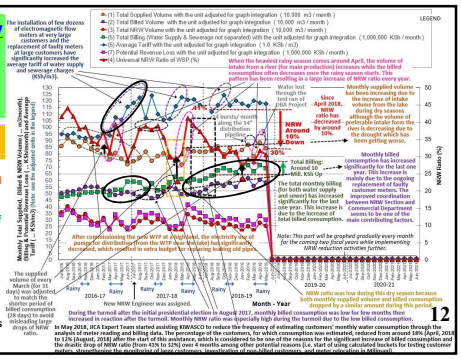
Results, Targets & Improvement Priority of the Self-Capacity Assessment at Nyahururu WSP

3. Under Monthly Universal (and Zonal) NRW Monitoring

E.g. 1: Universal NRW Monitoring in Kisumu

3-Year Monthly Transition & Interrelation of 1) Total Supplied Volume (an indicator of physical loss reduction), 2) Total Billed Consumption & Total Amount of Billing (indicators of commercial loss reduction), 3) Total NRW Volume/Ratio & Potential Revenue Loss (indicators of overall success) and 4) Average Tariff (an indicator for successful targeting of large customers), Kisumu WSP (KIWASCO), 3 years from 2016/17



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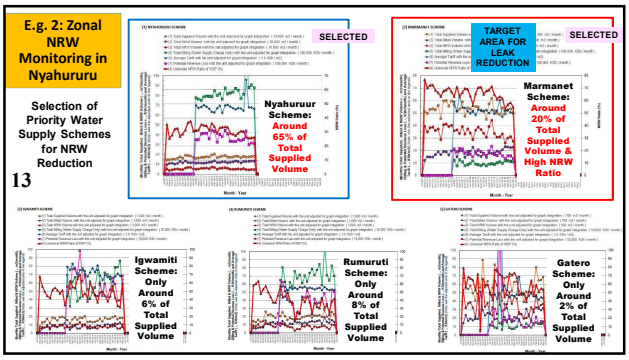

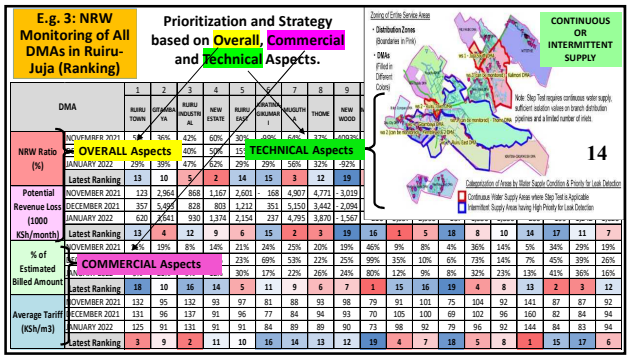

a. Various Analysis of Monthly Meter Reading & Billing Data and Prioritization of Large Customers

- ✓ Functions of the meter reading and billing software (e.g. filtering anomalies & sorting them by ave. consumption, zonal NRW calculation, cloud-based work ticket/stock management, etc.)
- ✓ Data extraction from the database using SQL or/and custom reporting
- ✓ Categorization of customers by tariff blocks (e.g. C1: > 300 m3/month)
- ✓ Proper categorization of non-domestic customers for proper billing
- ✓ Coverage of monthly meter reading including disconnected ones, etc.
- ✓ Outdated status of customers (e.g. inactive, disconnected, pending)
- ✓ Outdated zone, route and walk number and inaccurate coordinates
- ✓ Frequency & continuity of estimation for each category and reasons
- ✓ Rules for estimating consumption when required and their enforcement
- ✓ Tendencies of underestimation and overestimation
- ✓ Long-term slow down (e.g. over 5 years) & short-term slow down
- ✓ Sufficiency of large customers' meter size

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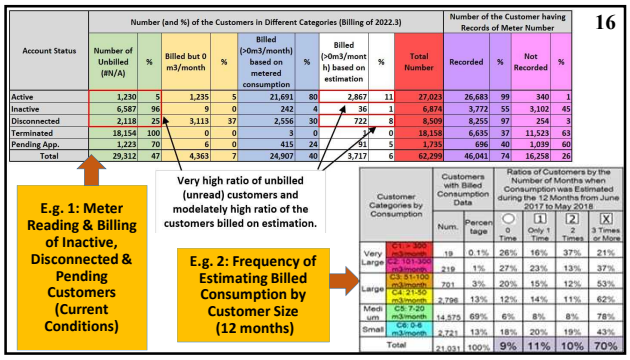
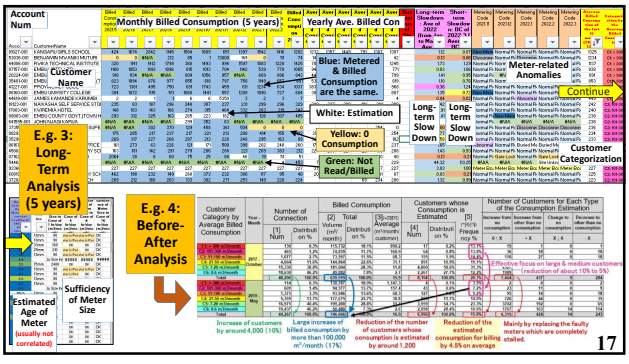
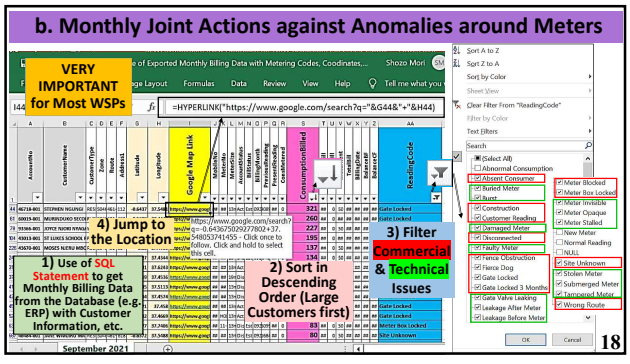
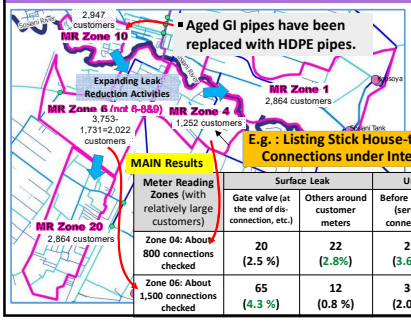






c. Patrol, Abnormal Flow Monitoring & Leak Detections



- Aged GI pipes have been replaced with HDPE pipes.
- If continuous supply, 1) hydraulic isolation of area, 2) MNF measurement & step test, 3) listening stick survey on the connections within identified leaking areas.... may work.

E.g. : Listing Stick House-to-House Survey covering All Connections under Intermittent Supply in Eldoret

MAIN Results

Meter Reading Zones (with relatively large customers)	Surface Leak		Underground Leak		Total
	Gate valve (at the end of dis-connection, etc.)	Others around customer meters	Before meters (service connection)	After meters (private pipes)	Very High Rate!!
Zone 04: About 800 connections checked	20 (2.5 %)	22 (2.8%)	29 (3.6 %)	8 (1.0 %)	79 (9.9 %)
Zone 06: About 1,500 connections checked	65 (4.3 %)	12 (0.8 %)	30 (2.0 %)	15 (1.0 %)	122 (8.1 %)

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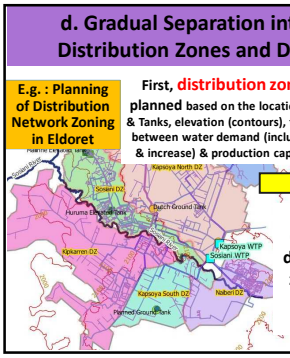
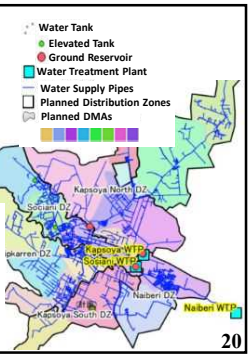
d. Gradual Separation into Distribution Zones and DMAs

E.g. : Planning of Distribution Network Zoning in Eldoret

First, distribution zones are planned based on the location of WTPs & Tanks, elevation (contours), the balance between water demand (including NRW & increase) & production capacity, etc.



Further divide the distribution zones into DMAs if required.



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4. Free GIS & Data Collection Software

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Best Combination of Free GIS Software

GIS Officer at Main Office

① QGIS (3.16.10)

② QField Sync
Experimental version of a QGIS's plugin

③ https://app.qfield.cloud/accounts/signup/

QFieldCloud

Field Staff

④ QField - Unstable (Early Access)

+ Handheld GPS (for mapping existing customer meters accurately at first)

Branch Office, etc. (and the main office while field staff are updating layers to avoid conflicts)

⑤ BlueStaks App Player (Android Emulator)

⑥ From Google Play (or APK) - QField – Unstable (Early Access)

Advantages
- All free but highly functional
- Search and widgets such as photo
- Unlimited layers
- Offline & online base maps
- No cable required
- Same symbology, etc.
- Security & authorization

Limitations
- Cannot establish a dynamic linkage with a Customer Database (e.g. ERP)
- No link to Google Map route navigation unlike MAPinr

How the best combination looks.

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① QGIS

② QField Sync

③ QFieldCloud

④ QField

⑤ BlueStacks

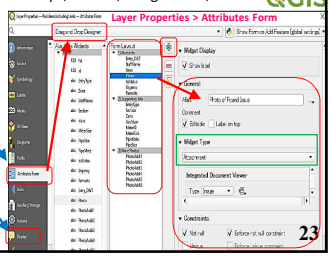
⑥

Technical Tips for GIS Officers to Replace Other Free Mobile/Web GIS & Data Collection Software with QField Cloud

Skip

- Better than other plugins of QGIS (e.g. qgis2web, QGIS Cloud, Mergin/input) and other free mapping and data collection software (e.g. WS Maps, MAPinr, Google Earth, Kobo Toolbox/Collect) in many cases.
- QGIS: In order to create sophisticated data entry forms like that of Kobo, please use 【1】 alias, 【2】 widgets (e.g. text edit, value map, attachment [path of the photo in string {e.g. 254 characters}, relative path, button, image {e.g. w:500px & h:auto}], hidden, date-time in string, etc.), 【3】 constraints, 【4】 default value (e.g. date-time: $now), 【5】 form layout functions (e.g. drop and drag designer, container, control visibility, group box, columns, etc.)
- QGIS: Set Display Name w/o expression to search a customer, facility, etc. with QField

QGIS



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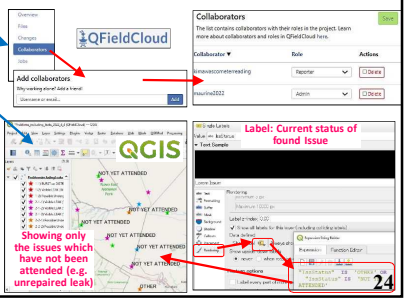
Technical Tips for GIS Officers to set QField Cloud & QGIS

Skip

- QField Cloud: Assign different roles/credentials to collaborators (other accounts) such as editor, reporter, etc.
- QGIS: Render the labels of various issues (having categorized symbology) with a expression to show selected issue status (e.g. unattended)
- QField: Measurement (Length, Lon, Lat) & Drawing by Tracking
- QGIS: Online base maps (e.g. QuickMapServices > hybrid satellite image)
- QGIS: "fid" should not be used as a field name before conversion into a cloud project.



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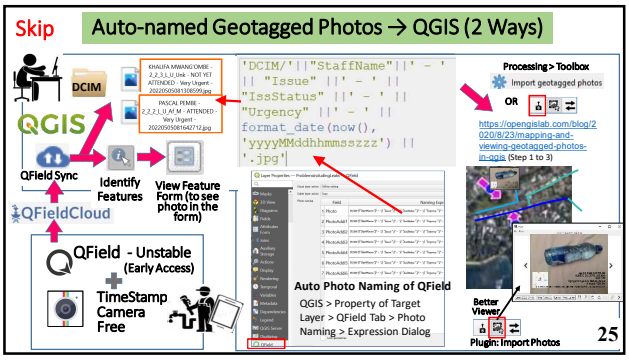

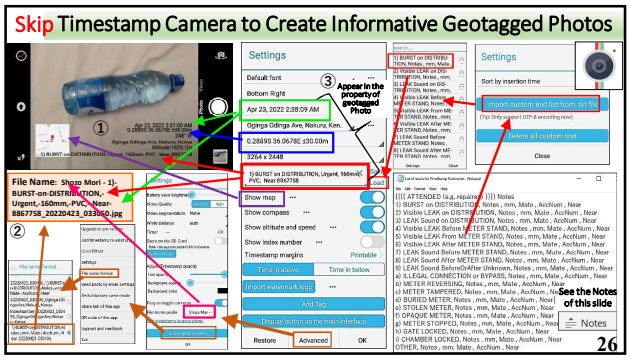

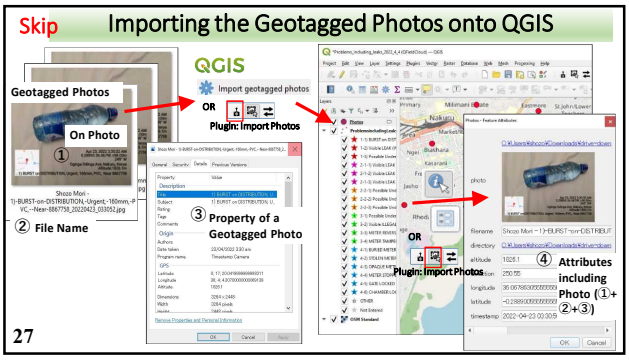

Last Words for Kenya

1) Supply driven approach ⇒ technical cooperation based on close consultation (requiring a broad range of skills including ICT, GIS, hydraulic analysis, Excel formulas for analysing billing data, leak detection, etc.)
2) Enhance the support from WSP's managers by increasing the billing first.
3) Don't adopt the approaches suggested by foreigners (usually having more budget, skilled staff, continuous water supply, different culture, etc.) without carefully scrutinizing their feasibilities.
4) Check latest free software and low-cost equipment, and share your updated knowledge with other WSPs.
5) Don't be fooled by performance-based contractors who may try to shorten water supply hours to reduce leakage or increase the number of over-estimated billed consumption for "NRW reduction" at the cost of customers.

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Good luck for your NRW reduction!

Thank you for your attention.

Any question or suggestion?

shozomoribiz@gmail.com

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② KEWI Non-Revenue Water Symposium

NON-REVENUE WATER SYMPOSIUM

Home Non-Revenue Water Symposium

2022 – MOMBASA COUNTY

THEME: "CLOSING THE LAST MILE TO SDG 6"

SYMPOSIUM DATES: 28TH AND 29TH APRIL 2022

VENUE: PRIDEINN PARADISE BEACH HOTEL, SHANZU

Register here LIPA NA MPESA PAYBILL NUMBER: 4004040

CONCEPT AND CALL FOR ABSTRACTS, POSTERS, EXHIBITIONS AND FIELD EXCURSION

Institute (KEWI) with the support of partners will hold the Non-Revenue Water gement Symposium on **28th and 29th April 2022** in Mombasa, Kenya. The heme is ***"CLOSING THE LAST MILE TO SDG 6"***

The Non-Revenue Water Management Symposium will showcase cutting edge technologies that address NRW reduction by bringing together managers of water service providers (WSPs), scholars, technology experts, policy makers, development partners, water utilities, institutions of higher learning, water associations, civil society, private sector and investors to share experiences on the globally accepted standards for the management of NRW.

Water loses continues to be the biggest challenge to a majority of counties in Kenya as more than 50% of the water produced is lost. This undermines the progressive realization of the right to water as enshrined in the Constitution. Achieving operational sustainability by water service providers, based on the principle of social commercialization, requires partnering to reduce Non-Revenue Water.

The symposium will be both physical and virtual expecting at least 400 delegates and 40 exhibitors to connect in-person attendees with local and international participants. Through plenary, interactive panels, breakout sessions and face to face interactions, the symposium will bring together a bigger network than ever before for two days of conversation and deal-making.

CHIEF GUEST and KEY SPEAKERS will be updated soon

THEMATIC AREAS

```
Non-Revenue Water Management Strategies
```

1. Application of Smart Meters in the Management of NRW
2. Use of Earth Observation and GIS in Non-Revenue Water Management
3. Leak detection techniques on Non-Revenue Water Management

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The Role of Academic Institutions, in the Management of
Non-Revenue Water
```

1. Roles of research on the reduction of Non-Revenue Water
2. Roles of capacity building on the reduction of Non-Revenue Water

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National Policies, Regulations for Non-Revenue Water Reduction
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1. Water regulations on Non-Revenue Water Management
2. Role of National Government on Non-Revenue Water Management
3. Role of County Governments on Non-Revenue Water Management

vironment and Incentives for Non-Revenue Water
t WSP level

n of Smart Meters in the Management of NRW

2. Use of Earth Observation and GIS in Non-Revenue Water Management
3. Leak detection techniques on Non-Revenue Water Management

The Role of Financial Institutions and Private Sector in the Management of Non-Revenue Water

1. Role of Financial Institutions on Non-Revenue Water Management
2. Role of Financing on the reduction Non-Revenue Water
3. Role of Non-governmental organizations on Non-Revenue Water Management

Data Management Analysis in Support of NRW Management

1. Data analytics
2. Big Data and cloud computing

SYMPOSIUM SPONSORSHIP PACKAGES

1. **TITLE SPONSOR: - KSHS 2,000,000**

Benefits of the Title sponsor; –

- Acknowledgement as a Title sponsor on event collateral and mentions by the event Master of Ceremonies
- 5 complementary VIP tickets
- 5 minutes' presentation during Plenary
- One slot for panel discussions during break away sessions
- Co-branding in all event and communication collateral
- Prime exhibition spot during the event
- Logo and link to your website on the KEWI website for 2 months with acknowledgement as a Title sponsor
- Opportunity to share customized message on the KEWI social media platform
- Opportunity to distribute own branded merchandise at the event
- Opportunity for post event publicity on all post event articles and adverts

2. **PLATINUM SPONSORS: - KSHS 1,500,000**

Benefits of the Platinum sponsor; –

- Acknowledgement as a Platinum Sponsor on event collateral and mentions by the event Master of Ceremonies
- 2 complementary VIP tickets
- Brief speech during plenary
- One slot for panel discussions during break away sessions
- Co-branding in all event and communication collateral
- Key exhibition spot during the event
- Logo and link to your website on the KEWI website for 1 month with acknowledgement as a platinum sponsor
- Opportunity to share customized message on the KEWI social media platform
- Opportunity to distribute own branded merchandise at the event
- Opportunity for post event publicity on all post event articles and adverts

3. EXHIBITION

An exhibition area will be located at the venue. Exhibitors will be provided with an exhibition booth, power socket, a table and two chairs. Each individual exhibitor will be required to provide own décor and draping. In order to participate, a fee of **Kshs 150,000** will be charged to facilitate the same. A second exhibition booth will be available at the exhibition area at an extra cost of **Kshs 50,000**.

4. GOLD SPONSORS: - KSHS 1,000,000

Benefits of the Gold sponsor; –

- Acknowledgement as a gold sponsor on event collateral and mentions by the event Master of Ceremonies
- 2 complementary VIP tickets
- Brief speech in the plenary
- Co-branding in all event and communication collateral
- A selected exhibition spot during the event
- Logo and link to your website on the KEWI website for 2 weeks with acknowledgement as a gold sponsor
- Opportunity to share customized message on the KEWI social media platform
- Opportunity to distribute own branded merchandise at the event
- Opportunity for post event publicity on all post event articles and adverts

5. SILVER SPONSORS: - KSHS 500,000

Benefits of the Silver sponsor; –

- Acknowledgement as a gold sponsor on event collateral and mentions by the event Master of es
- mentary VIP ticket
- ng in all event and communication collateral
- An exhibition tent at the exhibition area
- Opportunity to share customized message on the KEWI social media platform
- Opportunity for post event publicity on all post event articles and adverts

6. DELEGATE TICKET

Registration fee Kshs 30,000

7. YOUNG WATER PROFESSIONAL TICKET

Should be below 25 years

Registration fee Kshs 20,000

8. FIELD EXCURSIONS

To take place on 30th April 2022

The places to be visited will be within Mombasa County. Registration fee Kshs 7,000

FIELD EXCURSION REGISTRATION

This will take place on 30th April 2022. For participation register by 10th April 2022.

The places to be visited will be within Mombasa County. Registration fee of Kshs 7,000

Clearly indicate your interest to participate in the excursion by sending request to nrw-symposium@kewi.or.ke

IMPORTANT DATES

1. Symposium adverts/communication 30/3/2022
2. Call for Abstracts, Posters & Exhibitions 30/3/22
3. Sponsorship and packages 10/4/22
4. Symposium / Exhibition / Field Excursion registration 10/4/22
5. Tickets/badges to sponsors and delegates 26/4/22
6. Evaluation of Abstracts and Posters 15/4/22
7. Notification of Acceptance of Abstracts, and Posters 18/4/22
8. Deadline for submitting Power Point for oral presentations 25/4/2022

of presentation rooms 27/4/22

STRACTS AND POSTERS

Submissions are invited for oral and poster presentations

Submission guidelines
Oral Presentations

- Applicants should submit a complete abstract to nrw-symposium@kewi.or.ke
- Abstracts should be written in clear and concise **English** language
- Abstracts should have a maximum of 300 words; must have a clear and concise title, a brief introduction (purpose), methodology, results, and conclusions
- Authors can also submit case studies, best practices, innovations and new knowledge
- No references, tables or graphics should be included in the abstract
- Abstracts should be aligned with the symposium theme and sub-themes
- Authors must indicate the respective sub-themes
- Authors are not limited in the number of abstracts they can submit.
- Provide your details- Name, title, affiliation, a brief Bio and passport photo

Poster Submissions

- Applicants should submit a complete poster to nrw-symposium@kewi.or.ke
- All authors are responsible for printing their posters
- Posters dimensions should A0 (33.1 x 46.8 inches) in Portrait format
- You will be provided a space approximately 4 feet high x 4 feet wide (121cm x 121 cm). Prepare your poster to make the most of this space, but do not exceed the area
- Use Arial, Helvetica or Swiss typefaces
- Ensure that all text is legible when printed
- Use graphs and figures whenever possible.
- Provide your details- Name, title, affiliation, a brief Bio and passport photo

PARTNERS

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WASREB
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WaterFund
Financing the Water Sector

09 DAYS
14 HOURS
22 MINUTES
34 SECONDS