The Republic of Kenya
Ministry of Environment, Water and Natural Resources

The Project for Management of Non-Revenue Water in Kenya: Project Completion Report

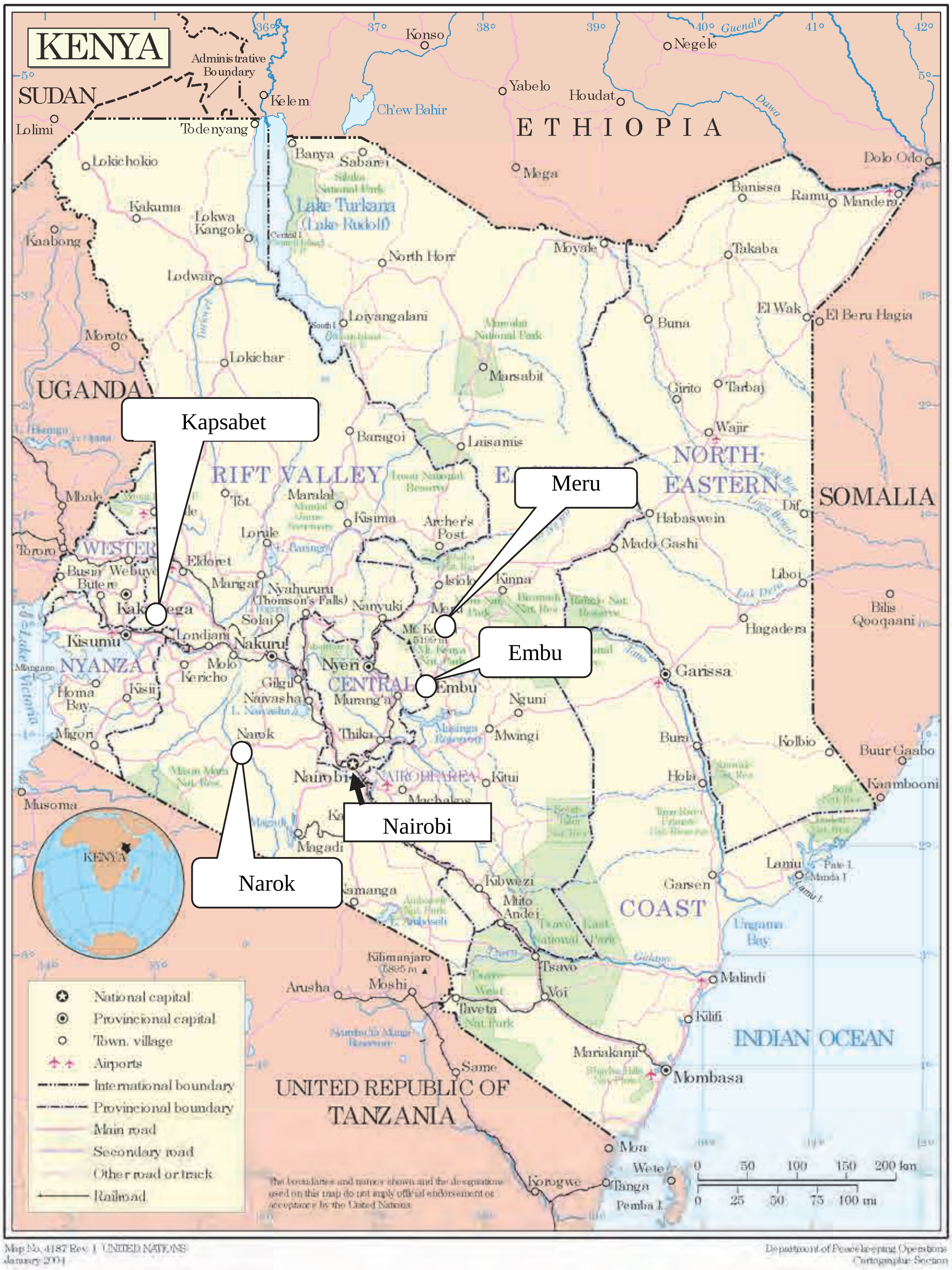
October, 2014

Japan International Cooperation Agency
(JICA)
Chuo Kaihatsu Corporation
Tokyo Water Co., Ltd.

GE
JR
14-179

Contents

APPENDIX



Location Map of Pilot Project

Activities of Meru Case Study

	
Visitation of distribution Tank	Service pipe setting
	
Meter reading	Minimum night flow measurement
	
Fare collection counter	Explanation of case study report

Activities of Embu Pilot Project

	
Construction of measuring chamber	Replacement of customer meter
	
Installation of telemetric monitoring system	OJT of leak detection with listening stick
	
Installation of electromagnetic flow meter	Installation of pressure reducing valve

Activities of Narok Pilot Project

	
Improvement of management of construction work (Direction at the field)	OJT of leak detection with listening stick
	
Repair leakage from distribution pipe	Customer meter after changing to expose from ground surface
	
Guidance on water meter inspection using meter test bench	Pipe network mapping

Activities of Kapsabet Pilot Project

	
Construction of measuring hut	Installation of electromagnetic flow meter
	
Measuring flow volume at electromagnetic flow meter	Check of customer meter
	
Check of gate valve	Data compiling after field work

Seminors

	
Guidance of information management and GIS for Embu WSP	Mini seminar of Non-Revenue Water management in Embu WSP
	
Mini seminor of Non-Revenue Water management conducted by Tana WSB	Lecture of pipe network analysis use EPANET
	
WASPA conducting Visitation of Embu WSP pilot project Embu technitian explains about flow meter	WASPA conducting Visitation of Embu WSP pilot project demonstration of leakage sound test by several type of pipes

Workshops

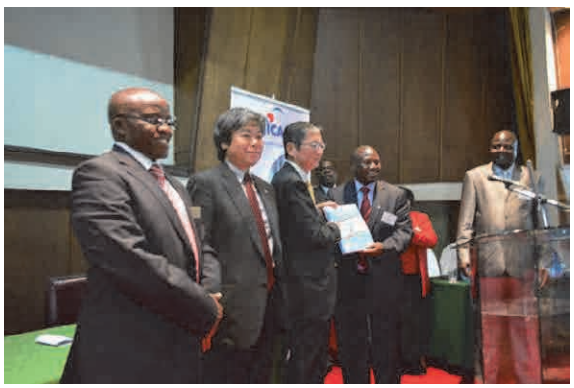
First workshop, February 2011

Second workshop, November 2011

Third workshop, November 2012

Fourth workshop, July 2013

Final workshop, August 2014

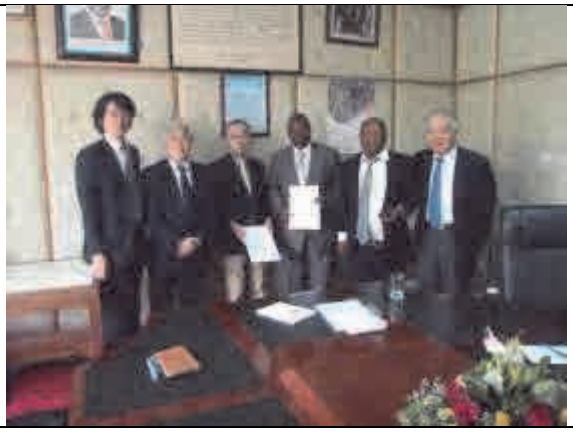


Final workshop, August 2014

Meeting with Counterparts

	
First JCC, 25th September 2010	Meeting with Ministry of Water and Irrigation in 2010
	
Meeting with WASREB	Meeting with KEWI
	
Meeting with GIZ	Meeting with Tana WSB

Mid Term Evaluation and Final Evaluation

	
Mid term evaluation	Mid term evaluation
	
Visitation in final evaluation	Interview in Kapsabet WSP in final evaluation
	
Final Evaluation, JCC	Final Evaluation, Exchange of M/M

Training in Japan

	
Trainning in Japan	OJT of distribution pipe connecting

Lecture of instructor's course and pedagogical method for KEWI staff

	
Guidance of course	Guidance of course

KEWI Non-Revenue Water Reduction Training

	
Visitation of treatment plant in Kakamega	OJT of inner cleaning of flow meter
	
OJT of non metallic pipe detecter	OJT of water pressure measuring
	
Lecture of reduction of commercial loss	OJT of wate flow volume measuring

Non-Revenue Water Reduction Standards Seminor

First seminar in Nakuru, November 2013

Second seminar in Nakuru, May 2014

Third semiar in Nyeri, May 2014

Fourth seminar in Isioro, May 2014

Fifth seminar in Nairobi, June 2014

Sixth seminor in Machakos, June

Abbribiations

C/P	Counterpart
EWASCO	Embu Water and Sewerage Services Co. Ltd.(EMBU WSP)
GIS	Geographic Information System
GIZ	German International Cooperation Agency
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
KEWI	Kenya Water Institute
KNWSC	Kapsabet Nandi Water Sanitation Company (Kapsabet WSP)
LMB	Leakage Monitoring Block
LVN WSB	Lake Victoria North Water Service Board
MEWASS	Meru Water and Sewerage Services(Meru WSP)
MEWNR	Ministry of Environmental, Water and Natural Resources
MWI	Ministry of Water and Irrigation
NARWASSCO	Narok Water & Sewerage Services Co. Ltd.(NAROK WSP)
NRW	Non-Revenue Water
OJT	On the Job Training
PI	Performance Indicator
PIC	Project Implementation Committee
PMC	Project Management Committee
PO	Plan of operation
SPA	Service Provision Agreement
RV WSB	Rift Valley Water Service Board
TANA WSB	Tana Water Service Board
WARIS	Water Regulation Information System
WASPA	Water Services Providers Association
WASREB	Water Service Regulatory Board
WSB	Water Service Board
WSP	Water Service Provider

List of Diagram and Graph

List of Table

Chapter 1 Project Outline

1-1 Project Background

The Republic of Kenya (hereinafter referred to as Kenya) is located in the Eastern part of the African continent. The country spans a total area of 5,830,000 square kilometers with a population of 35.1 million (World Bank 2006 data). The GNI is US$540 per capita (World Bank).

In regards to the water resources, the freshwater endowment per capita in Kenya is 647 cubic meters per year. This amount is projected to diminish to 235 cubic meters per capita per year in the year 2025 due to reasons such as population growth.

Under such conditions, the Government of Kenya developed a national policy on Water Resources Management and Development (1999) to target sustainable management and growth of water resources. The Government prepared the Ninth (9^{th}) National Development Plan (2002 to 2008) and the National Poverty Redcution Strategy (1999 to 2015) in which the importance of safe water supply is highlighted. The Government pledged that by year 2015, improvements to the seven hundred (700) existing water facilities would be made.

As the foundation for the implementation of this goal and to regulate the Water sector, the Water Act (2002) was introduced. In this Act, the Ministry of Water and Irrigation (MWI) was vested with the responsibility of water resource management as well as development of water supply in rural areas

It is later mentioned in the Economic Recovery Strategy of 2003, that institutional reforms that encourages more self-reliance were necessary in order to ensure stable and sustainable supply of potable and sewage services.

With the multitude of difficulties facing the water sector, reduction of Non-Revenue Water (NRW) is considered to have a high cost-benefit return and has been attracting attention. The aim of the government is to reduce the current NRW rate of approximately 60% to an average of 30% nationwide by year 2015. In parallel to this goal, there were sector reforms that were implemented as per the Water Act 2002 with the aim of improved efficiency in the water sector. Some of the reforms put in place were, the Minisitry of Water and Irrigation (MWI) being given the responsibility in the sector's policy-making and national monitoring, the establishment of Water Services Regulatory Board (WASREB) to issue licenses for the provision of water amongst other responsibilities, efficient and economical provision of water services by the eight nationwide (8) Water Service Boards (WSB) and continuous management of water services by the Water Service Provider (WSP). In parallel to the reforms, the Kenya Water Institute (KEWI) was established in 2001 with the aim to provide training to WSB staffs and other water service organizations at work in rural areas.

The implementation structure of water services reform is still currently under construction and there is a need to strengthen this structure as soon as possible.

In the past, Japan has contributed to the water sector of Kenya through implementation of development surveys, providing Grant Aid assistance and dispatching of experts in this field. One

example of a successful and highly rated project is the Grant Aid Project for the Plan for Water Supply in Meru Town. In this Project, the NRW ratio reduced to 30% from 60% (NRW ratio was at 25% after evaluation) in Meru.

With successful cooperation records as this, the MWI approached the Government of Japan for assistance once again, in the aim to reduce NRW, reduce cost of operation and improve on effective use of water.

A team of JICA Experts were despatched to Kenya in October 2008 and January 2009 for Detailed Design Survey. The outline of the Project was discussed between the two governments and on 11th August 2009, the Record of Discussion (R/D) was signed.

1-2 Project Goal

The goal of this Project is to accept and implement the above request. It aims to build the necessary systems and structures and improve implementation capacity in order to reduce the NRW ratio of Kenya.

(1) Overall goal and its indicator

1) Overall Goal : Kenya's water resources are effectively utilized by reducing non-revenue water (NRW).

2) Indicator : The average NRW ratio within regulated WSP (under SPA) is reduced to 20-25% by year 2020.

(2) Project purpose and indicator

1) Project purpose : Kenya's systems, mechanisms and capacity for supervision, implementation and dissemination of NRW reduction are consolidated and strengthened.

2) Indicator : The NRW Reduction Plans prepared by the three (3) WSBs and three (3) WSPs that executed the Pilot Projects are implemented.

: WSPs that participate in KEWI's NRW Reduction Training start producing their NRW Reduction Plan.

1-3 Scope of Activities

(1) Target area of activities

The element of capacity development of this Project will be applicable to WSB and WSP nationwide, but the Project activites will be implemented in Nairobi, areas under Tana WSB, areas under Lake Victoria North WSB and areas under Rift Valley WSB. For areas outside of these, support and guidance will be given to WASREB activity implementation.

The activities and target areas are as indicated below.

1) Pilot Project：Tana Water Service Board (WSB) area
: Embu Water Service Provider (WSP) area
: Lake Victoria North Water Service Board (WSB) area
: Kapsabet Water Service Provider (WSP) area
: Rift Valley Water Service Board (WSB) area
: Narok Water Service Provider (WSP) area

2) Establshing WASREB NRW Reduction standards, strengthening of monitoring structure
: Nairobi, nationwide

3) KEWI Training capacity building: Nairobi, nationwide

4) Nationwide NRW Reduction Dissemination Plan: Nairobi, nationwide

(2) Counterparts

1) Counter Government organization: Ministry of Environment, Water and Natural Resources

2) Counterpart Organizations

Organization
Ministry of Environment, Water and Natural Resources（MoEWNR）（Water services Department）
Water services Regulatory Board（WASREB）
Kenya Water Institute（KEWI）
Water Services Boards（WSB）
Tana WSB
Lake Victoria North WSB
Rift Valley WSB
Water Services Providers (WSP)
Embu Water and Sanitation Company (EWASCO)
Meru Water and Sewerage Services (MEWASS)
Kapsabet Nandi Water and Sanitation Company (KNWSC)
Narok Water and Sewerage Company（NARWASSCO）

(3) Beneficiaries

1) Direct beneficiaries: WASREB, KEWI, staff of Pilot Project implementing WSB and WSP, residents of Embu, Narok and Kapsabet Pilot Project sites.

2) Indirect beneficiaries: Staff of all WSB and WSP, residents nationwide that receive water supply from WSP.

Chapter2 Methodology for Project Implementation

2-1 Steps to Implementation of Technical Transfer

Kenya's national NRW ratio stands at a high ratio of 60%. The problem facing NRW is the difficulty in establishing one standard model to tackle reducing NRW ratio, as all WSP are faced with different geographical and environmental conditons, water resources and different financial status. In addition to these conditions, at the time of Project startup, no standard NRW measures existed in Kenya. The goal of this Project was to use the results of NRW measures tested in the Pilot Project areas to prepare NRW Reduction implemetation manual (hereinafter referred to as the Manual), NRW Reduction supervision guideline (hereinafter referred to as the Guideline) and NRW Reduction standards. The results of this Project were indicated in four steps shown below.

Step1

A Case Study of Meru WSP that had track records was conducted.

The results of this Case Study were taken and NRW measures that were applicable to each WSP in the Project were selected to prepare the Manual Version 1 and Guideline Version 1.

Based on the Manual / Guideline Ver. 1, a Pilot Project area was selected in Embu WSP under the jurisdiction of Tana WSB, and NRW reduction measures were implemented in the selected area.

The results that were obtained in implementing NRW reduction measures in Embu were utilized to improve the Manual / Guideline Ver. 1 to prepare Manual / Guideline Version 2.

Step 2

In order the spread the results obtained in Step 1 to other areas, Pilot Project areas were selected in Kapsabet WSP which falls under the jurisdaiction of Lake Victoria North WSB, and another in Narok WSP which falls under the jurisdiction of Rift Valley WSB. NRW reduction measures were then implemented in these Pilot Projct areas.

In Narok, the following conditions were exposed when the preliminary survey was conducted; 1) pipeline network data were not maintained, 2) well aged facilities and lack of technical skills, 3) low number of customers and collection rate, 4) weak organizational structure, 5) lack of any investment plans for facility maintenance.

It can be anticipated that the majority of WSP in Kenya is in a similar situation to Narok WSP. For this reason, the approach taken for the implementation of NRW reduction in Narok is important, as it would be the model applicable in wide areas of the country in the future.

NRW reduction measures were implemented in Narok during the second year of the Project and the results obtained were included in the Manual / Guideline Ver. 2 to prepare the Manual / Guideline Version 3.

In Kapsabet WSP, there was an overlap of this Project with the implementation of the Grant Aid expansion of the water supply plan therefore the activities for this Project were planned so that

combined results could be obtained. NRW reduction measures in Kapsabet were commenced in the second year into the third year of the Project. The results of Kapsabet were included in the Manual and Guideline to prepare Manual / Guideline Version 4.

Step 3

In this Step, Kenya Institute of Water (KEWI) implemented its NRW Reduction Training Courses to the WSB and WSP staffs. The details and the structure of the Training Course (goal, results, target groups, number of participants, length of the course, costs etc.) were established by KEWI. Training materials (curriculum, syllabus, texts) were prepared before the implementation. Year 1 and year 2 of this Project was the preparation stage where capacity building of lecturers of the Training Course was conducted. The original plan was to start implementing the Training Course to WSB and WSP in year 3 of the Project however difficulties in setting up the team within KEWI delayed the timing. The Training Course was eventually started in the latter part of year (April 2013). Three one-week courses that targeted one Module per course were implemented. In addition to the implementation of this course, preparations for a new training course targeting the Management level staff of WSB and WSP were started.

Step 4

This is the dissemination activity of the NRW Reduction standards (approved by the Ministry of Environment, Water and Natural Resources (MEWNR) in year 3 of this Project). The dissemination activity was headed by WASREB, targeting the WSB and WSP nationwide. A team of facilitators was selected by WASREB and this team led the implementation of seminars in seven (7) locations in Kenya. The workshops focused on the NRW Reduction standards and learning how to prepare NRW Reduction Plan which is a necessary process in building a sustainable implementation of NRW reduction activities.

2-2 Implementation Structure

2-2-1 Related Organizations in Kenya's Water Sector

Diagram 2-1 below shows the four-tier structure of Kenya's Water sector that has been in place since October 2014.

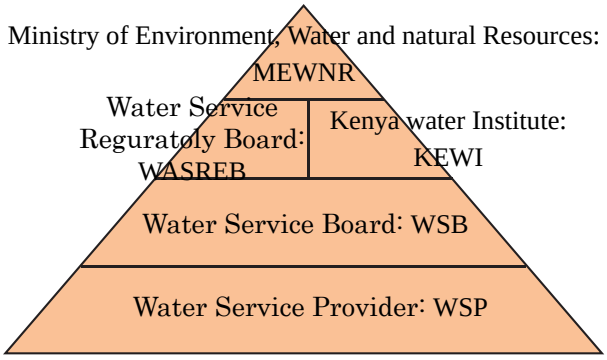


Diagram 2-1 Related Organizations in Kenya's Water Sector

Reforms conforming to the new constitution of Kenya of 2010 are still ongoing. The Water Sector will be restructured to decentralize to the local governments therefore impact on the entire organization and structure of the Water Sector is anticipated. The new role or the WSB in particular, is in question. According to the Minsitry of Environment, Water and Natural Resources (MEWNR), as at August 2014 the final decision on the future role and structure of WSB had not yet been decided.

This Project continued to be implemented under the structure that existed at the time this Project was formulated. Activities were therefore conducted with WASREB, WSB and WSP. In year 3 of this Project (2013 and 2014), with the anticipation that County Directors of Water would have important roles in the Water Sectors in the future, they were invited to participate in dissemination meetings and workshops.

The chart below outlines the information gathered from MEWNR and WASREB in regards to current movements in the Water Sector.

Status of Reforms in the Water Sector
Water act 2012 was passed by national assembry in 2012. According to the enactment of water law in 2012, the water sector transition plan (2012 -) is created, is a five-year transition period is provided. Organization, systems and privileges in stages of WSB in this period, the transition is made to the County (local government). Has not been determined yet, but the changes to be anticipated, whether WSB is agency responsible for Water Service Trust Fund, also on whether the change in morphology of the organization basin unit or county Units there. Process of restructuring did not make any significant impact on the framework during the project period.

2-2-2 Structure of this Project

Diagram 2-2 shows the structure that was taken for this Project to ensure its smooth operation.

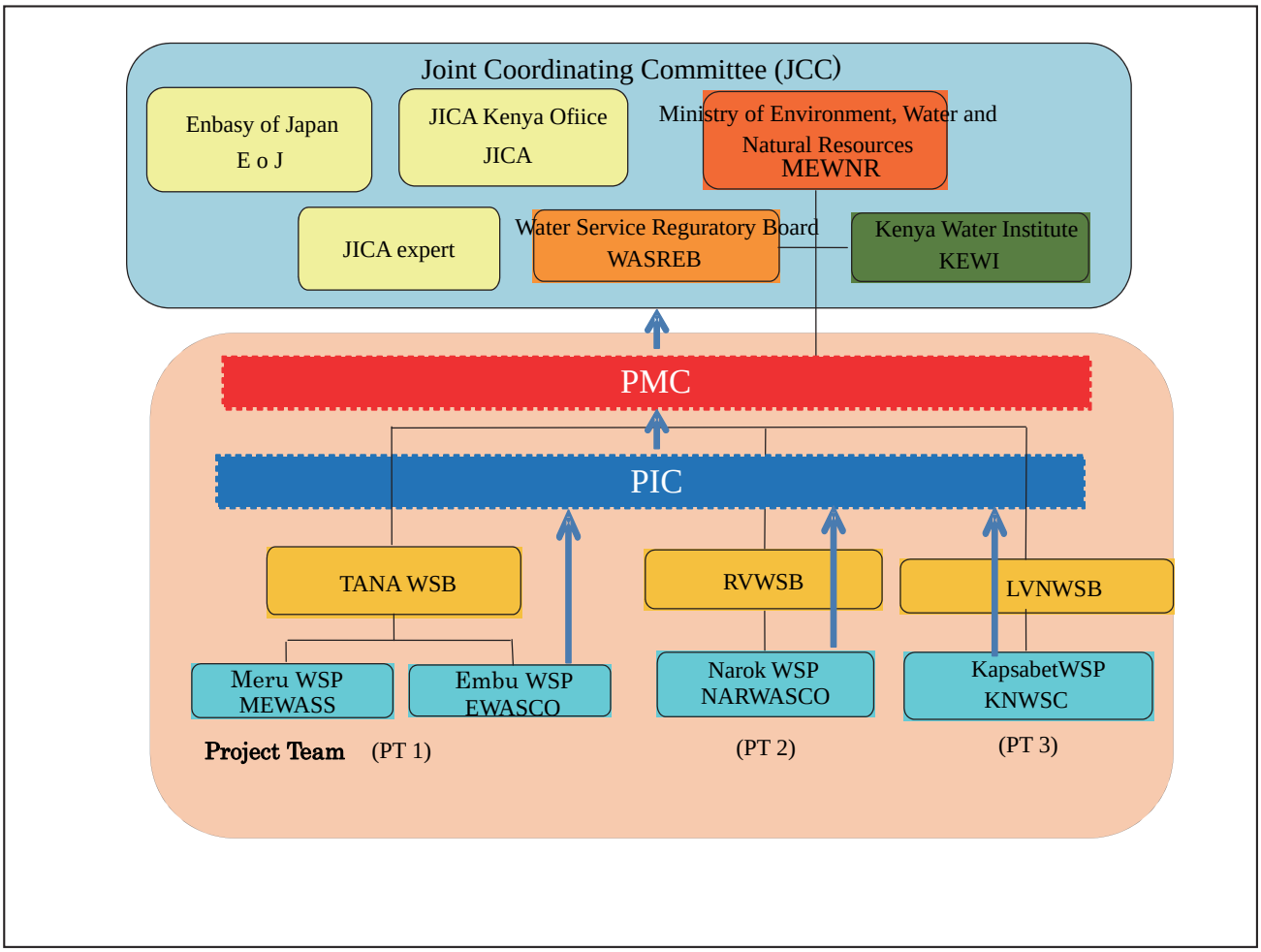


Diagram 2-2: Structure of Projet Implementation

（1） Formation of Project Team

Project Team 1 was formed for the implementation of Meru Case Study and Embu WSP Pilot Project. The Team was made up of JICA Experts and Tana WSB.

Project Team 2 was formed for the implementation of Narok WSP Pilot Project. The Team consisted of JICA Experts and Rift Valley WSB.

Project Team 3 was formed for the implementation of Kapsabet WSP Pilot Project. The Team consisted of JICA Experts and Lake Victoria North WSB.

（2） Project Implementation Committee: PIC

Initially this committee was formed to monitor the preparation of the Manual and the Guideline. It was later vested with additional responsibility of monitoring the Project activities as a whole.

（3） Preparation of NRW Reduction standards and Dissemination activities

The decision making body for this Project is the JCC. In regards to Project monitoring, Manual and

Guideline preparation, establishing NRW reduction standards and implementation of dissemination activities, the leadership and responsibilities were taken by the Water Service Regulatory Board (WASREB).

（4）Project Management Committee: PMC

Cross-cutting bodies such as the Project Implementation Committee (PIC) and Project Management Committee (PMC) were put in place for the smooth running of the Project. The role of PMC was to approve the items discussed and forward to PMC through discussions held in PIC. An additional role of the PMC was to discuss the Project implementation method.

2-3 Project Outputs and Indicators

The Outputs and Indicators of this Project as per the PDM (final version : Version 2) are shown in Chart 2-1 below. This Project was implemented with the objective of achieving the Outputs and Indictors stipulated in the PDM.

Table 2-1 Project Output and Indicators

	Output	Objectively verifiable indicators
Output 1	Manual and Guidelines for NRW reduction are developed taking into consideration experience lernt during the implementation of pilot projects.	1-1. Three (3) WSPs' and three (3) WSBs' NRW Reduction Plans Tana WSB, Embu WSP (by Mar. 2013), Rift Valley WSB,Narok WSP (by Mar. 2013), Lake Victoria North WSB , Kapsabet WSP (by Mar. 2013) 1-2. NRW ratio in the pilot project area is reduced by half comparing with that prior to the project. In Narok, in particular, the following should be accomplished: 1) mapping is created; 2) the volume of distributed water is analyzed; 3) equal water distribution can be conducted through valve operation; 4) the quality of construction is improved; 5) NRW reduction measures are implemented. 1-3. Draft NRW Reduction Manual (for all WSP) and draft Guideline (for all WSB) are prepared by May 2013.
Output 2	Kenya's NRW Reduction Standards are developed and WASREB strengthens its capacity to lead WSBs and WSPs in reducing NRW.	2-1. Kenya's NRW Reduction Standards are approved by WASREB Board by June 2013 and published by WASREB by Septmeber 2013 2-2. WASREB develops a NRW Reduction Standards Dissemination Plan by June 2013 2-3. WASREB develops a Human Resources Development Standard by September 2012
Output 3	KEWI develops and strenghten training capacity on NRW reduction measures to WSPs.	3-1. Five (5) KEWI staffs complete instructors courses on NRW reduction measures and pedagogical methods of teaching. 3-2. KEWI develops curricula, syllabi and training materials on NRW Reduction measures by March 2013 3-3. Participants in KEWI training courses level of satisfaction indicate over 80% 3-4. KEWI develops the Human Resources Development Plan[4] by December 2012 3-5. The number of participants who completed KEWI training courses (60 participants)
Output 4	WASREB disseminates the Kenya's NRW Reduction Standards to WSBs and WSPs.	4-1. WASREB organises seminars on Kenya's NRW Reduction Standards at least two (2) times for all WSBs and all WSPs. 4-2. NRW Reduction Plans in all WSBs are developed in line with the Kenya's NRW Reduction Standards by July 2014 4-3. All WSPs submit reports in accordance with the Kenya's NRW Reduction Standards to WASREB 4-4. The coordination meetings among WSBs and all WSPs to address Kenya's NRW Reduction Standards at least four (4) times.

Chapter 3 Project Outputs

3-1 Outline of Project Activities

The results of the activities are explained below using Outputs and Indicators stipulated in PDM Version 2 that was prepared in September 2012.

3-1-1 Activities for PDM Output 1

Output 1 : **Manual and Guidelines for NRW reduction are developed taking into consideration experience lernt during the implementation of pilot projects.**
Indicator 1-1 : Three (3) WSPs' and three (3) WSBs' NRW Reduction Plans Tana WSB, Embu WSP (by Mar. 2013), Rift Valley WSB,Narok WSP (by Mar. 2013), Lake Victoria North WSB , Kapsabet WSP (by Mar. 2013)

All of three (3) WSB and three (3) WSP that implemented pilot project prepared their NRW Reduction Plan.

Embu WSP as well as the three WSBs (Tana, Rift Valley and Lake Victoria North) that are responsible for their respective target WSPs prepared their NRW Reduction Plan by March 2013 and made a presentation on it at the fourth NRW Reduction Workshop held in July 2013.

Embu WSP prepared a five-year plan of operation (which is to be renewed annually) specifying necessary human resources, equipment and budget with the participation of both technical and administrative staff. According to the current plan, the replacement of all the aged service pipes will be completed in five years. Following the plan, Embu WSP has already embarked on the rolling out of their NRW reduction measures implemented in the pilot project sites, particularly the pressure reduction, to its entire service areas. Moreover, the WSP developed the human resources development plan on its own initiative.

Narok WSP and Kapsabet WSP prepared their NRW Reduction Plan by April 2014 reffering plan of Embu WSP. Narok WSP and Kapsabet WSP must implement their NRW Redution Plan.

Tana WSB has explained that a two-year plan was prepared in the following process: 1) The Self-assessment Matrix which is included in the Guideline for NRW reduction was filled out by all the WSPs under its supervision; 2) Tana WSB held a two-day meeting with the WSPs to discuss the accuracy of their assessments on the current situation and to identify priority issues that should make a large impact; and 3) Tana WSB consulted with the Project Team and finalized its plan.

Rift Valley and Lake Victoria North WSBs prepared their NRW Reduction plan learned from Tana WSB how to develop their plan.

Indicator 1-2 :
NRW ratio in the Pilot Project area is reduced by half comparing with that prior to the project.
In Narok, in particular, the following should be accomplished: 1) mapping is created; 2) the volume of distributed water is analyzed; 3) equal water distribution can be conducted through valve operation; 4) the quality of construction is improved; 5) NRW reduction measures are implemented.

Only Embu WSP was succeed to reduce of NRW ratio by half in its pilot project sites.

Embu WSP maintained it at lower levels, after having successfully reduced the overall NRW by half in its pilot project sites.

Narok WSP has conducted NRW reduction activities in the Leakage Monitoring Blocks (LMBs) since August 2012. The indicators specifically set for Narok have been partially met as follows:

1) Narok WSP staff, together with the Experts, conducted a field survey in the LMBs, drew the distribution network by hand and digitized it. Since they have not yet mastered GIS mapping functions, they are employing drawing instruments for the mapping of the whole area in charge.
2) With one electromagnetic flow meter and three bulk meters installed, the quantity of production in the whole Majengo area including LMB 1, 2 and 3 has been analyzed.
3) The Majengo area suffers chronic water shortages and unequal water distribution. Even the 23 valves newly installed are not yet properly operating.
4) Narok WSP outsources construction works of water supply facilities. Narok WSP has learned from the Experts to properly conduct site supervisions with their standards for new works and make photographic records.
5) Narok WSP has taken the following NRW reduction measures and has examined its effects by measuring the quantity of minimum night flow before and after each activity in the pilot sites: the replacing of meters in LMB 1, the leakage detection and repairs in LMB 2, and the replacement of service and distribution pipes. Furthermore, it has started to keep leakage repair records, which is reflected to the mapping. Narok WSP started to implement these measures from the central town.

Kapsabet WSP, according to the results of the analysis on the quantity of production, the NRW ratio reduced from 69% to 42% on average. The WSP still faces challenges in enhancing the accuracy of measurement due to the considerable fluctuation from month to month.

One of the major achievements of Narok and Kapsabet WSPs is that since the beginning of their pilot projects, they keep using the operation management sheet encompassing the same NRW parameters as the ones submitted to WASREB through the Water Regulation Information System (WARIS). Kapsabet WSP has learned to read bulk and customer meters on a daily/weekly basis; however, the WSP needs to improve its data management by putting the collected data in order.

Indicator 1-3 :
Draft NRW Reduction Manual (for all WSP) and draft Guideline (for all WSB) are prepared by May 2013

A NRW Reduction Manual consisting of the theory and case studies and the Guideline of NRW

Reduction in Kenya (Ver. 4) were developed.

They have reflected the results of OJT activities in the three target WSPs which were completed in October 2012. As Kapsabet WSP has not yet achieved tangible results in its pilot project, its case is not shown in the Manual.

After the Manual and Guideline (Ver. 4) were distributed at the Forth NRW Reduction Workshop held in July 2013, they were finalized by the stakeholders in November 2013.

3-1-2 Activities for PDM Output 2

Output 2： **Kenya's NRW Reduction Standards are developed and WASREB strengthens its capacity to lead WSBs and WSPs in reducing NRW.**
Indicator 2-1： Kenya's NRW Reduction Standards are approved by WASREB Board by June 2013 and published by WASREB by September 2013.

The draft NRW Reduction Standards by the WASREB Board has approved on June 2014.

NRW Reduction Standards published and applied in August 2014 in. NRW Reduction Standards consists of four documents: the Manual for NRW Reduction (for WSPs), the Guideline for NRW Reduction (for WSBs), NRW Reduction Handbook (for WSPs) and Case studies (for WSPs).

Indicator 2-2： WASREB develops a NRW Reduction Standards Dissemination Plan by June 2013.

WASREB prepared NRW Reduction Standards dissemination plan on April 2014.

As follow of advice of evaluation team, the leading WSB (Tana) and WSPs (Embu and some others) was involved as trainer in the dissemination seminor. County diractor of water was also involved as participant, be able to adjust change of water sector in near future.

Indicator 2-3： WASREB develops a Human Resources Development Standard by September 2012.

WASREB developed in May 2013 the Human Resource Standards in the Management of NRW in Kenya.

WASREB was borrowed ideas from various studies on the water sector reform supported by KfW(Kreditanstalt für Wiederaufbau（German government-owned development bank）)

The Standards includes the organizational structures and staff qualities (especially for the personnel at the management level) required to WSP; however, it does not clearly describe for each position the

specific actions (such as specific skills and training courses) required for the effective implementation of NRW reduction measures in WSPs. The standards should be urgently reviewed by WASREB.

3-1-3 Activities for PDM Output 3

Output 3： **KEWI develops and strengthen training capacity on NRW reduction measures to WSPs.**
Indicator 3-1： Five (5) KEWI staffs complete instructors courses on NRW reduction measures and pedagogical methods of teaching.

Five KEWI staff completed a five-day instructor's course and pedagogical method in September 2012.

Five KEWI staff, together with one staff from WASREB, three from WSBs and three from WSPs, completed in September 2012 a five-day instructors' course on NRW reduction measures and the pedagogical method. KEWI staff also participated in one-week OJT in Narok WSP that was held to meet their needs to have more practices.

Indicator 3-2： KEWI develops curricula, syllabi and training materials on NRW Reduction measures by March 2013.

KEWI developed the Curricula and Syllabus in June 2013, and afterwards, Trainers' Manual and Trainees' Manual. About The Manual for NRW reduction, which is part of the NRW Reduction Standards, together with other existing materials and information obtained from internet, has been used as training materials.

Curricula and Syllabus are to be continuously modified based on the training participants' needs.

The training course consists of three modules: I) Basics of NRW Management (mainly physical losses), II) Commercial Losses and III) GIS and Cost-Benefit Analysis.

A module consists of the subjects for six days (20 participants). The Syllabus was prepared reflecting WSPs' opinions obtained at NRW Reduction Workshops while Trainers' and Trainees' Manuals were created after KEWI staff's field studies in the pilot project sites.

Material will be modified through the experience of training implementation.

KEWI implemented training from Module 1 to Module 3. As a result, participants made opinion that it is difficult to create NRW reduction plan from the participants, if they attend all modules. KEWI will unite three modules to one module.

Indicator 3-3： Participants in KEWI training courses level of satisfaction indicate over 80%.

KEWI has been conducting the training course to the WSPs under Lake Victoria North WSB. The participants' satisfaction level for each training was 90% on average according to their responses to the questionnaires.

KEWI implemented module 1 in Augusut 2013, module 2 in October 2013, module 1 and 3 in March 2014. Participants were staff of Western WSP and other WSPs through module 1 to 3. Participants of module 1 that hold in March 2014 were staff of Monbasa WSP and other WSPs.

There were 71 participants joined to all four times trainings

Indicator 3-4 :
KEWI develops the Human Resources Development Plan by December 2012.

The Human Resource Development Plan for the NRW Reduction Training Course at KEWI (2013-2015) was developed in December 2012.

The plan needs to be modified in such a way that it is consistent with WASREB's Human Resource Standards in the Management of NRW and shows how they can contribute to WSP's human resource development.

Indicator 3-5
The number of participants who completed KEWI training courses (60 participants).

A total of 71 staff from WSPs (including some from WSBs) participated in the NRW Reduction Training course from Module 1 to Module 3.

Furthermore, Mombasa WSP learnt about KEWI Training Course when it attended the Third Workshop. Together with other WSP in the coastal area, there was a request for KEWI to conduct a Training Course. In March 2014 therefore, a Training Course on Module 1 was conducted for eighteen (18) participants.

3-1-4 Activities for PDM Output 4

Output 4 : **WASREB disseminates the Kenya's NRW Reduction Standards to WSBs and WSPs.**
Indicator 4-1 : WASREB organises seminars on Kenya's NRW Reduction Standards at least two (2) times for all WSBs and all WSPs.

WASREB hold total thirteen (13) seminars of relation with NRW Reduction Standars.

In total, five (5) Workshops were held. The target group of the Workshops was the WSB and WSP nationwide, and the aim was to emphasize on the importance of NRW reduction.

In addition to these Workshops, total eight (8) semiars were conducted by WASREB. First seminor was held on Naivasha. Target of first seminor was 3 WSB, and purpose is explanation of final version

of Manual and Guideline. Other seven (7) seminars in seven locations were conducted in May and June 2014. These were all part of the dissemination of NRW Reduction Standards. The target group was the WSB and WSP and the County Director of Water.

The seminar focused on the explanation of NRW Reduction Standards, group work focusing on problems of tackling NRW and OJT of preparation of NRW Reduction Plan.

Indicator 4-2 :
NRW Reduction Plans in all WSBs are developed in line with the Kenya's NRW Reduction Standards by July 2014.

Three (3) WSB prepared a NRW Reduction Plan by June 2013.

Tana WSB, Rift Valley WSB and Lake Victoria North WSB each prepared a NRW Reduction Plan. The three NRW Reduction Plans were presented at the Fourth Workshop held in July 2013.

The remainin five (5) WSB have not yet prepared the NRW Reduction Plan. In the future, it will be WASREB responsibility to request updated NRW Reduction Plan from WSB.

Indicator 4-3 :
All WSPs submit reports in accordance with the Kenya's NRW Reduction Standards to WASREB.

In a final evaluation, Indicator 4-3 is determined not effective view of the time axis of the activities of this project. Therefore output of this indicator not to be described here.

Indicator 4-4 :
The coordination meetings among WSBs and all WSPs to address Kenya's NRW Reduction Standards at least four (4) times.

NRW Reduction Standards was just appved on June 2014, it never addressed among WSBs and WSPs meeting evere before. Otherwise, Manual and Guideline that is bases of NRW Reduction Standards and this project was addressed many times at their meetings.

Water Services Providers Association : WASPA meeting was held each every two monthes. WASPA meeting addressed NRW reduction asa the theme. WASREB hold the NRW reduction workshop every year target as for WSB.

By reducing NRW standard was approved in June 2014 and will be taken up by the meeting also NRW reduction standards in the future.

3-1-5 Project Purpose

Project Purpose： **Kenya's systems, mechanisms and capacity for supervision, implementation and dissemination of NRW reduction are consolidated and strengthened.**
Indicator： 1. Three WSPs, namely, Embu, Narok and Kapsabet, start the implementation of their NRW Reduction Plan. 2. WSPs which participate in KEWI's NRW reduction training start producing their NRW Reduction Plan.

(1) Indicator 1

Embu WSP has prepared its NRW Reduction Plan and is currently in its implementation.

Narok WSP and Kapsabet WSP have also each prepared their NRW Reduction Plan.However, in regards to the implementation of the reduction, it is necercely to ensure budget and place human resources.

Before the NRW reduction plan is created, three WSP dose not know reduction activities takes how long time spents, and how much cost to do. Necessary manpower and budget was cleared by NRW reduction plan was preppared.

Financially support from MEWNR and other donars is need for WSP and WSB will continue their NRW reduction activities. NRW reduction plan is use as material to be bases of support and it is effective to particularly implement NRW reduction activities.

(2) Indicator 2

Among the Participant of KEWI's NRW Reduction Training, some person of Western WSP, Kakamega WSP and Mombasa WSP prepared their Action Plan about in charge of their area. Western WSP starts to prepare WSP NRW Reduction Plan by compiled each technicians action plan including leaders.

KEWI is asking all participants of the NRW Reduction Training Course to prepare NRW Redution Plan and submit the plan to KEWI. It has been seen in the past that participants from WSP were required to prepare NRW Reduction Plan for only the area that the participant was in charge of. In order for the WSP to prepare a NRW Reduction Plan as one organization, it is necessary to understand the entire content of the Training Course, from Module 1 to Module 3. Attending only one Module is not sufficient to adequately prepare the NRW Reduction Plan.

In order to find solutions to such problems, it is standard procedure for KEWI to distribute questionnaires after the Training Course is completed, to all participants. In addition to this, KEWI lecturers participated in the NRW Reduction Standards seminar as facilitators to gain more experience, which will lead to more suggestions to making improvements in the future.

One suggestion for improvement is to consolidate or combine the existing three Modules into one Module that gives guidance up to the point of NRW Reduction Plan preparation. This improvement

will lead to all participants of WSP to gain knowledge on the preparation of NRW Reduction Plan.

Second suggestion for improvement is to prepare a Training Course for the management staffs of WSP. This way, the management will be able to provide internal guidance and organize training for staff. Knowledge brought back from training can be the foundation of improved WSP structure and lead to preparation of imrpoved NRW Reduction Plan.

3-1-6 Overall Goal

Overall Goal：
Kenya's water resources are effectively utilized by reducing Non-Revenue Water (NRW).
Indicator：
Average NRW ratio within regulated WSPs is reduced to 20-25% by 2020.

The target ratio of NRW by 2020 between 20 to 25% all WSP by 2020 is determind along by IMPACT report that WASREB published each per year.

This project established that WSP could make NRW reduction plan. To WSP will implement their NRW reduction plan, WASREB should support and indicate WSP continuously.

3-2 Role of Related Organizations

3-2-1 Ministry of Environment, Water and Natural Resources（MEWNR）

Ministry of Environment, Water and Natural Resources overseed and managed all part of this project. In particular, hold project management committee (PMC), approval of content that has been approved by the Project Implementation Committee (PIC), and send invitation letter to WSB or WSP to participate in the workshop.

3-2-2 WASREB

WASREB was the organizer for PIC and all the five (5) Workshops that were conducted during this Project. WASREB organized the NRW Reduction Plan preparation workshop and the seminars for the dissemination of NRW Reduction Standards. WASREB actively participated in this Project. The table below gives a summary of activities conducted by WASREB.

Table 3-1 List of WASREB Activities

Activity by WASREB	Content of Activity
Workshop	In total five (5) Workshops, (2011(2), 2012, 2013 and 2014)
Organaization of PIC	Organizing and coordination PIC meetings in 2010 after the completion of Manual Version 1, in 2011 after the completion of Manual Version 2, in 2012 after the completion of Manual Version 3, in 2013 after the completion of Manual Version 4. WASREB also reviewed the contents. PIC meeting was also held at mid-term evaluation in 2012 and terminal evaluation in 2014.
Workshop of WSB NRW Reduction Plan preparation	Implemented in June 2013
NRW Reduction Standards	WASREB Board approved the NRW Reduction Standards in June 2014. The document was distributed to participants at the Final Workshop held in August 2014.
Human Resource Development Standards	Prepared in December 2012
NRW Reduction Standards Dissemination Plan	Prepared in April 2014
NRW Redction Standards Dissemination Seminer	Implemented in May and June 2014

3-2-3 KEWI

At the Fourth (4th) Workshop, KEWI presented an outline of a Training Course that is specific to NRW Reduction. This Training Course was based on the already prepared curriculum, syllabus, teaching material and schedule. In line with this Training Course, three (3) NRW Management Courses were conducted in August 2013, October 2013 and March 2014. At the end of each course, participants were asked to fill in a questionnaire and the results show that there was more than 80% satisfaction rate.

In August 2014, KEWI was reviewing the course to make improvements. The point of focus of improvement were, to make sure that the process of preparation of NRW Reduction Plan was included in the course and to design a training course for the upper management of WSP. The goal is to have all WSP that participated in KEWI Training Course would be able to prepare the NRW Reduction Plan.

The table below gives a summary of activities conducted by KEWI.

Table 3-2 List of KEWI Activities

Activity by KEWI	Content of Activity
Preparation of Human Resource Development Plan	Prepared in December 2012
Establish NRW Reduction Training Course	Preparation of curriculum, syllabus, teaching material, schedule (April to June 2013)
Implementation of NRW Reduction Training Course	Module 1 : August 2013 Module 2 : November 2013 Module 3 : March 2014
Improvements to the NRW Reduction Training Course	April 2014 ~ ongoing
Presentation of the results of implementation of NRW Reduction Training Course	Presentation at the Final Workshop (August 2014)

3-2-4 WSB

The three WSP involved in this Project (Tana, Rift Valley and Lake Victoria North) participated in the seminar organized by WASREB on the preparation of NRW Reduction Plan in July 2013. Each plan was presented at the Fourth Workshop held in July 2013 and the data and information were distributed to the participants of the Workshop.

At the NRW Reduction Standards dissemination seminars held in May and June 2014, representatives from each of the three WSB were appointed as facilitators. At the seminars, participants from WSB and WSP prepared NRW Reduction Plans as group work. As part of ongoing activities after the completion of this Project, WSB are advised to continue to pursue each WSP to prepare its NRW Reduction Plan.

Table below shows the summary of activities that were conducted by WSB.

Table 3-3 List of Activities by WSB

Activity by WSB	Contnt of Activity
NRW Reduction Plan for Tana WSB	Data and information were distributed to participants at the Fourth Workshop
NRW Reduction Plan for Rift Valley WSB	
NRW Reduction Plan for Lake Victoria North WSB	
Dissemination activities of NRW Reduction Standards	Participated as facilitators in all seven (7) seminars

3-2-5 WSP

(1) Embu WSP

Embu WSP has prepared its NRW Reduction Plan. This Plan was presented at the Fourth Workshop held in July 2013.

Embu WSP is still monitoring the Pilot Project activities. At the beginning of 2014 the NRW ratio was ranging between 7% and 38%, which is a good achievement compared to NRW ratio of 68% before the implementation of the Pilot Project.

Embu WSP has been transferring the experience and know-how to other areas outside of the Pilot Project area. The NRW ratio of the whole area is now at 33% compared to the NRW ratio of 48% before implementation.

Table 3-4 List of Activities by Embu WSP

Activity by Embu WSP	Content of Activity
Reduction of NRW ratio	NRW 68% (October 2010) → 7% (July 2014))
NRW Reduction Plan for Embu WSP	Prepared in June 2013 Presentation at the Fourth Workshop (July 2013)
Transfer experience to other areas outside of Pilot Project area	NRW 48% → 33% (August 2014)
Visits and training venue for WSP and WASPA	WASPA visit (2012) KEWI Training (2014)
Visit to Narok WSP for advise and supervision	Implemented in 2013

(2) Narok WSP

NRW ratio of Narok WSP was 61% in March 2011. In July 2014, the ratio had reduced to 34% but it has not yet reached 50% reduction. There is still an ongoing problem of inaccurate measurements of volume of water distributed. Some of the causes of inaccuracy are the rationing of water distribution due to lack of water and accumulation of unwanted matter in the flow meters. In order to improve this situation, it is necessary to continue monitoring the operation of gate valves and the conditions of customer meters.

Narok WSP prepared its NRW Reduction Plan in April 2014. The Plan includes survey and measurement schedules and the necessary funds. It is expected that improvements can be made if the Plan could be put into action.

Table 3-5 List of Activities by Narok WSP

Activity by Narok WSP	Content of Activity
Reduction of NRW ratio	NRW 61%（March 2011）→34%（July 2014）
NRW Reduction Plan for Narok WSP	Prepared in April 2014 Presented at the Final Workshop（August 2014）
Accepted KEWI lecturers Pedagogical training practicals	Five (5) KEWI lecturers visited Narok WSP Pilot Project area for practical training (September 2012)

(3) Kapsabet WSP

As a result of NRW reduction measures that were implemented and supervised, the NRW ratio of 63% in July 2012 has reduced to 40% in July 2014. Similar to Narok WSP, there is an ongoing problem with readings obtained from the flow meters.

Kapsabet WSP prepared its NRW Reduction Plan in April 2014. After the completion of this Project, the efforts of the WSP in implementing the actions stipulated in the Reduction Plan would lead to improved results.

Table 3-6 List of Activities by Kapsabet WSP

Activity by Kapsabet WSP	Content of Activity
Reduction of NRW ratio	NRW 69%（February 2012）→ 40%（July 2014）
NRW Reduction Plan for Kapsabet WSP	Prepared in April 2014 Presented at the Final Workshop (August 2014)
Seminar for dissemination of NRW Reduction Standards	The person-in-charge of NRW in Kapsabet WSP, participated in the seminars as a facilitator (May and June 2014)

3-2-6 GIZ

Good relationship with GIZ has been maintained throughout the Project. Outside of this Project, discussions have been held in regards to WSP operations in low-income rural areas. In regards to the five Workshops implemented in this Project, the cost of the Workshops has been shared with GIZ. At each Workshop GIZ experts gave a presentation.

Table 3-7 List of GIZ Activities

Activity by GIZ	Content of Activity
Workshop	Cost sharing for all 5 workshops Presentations at all 5 workshops (Introduction of GIZ activities in Kenya)

3-3 Preparation of NRW Reduction Standards

3-3-1 Manual for NRW Reduction for WSP

In this Project, the results of Meru Case Study were used as a basis to prepare Manual Version 1. A Pilot Project was then implemented in Embu WSP and the results of this Pilot Project were used to prepare Manual Version 2. Similarly, results of Pilot Project in Narok WSP were used to prepare Manual Version 3 and that of Kapsabet WSP to prepare Manual Version 4. In this way, improvements were gradually made to the Manual.

3-3-2 Guideline of NRW Reduction for WSB

The Guideline was prepared to guide the WSB in supervising the WSP. Similarly to the Manual, the Guideline was also prepared from Version 1 and improved to Version 4.

The Guideline gives guidance to WSB to evaluate the status of operation of the WSP by using tools such as Self Assessment Matrix and Performance Indicators (PI) related to NRW. Performance Indicators are used by WASREB WARIS, based on the data obtained from WSP.

In the Guideline, sample data obtained from Meru WSP Case Study and Embu WSP are shown.

3-3-3 NRW Reduction Handbook

In addition to the Manual that was prepared for the WSP management staff, a Handbook was also prepared in this Project. The Handbook was prepared for the field technical staff. It explains the techniques of NRW reduction with more photographs and diagrams.

3-3-4 NRW Reduction Standards

In July 2013, the preparation of Manual Version 4, Guideline Version 4 and the Handbook was completed. It was decided by the WASREB Counterpart and JICA Expert to add the process of preparation of NRW Reduction Plan and the Cost-Benefit Analysis in Manual Version 4. These improved documents were presented to the WASREB Board in June 2014 and approval was obtained as NRW Reduction Standards.

WSB and WSP will each prepare its NRW Reduction Plan based on the Guideline and the Manual. A sample NRW Reduction Plan has been included in the Guideline and Manual.

Summary of target groups for Manual, Guideline, Handbook and Case Study is summarized in Table 3-8.

Table 3-8 Type of Document and Target Group

Document	Supervisor	Target Group	Level in Target Group
Manual for NRW Reduction for WSP	WASREB	WSP	Managing Director, Technical Director, Commercial Manager, Engineers
Guideline of NRW Reduction for WSB	WASREB	WSB	Management
Handbook for NRW Reduction	WASREB	WSP	Engineers, Technicians, Operators, Artisans
Case Study	WASREB	WSP	Managing Director, Technical Director, Commercial Manager, Engineers

3-4 Summary of Documents Produced

A summary of documents that were produced in this Project is shown in Table 3-9.

Table 3-9 Summary of Documents Produced

Type of Document	Supervisor	Target Organization	Outline	Relation with PDM_2
Manual for NRW Reduction for WSP	WASREB	WSP	Completed up to Manual Version 4	Output1
Guideline for NRW Reduction for WSB	WASREB	WSB	As above	Output1
Handbook for NRW Reduction	WASREB	WSP	Improvements in the contents in line with Manual Version 4	Output1
NRW Reduction Training Course Trainer's Material (Manual)	KEWI	KEWI	Completed July 2013	Output3
NRW Reduction Training Course Trainee's Material (Manual)	KEWI	WSP	Completed July 2013	Output3
Three WSB NRW Reduction Plan	Tana WSB RV WSB LVN WSB	Tana WSB RV WSB LVN WSB	Completed July 2013	Output1
Three WSP NRW Reduction Plan	Embu WSP Narok WSP Kapsabet WSP	Embu WSP Narok WSP Kapsabet WSP	Embu WSP completed in July 2013 Narok WSP and Kapsabet WSP prepared in April 2014	Output1
NRW Reduction Standards	WASREB	All WSB and All WSP	Approved by WASREB Board in June 2014	Output2
NRW Reduction Dissemination Plan	WASREB	WASREB	Completed in April 2014	Output2
Human Resource Development Standards	WASREB	WASREB	Completed in September 2012	Output2
Human Resource Development Plan	KEWI	WSP nationwide	Completed in December 2012	Output3
KEWI NRW Reduction Training Report	KEWI	KEWI	Completed report on each Module 1,2 and 3	Output3

3-5 Terminal Evaluation

The Terminal Evaluation was conducted from 22 February 2014 to 15 March 2014.

In the Terminal Evaluation Report, evaluation results on the Output of this Project, items pending completion and items to be implemented after the completion of this Project were stipulated.

Table 3-10 Results of Evaluation

Evaluation item	Evaluation
Relevance	High
Effectiveness	Medium
Efficiency	Relatively High
Impact	Medium
Sustainability	Medium

The comments and explanation of the five Evaluation points are shown below.

3-5-1 Relevance

The Project is consistent with the Kenyan development policy: “Kenya Vision 2030” with its Second Medium Term Plan (2013-2017). Upgrading the existing water supply system while reducing high levels of NRW (45%) is one of the key challenges in addressing the country’s water scarcity. The National Water Services Strategy (2007-2015) aims at ensuring that the water resources are conserved and maintained according to the defined standards. It sets the target NRW ratio at less than 30% by 2015 while WASREB targets the NRW ratio at 20-25% by 2020.

The Project is also consistent with the Japan’s ODA policies. Japan’s ODA policy for Kenya is to promote its sustainable economy and development. In the area of environmental conservation, Japan has committed to supporting Kenyan water supply and water resource management to address climate change.

The Project has been implemented in cooperation with the Project for Augmentation of Water Supply System in Kapsabet Town (2009-2011) and the Project for Improvement of Water Supply System in Embu and Surrounding Areas (2010-2013) (both of them are grant aid). Water treatment plants were constructed with distribution mains installed in these areas. Another grant aid project in Narok was launched in March 2014.

The Project has learned from the lessons of the precedent projects in Kenya especially in the development of the Manual and the Guideline for NRW reduction Ver. 1: Enhancement of Meru Water and Sewerage Services (MEWASS) (2004-2005) and The Meru Water Supply Project (2001-2004).

It has been confirmed through interviews that the Project is consistent with the target WSPs’ and WSBs’ needs. Technical assistance which has addressed their specific challenges has led to good

results, which has been compiled in the Manual.

The Project is designed to be implemented according to the following steps: 1) implement pilot projects, 2) develop the Manual and Guideline for NRW reduction, i.e. the NRW Reduction Standards based on lessons learned from the pilot projects, 3) develop a NRW Reduction Training Course in line with (WASREB's) NRW Reduction Standards and Human Resources Development Standard, 4) develop (KEWI's) Human Resources Development Plan (the plans for conducting NRW Reduction Training Course) and 5) disseminate the NRW Reduction Standards nationwide based on (WASREB's) Dissemination Plan. It has been verified that the systematic project approach is appropriate to achieve the Project Purpose.

3-5-2 Effectiveness

It has been judged that it is difficult to fully achieve the Project Purpose by the end of the project period, October 2014. On the other hand, it is determined that it can be constructed to a certain extent system for carrying out the NRW reduction nationwide.

The Evaluation Team has judged that OVI 1 for the achievement of the Project Purpose will not be met. Embu WSP has already worked out and implemented its plan. By contrast, Narok and Kapsabet WSPs have not even started to prepare their NRW Reduction Plan at the time of the Terminal Evaluation. Narok WSP and Kapsabet WSP prepared their each NRW reduction plan by April 2014 after final evaluation of this project. Continuous suppor by WSB and WASREB must be needed WSP will implement plan.

OVI 2 will be partially met; The WSPs that participated in KEWI's NRW Reduction Training have started to prepare their action plans which could be a part of their NRW Reduction Plans but not the ones for their organizations since the action plans are prepared but remain unofficial. The Curricula is to be modified in such a way that the participants of the training will be able to take a lead to prepare the organization (WSP)'s NRW Reduction.

The achievement of the Outputs is contingent on the fulfillment of the following conditions:

(1) WASREB strengthens its capacity to lead WSBs and WSPs through the development of a NRW Reduction Standards Dissemination Plan (Output 2).

(2) KEWI strengthens its training capacity for NRW reduction in line with the development of its annual and mid-term plans for conducting the NRW Reduction Training Course (Output 3).

(3) WASREB properly disseminates the NRW Reduction Standards in which the procedures for developing a NRW reduction plan is clearly stated so that all WSBs and (after the completion of the Project) WSPs prepare implementable NRW reduction plans (Output 4).

The activities required for the achievement of these Outputs need to be urgently implemented with the modifications.

There is an issue remaining in the NRW reduction management framework after the Water Bill is enacted. The responsibilities divided among the institutions involved in the Project, particularly those of WSB, are not clear. MoEWNR and WASREB need to make sure that those who acquired knowledge and technologies through the implementation of the Project continue their services in NRW reduction.

A contributing factor is the proactive participation of Embu WSP and Tana WSB in the Project. They have not only developed a good model for other WSBs/WSPs in implementing NRW reduction measures but also have potential to contribute to the human resources development of other WSPs, conducting OJT.

A hindering factor for the achievement of the Project Purpose is that the Project Team has to give much of its time and energy only for coordination with the C/Ps since the Project includes various components involving different institutions.

3-5-3 Efficiency

The Outputs are expected to be achieved to some extent by the termination of the Project.

Regarding the inputs from the Japanese side, it has been confirmed that the assignment of Experts, the provision of equipment and materials, the implementation of the training in Japan and JICA's budget allocation for the Project have been mostly appropriate. A hindering factor was the delayed dispatch of the Experts by three months due to the general election in March 2013. This particularly affected the achievement of Output 1; the development of three WSBs' and three WSPs' NRW Reduction Plans (OVI 1-1) and the preparation of final draft NRW Reduction Manual and Guideline (OVI 1-3). Most of the provided equipment and materials have been effectively used for the pilot projects and KEWI's training on NRW reduction.

As for the inputs from the Kenyan side, C/Ps have been properly assigned for the coordination of the Project (WASREB) as well as for three pilot projects (three WSPs and three WSBs). KEWI had a few activities relate with this project up to April 2013. Particularly, Embu WSP allocated budget to implement its pilot project as well as to roll out its NRW reduction measures to its entire service area. KEWI staffs were not assigned as planned until April 2013.

The Project has shared information on NRW reduction with GIZ since its inception. The First to Fourth NRW Reduction Workshops were co-sponsored by GIZ and JICA. Before the implementation of the Project, GIZ technically assisted Nyeri WSP, which has been a good model for other WSPs. GIZ made presentation about their activity in Nyeri WSP and Kericho WSP in NRW workshop.

Water supply treatment plants were constructed with distribution mains installed in Kapsabet and Embu by Japanese grant aid during the project period. Kapsabet WSP has efficiently made use of the equipment provided by the grant project, especially a total of 1,700 customer meters.

A Japan Overseas Cooperation Volunteer (JOCV) dispatched to Tana WSB played the role of a coordinator between WSB and the Project, which contributed to the smooth communication between these two.

3-5-4 Impact

The Overall Goal could be achieved by 2020 should the Project Purpose be duly achieved and the system/mechanism for NRW management developed through the Project works even after the enactment of the Water Bill.WASREB has expressed its intention to focus on Medium, Large and Very Large WSPs, which are capable of reducing NRW if they properly develop and implement their NRW reduction plans. The Evaluation Team is of the opinion that for NRW reduction MoEWNR should continue its policies to implement NRW reduction and secure necessary budget.

The following are positive impacts:

- Many of the WSPs under Tana WSB have established an NRW unit after the beginning of the Project. Tana WSB, which has well-performing WSPs such as Nyeri, Meru and Embu WSPs, has organized some information sharing activities, including study tours to visit Embu WSP, for those WSPs under its supervision. According to Tana WSB, the rise in the awareness on NRW reduction has been manifested among those WSPs.
- Recognizing the importance of capacity development of its staff, Embu WSP developed its own Human Resources Development Plan.
- Embu WSP made a presentation on their NRW reduction measures as a best practice in front of the participants from East African countries at a workshop (GIZ's WAVEplus Programme) held in Tanzania in October 2013. The WSP had another opportunity through the African Development Bank to show their practices of NRW reduction measures to the WSPs that visited it from other counties.
- The NRW reduction measures taken in the pilot projects have been spilled over to other WSPs. For example, Narok WSP's experiences were passed on to Nakuru WSP and some others. At the time Rift Valley WSB organized a quarterly meeting, it invited all WSPs to Narok and arranged a knowledge sharing.
- Narok WSP's customers are now conscious of water conservation. They report to the WSP as soon as they find leakages.
- Some 60 WSPs out of about 100 are WASPA's members. The main purpose of WASPA is to share experiences of WSP's better management. During the pilot project period in Embu WSP, a study tour to visit Embu WSP was conducted as a WASPA's activity. Furthermore, individual information exchange has been observed among WSPs personnel for the purpose of sharing

information on NRW reduction measures as well as on management issues.

- KEWI has started to conduct the training on NRW reduction for WSPs. During the Terminal Evaluation, KEWI conducted a one-week training session in Nairobi to a total of 18 participants from the WSPs under the jurisdiction of Coastal WSP which attended the training by paying the tuition fees by themselves.

3-5-5 Sustainability

(1) Institutional and Organizational aspects: Medium

1) MEWNR has clearly shown its intention to continuously enforce WSPs to reduce the NRW ratio in accordance with the Second Medium Term Plan (2013-2017) of Kenya Vision 2030 implicating that reducing high levels of NRW is a key challenge in addressing the country's water scarcity and the National Water Services Strategy (2007-2015) which sets the target NRW ratio at less than 30% by 2015.

2) The Project is aimed at establishing an institutional framework to implement and disseminate NRW reduction measures, which includes:

WSPs implement NRW reduction measures while WSBs conduct monitoring of WSPs and provide them with necessary equipment; MoEWNR and WASREB supervise WSBs; and KEWI conducts the training on NRW reduction for WSPs.

Their roles including the county governments' in respect to the water service provision are not clear until the enactment of the Water Bill. WASREB will take an action as soon as the Water Bill is enacted.

3) Embu WSP, which established its NRW Unit and increased the number of staff, is capable of continuously enhancing its organizational capacity in terms of the improvement of its services and human resources.

Narok WSP has also established its NRW Unit and implements daily activities for NRW reduction; however, it does not have an action plan for human resources development for the staff other than the NRW Unit members, which should be addressed.

Kapsabet WSP suffers from the limited number of staff being engaged in NRW reduction. Its organizational management needs to be improved as soon as a permanent managing director is appointed.

4) KEWI, a training institute in the water sector, developed the NRW Reduction Training Course for WSPs through the Project. Five skilled and motivated instructors have been allocated to conduct the course. The training course is currently being developed without its plan for the NRW Reduction Training Course; the course needs to be developed in line with WASREB's Human Resources Development Standard and KEWI's plan for the NRW Reduction Training Course (these two

documents need to be modified within the framework of the Project).

(2) Financial aspects: Medium

1) WASREB is to secure the budget for the dissemination (including the follow-ups) of the NRW Reduction Standards. It has several programs, among which NRW reduction is one of its priority issues.

2) WSPs are in principle run with the revenue from water charges. Embu WSP is currently financially sustainable enough to secure budget for NRW reduction measures while Narok WSP has started to allocate a small budget to expand their NRW measures to a certain area. Kapsabet WSP still operates at a loss; it should steadily follow every step of NRW reduction so that it can reduce commercial losses.

On the other hand, Embu and Kapsabet WSPs have requested the county governments to fund necessary improvement of infrastructure, although the scale and timing of the county governments' budget in the water sector are not known at the time of the Terminal Evaluation.All WSPs, together with WSBs, should seek to effectively collaborate with the county governments.

3) KEWI, a semi-autonomous institution, is supposed to be run principally with the revenue from tuition fees. KEWI will prepare a revenue and expenditure plan for the training course on NRW reduction based on the actual expenditure of the pilot training. KEWI has been advertising their NRW Reduction Training Course at WASPA's meetings.

Although WSPs are required to allocate 1% of their revenues from water charges to human resources development (which is not limited to NRW reduction), most WSPs do not follow this rule since their budget is too tight. Training should be collectively conducted by grouping several WSPs under the coordination of WSBs so that the training becomes affordable for WSPs.

(3) Technical aspects: Medium

1) Once the NRW Reduction Standards is approved, WASREB will be able to strongly promote NRW reduction nationwide by presenting implementable measures to WSPs. WASREB still needs to improve its monitoring of the data on water services submitted by WSPs through WARIS so that the accuracy of the data will improve

2) Tana WSB is capable of providing necessary support to WSPs that have different needs.Rift Valley and Lake Victoria North WSBs need to fully understand the problems happening on the ground so that they will be able to provide proper support to WSPs under their supervision and then WSPs can prepare and implement their NRW Reduction Plan.

The WSBs' staff who have been involved in the Project should continue their monitoring of WSPs irrespective of the enactment of Water Bill.

3) Embu WSP has already started to implement NRW reduction measures in its whole service area based on its NRW Reduction Plan. On the other hand, in Narok WSP, the number of skilled staff in NRW reduction is still limited; therefore, the WSP needs to urgently prepare its NRW Reduction Plan and start developing necessary human resources. Kapsabet WSP should ensure that it puts into practice what it learned from the Experts.

4) The development of the KEWI's training course on NRW reduction is still underway. KEWI needs to repeatedly implement the training cycle so that it can further improve the curricula, materials and teaching/facilitation skills that meet WSPs' needs.

5) The NRW Reduction Standards (Manual, Guideline and Handbook) covers major NRW reduction measures required to be taken in the country. However, it needs further improvement; in order for the Standards to be effectively utilized by WSPs nationwide, it needs to be modified in such a way that WSPs can prepare their NRW Reduction Plans referring to the Manual. Therefore on May 2014, WASREB and JICA Expert add Chapter11（NRW Reduction Plan） that mentioned about how to make NRW Reduction Plan.

(4) Other contributing factor for sustainability

1) The concept of NRW reduction is becoming familiar nationwide. Even the small-scale WSPs whose urgency is water distribution understand the importance of NRW reduction that can generate revenues.

2) Embu WSP and Tana WSB are ready to contribute to the dissemination of NRW reduction measures to WSBs/WSPs in the country.

3) WASREB, the national regulator, has introduced a new tariff system, which allows WSPs to secure a budget for NRW reduction measures from their revenues.

3-5-6 Reccommendations of Terminal Evaluation and Status of Achievement

The recommendations of the Terminal Evaluation and the achievement status for the period of this project and medium and long term are indicated below

Table 3-11 Achievement Status of Terminal Evaluation Recommendations

Target Group of the Recommendation and Recommendations
To Ministry to Environment, Water and Natural Resources and the Project Team
Establish a method to assess the quality of KEWI's NRW Reduction Training Course with WASREB's assistance
To WASREB and the Project Team
Finalize the Manual for NRW reduction by adding detailed procedures for the preparation of WSPs' NRW Reduction Plan
Prepare the NRW Reduction Standards Dissemination Plan including the following elements
All WSBs prepare their NRW Reduction Plan in consultation with the county governments
Both management and operational staff of WSBs/WSPs be involved in the process of preparing the NRW Reduction Plan
Leading WSBs/WSPs such as Tana WSB and Embu WSP be involved in the dissemination process
Modify the Human Resource Standards in the Management of NRW including in such a manner that it clearly describes for each position in WSPs the specific actions (such as specific skills and training courses) required for the effective implementation of NRW reduction measures
To KEWI and the Project Team
Prepare its annual and mid-term plans for conducting the NRW Reduction Training Course for WSP that is in line with WASREB's Human Resource Standards. To consider implementation of OJT with organizations such as Embu WSP.
Develop a one-day module for management executives and administrative managers
Modify the current Modules to include an overview of NRW Reduction Plan preparation
To Narok WSP and Kapsabet WSP and the Project Team
Prepare NRW Redution Plan based on the NRW Reduction Standards
To JICA Experts
To conduct efficient monitoring of recommendations. To implement PIC and PMC meeting before the completion of this Project and disseminate the final results to all related parties

Table 3-12 Midium to long term recommendations from Terminal Evaluation

Target Group of the Recommendation and Recommendations
MEWNR
Continue enforcing its policies to implement NRW reduction and secure necessary budget to achieve the reduction of the average NRW ratio within regulated WSPs to 20-25% by 2020 (Overall Goal).
WASREB
Implement and follow up the dissemination of the NRW Reduction Standards by strengthening the monitoring functions of WSBs and/or (after the enactment of Water Bill) the county governments which (will) supervise WSPs so that the accuracy of the data on water services submitted by WSPs through WARIS will be enhanced. WASREB needs to lead WSPs to reduce NRW in line with the government policies.
KEWI
Repeatedly implement the cycle of the NRW Reduction Training Course and improve its quality. It is advisable for KEWI to establish a permanent collaborative relationship with leading WSPs that can assume the responsibility of conducting the practical part of the training (for example, through the secondment of WSP staff to KEWI).
Narok WSP and Kapsabet WSP
Prepare, implement and periodically review their NRW Reduction Plans.

Chapter 4 Schedule of Activities and Results

4-1 Schedule of Activities and Results

Schedule of activities of the Project and the results are shown in Diagram 4-1.

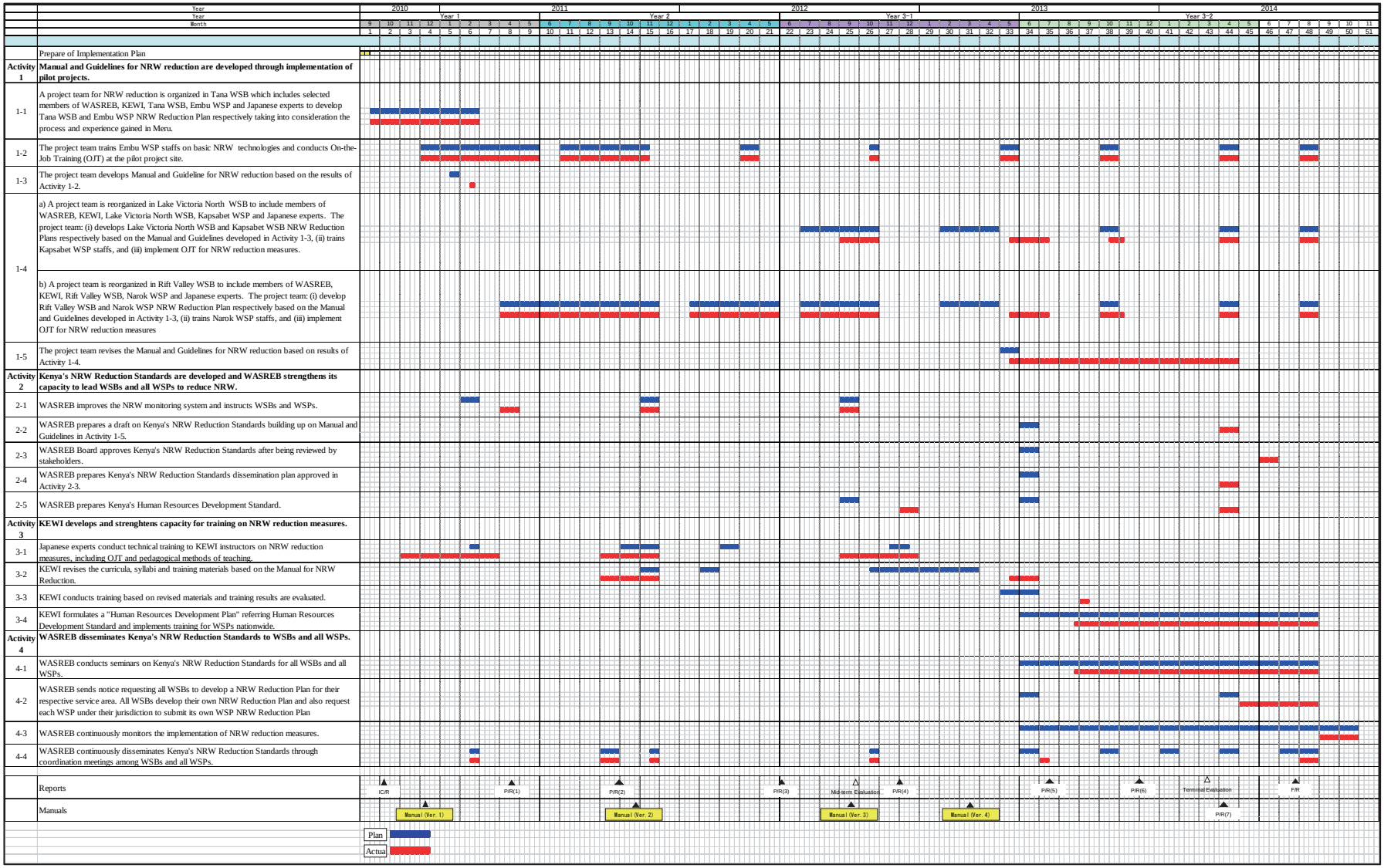


Diagram 4-1 Schedule of activities of the Project and the result

4-2 Activities of Pilot Project Area

4-2-1 Embu Pilot Project

Embu WSP activities have been summarized and shown in Diagram 4-2 and Table 4-1. The details of the activities by year are shown in Table 4-2.

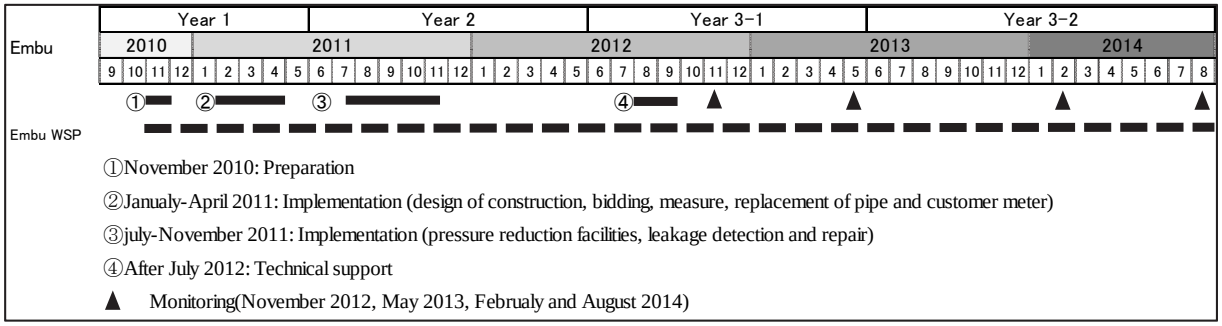


Diagram 4-2 Activities of Embu WSP Pilot Project

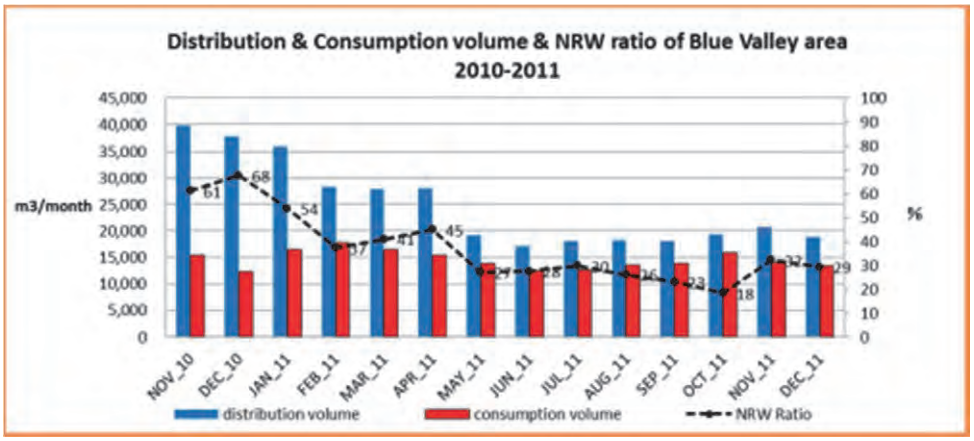
Table 4-1 Outline of Embu WSP Pilot Project Activities of JICA Expert

Year	Month	Outline of Activity
Year 1	2010/11～12	Preparation of Pilot Project
	2011/1～4	Start up of Pilot Project activities
Year 2	2011/7～11	Implementation of Pilot Projet activities
Year 3-1	2012/7～11	Technical assistance to Narok and Kapsabet
	2013/5	Monitoring
Year 3-2	2014/2	Monitoring
	2014/8	Monitoring

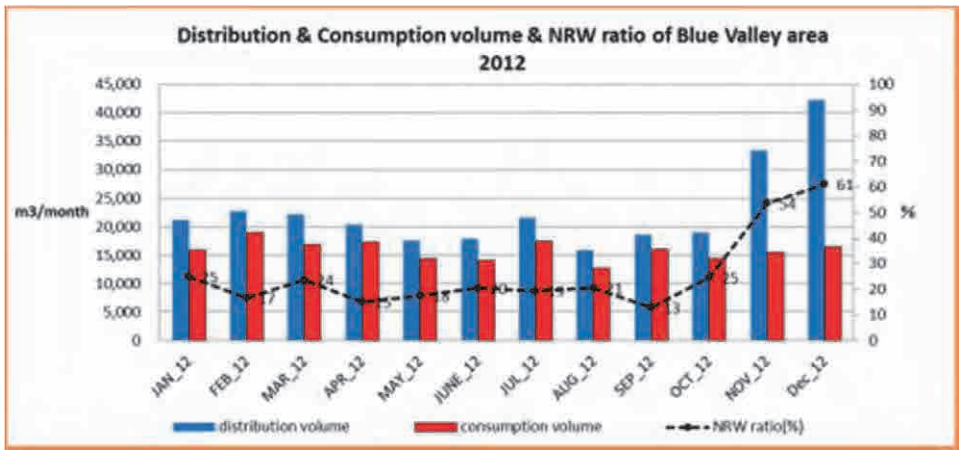
Year 3 is a contract over the July 2012 to October 2014. Year 3-1 is the period of July 2012 to June 2013. Year 3-2 is the period of July 2013 to Octorber 2014.

Table 4-2　Detail of Embu WSP Pilot Project Activities

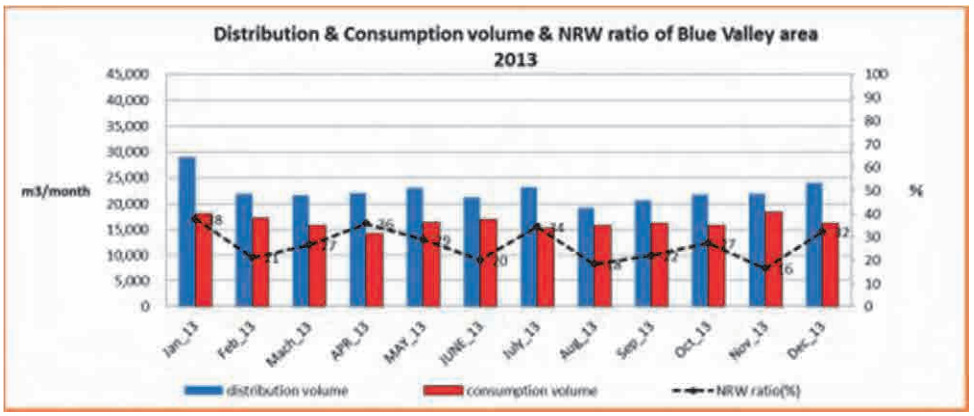
Year	Activity	Details
Year 1	・Collection and analysis of existing informantion ・Basic design, calicullation of material and equipment, cost estimation, bidding (Kenya) and procurement (Kenya) ・Installation of flow meter and bulk meter ・Upgrading and checking customer meter ledger ・Construction of measuring chamber ・Replacement of old customer meter ・Guidance of metet inspection ・Guidance of measuring Qmnf and Qd ・OJT of measuring equipment and leak detection equipment ・Replacement of old and weak pipes ・Installation of Pressure Reducing Valve ・Packing test about replaced pipe	Following the gathering of basic data and its analysis, details of activities that would be conducted in the Pilot Project Area were shared and discussed with the counterpart and project implementation plan was prepared Non-Revenue Water reduction activities are implemented followed by preparerd plan with recognizing about fisical loss and commercial loss. Activities were implemented with care about pressure control.
Year 2	・Monitoring ・Investigation of water pressure and control of water pressure with PRV ・Leak detection and repair ・Analysis of pipe network by using Epanet ・Investigation of air valve working ・Management of civil work and construction ・Replacement of customer meter ・Reduction of commercial loss ・Install of Auto PRV ・Self assessment of activities ・Cooperation with Narok WSP and Kapsabet WSP	Embu WSP implemented activities on the opinion of improvement of network during July to November 2011. Embu WSP analysed commercial loss effectness by controlling water pressure by using PRV and mechanical probrem about water meter such as error and no sense. In the end of second year, Embu WSP started cost-benefit analysis and Non-Revenue water reduction activites to the out of pilot project area. They also started cooperation with Narok WSP and Kapsabet WSP.
Year 3-1	・Visitation of pilot project area by Nyeri WSP, Tana WSB and KEWI ・OJT of hydraulic analysis ・Monitoring, prepare of NRW reduction plan and cost-benefit analysis.	Nyeri WSP, Tana WSB and KEWI visit EmbuWSP's pilot project and had training about hydraulic analysis Embu prepared NRW reduction plan and started their activities in all distribution area follow as plan.
Year 3-2	・Definition of monitoring and management after grant aid consruction.	Embu WSP and JICA Expert confirmed improvement about pipe network management and customer service based on knowledge from pilot project.



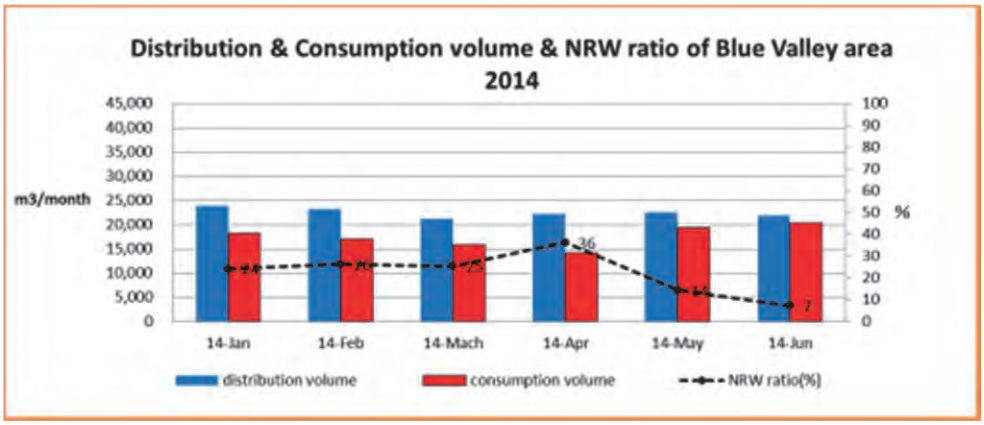
Graph 4-3 Non-Revenue Water Ratio of Embu Pilot Project Area 2010-2011



Graph 4-4 Non-Revenue Water Ratio of Embu Pilot Project Area 2011-2012



Graph 4-5 Non-Revenue Water Ratio of Embu Pilot Project Area 2013



Graph 4-6 Non-Revenue Water Ratio of Embu Pilot Project Area 2014

In year 1, NRW ratio was 60% around before project. Pilot project acitivities started from reduction ofcommercial loss and fisical loss. NRW ratio reduced and reaced 39% at the end of year 1. Average of NRW ratio in first half of 2011 was 39% and reduced to 26% in second half.

In year 2, reakage detection, repair and water pressure adjustment was implemented. NRW ratio reduced below 30% and reaced to 20% around. Temporaly, NRW ratio in November and December were rised up because of lealage accident caused by breaking pressure reducing valve and high pressure in distribution pipe.

This accsident proved that high NRW ratio as before was caused in the case of PRV break down. Embu WSP area located at foot of Mount Kenya and altitude difference has reached to 200m over in distribution area. This fact proved that pressure control is the important matter in Embu WSP area.

In year 3, Embu WSP prepared their NRW reduction plan and continued NRW reductionactivities in whole area. Embu WSP had 7% NRW ratio in pilot project area on June 2014. It was caused by customer ledger has updated on March 2014 and new customer meter installation, and increasing of customer meter number.

4-2-2 Narok Pilot Project

(1) Activity of Pilot Project

Activities conducted in Narok WSP are indicated in Chart 4-7 and Table 4-6. The annual activity details are also indicated.

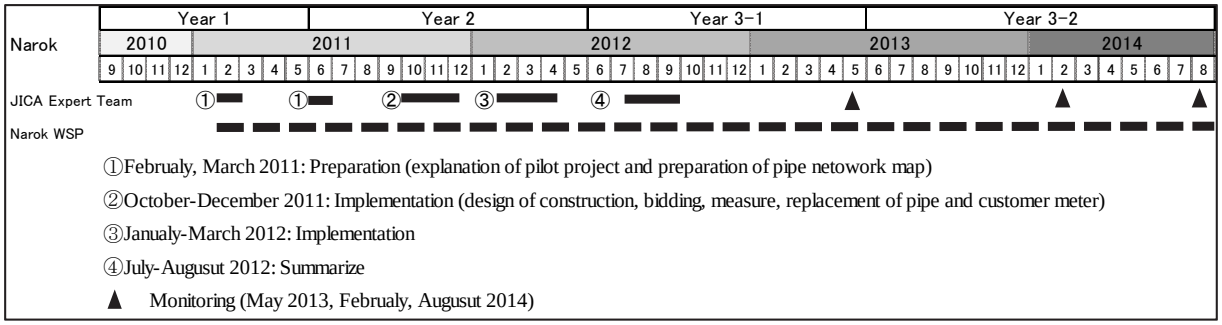


Diagram 4-7 Activities of Narok Pilot Project

Table 4-3 Outline of Narok Pilot Project Activities of JICA Expert

Year	Month	Activity
Year 1	2011/2	Explanation to Narok WSP on Pilot Project period and outline of Project.
	2011/5	Preliminary survey on pipeline network, water treatment plant and customer data maintenance.
Year 2	2011/10 2011/11 2011/12	・Preparation for measuring volume of distributed water in Pilot Projet areas in Narok WSP ・Confirmation fo pipeline network status ・Confirmation of uniform distribution of water and other pipe network maintenance ・Analysis of volume of water distributed and volume of water charged in Pilot area ・Isolation of LMB1.2.3 ・Survey of service pipes and leakage detection and repair in Pilot area
	2012/1 2012/2 2012/3	・Measuring of Dstribution Water Volume about LMB1,2,3 ・Gathering pipeline network data using Project donated equipment ・Additional construction on pipeline etc. (Constructions 1 to 5)
Year 3-1	2012/7～9	Five new components indicated below were suggested for Narok Pilot area. Technical assistance was based on these five new components 1.To be able to prepare pipeline network map 2.To be able to analyse volume of water distributed 3.To be able to obtain uniform distribution of water by use of valves 4.To improve the quality of construction 5.To implement NRW reduction methods
	2013/5	Monitoring
Year 3-2	2014/2	Monitoring
	2014/8	Monitoring

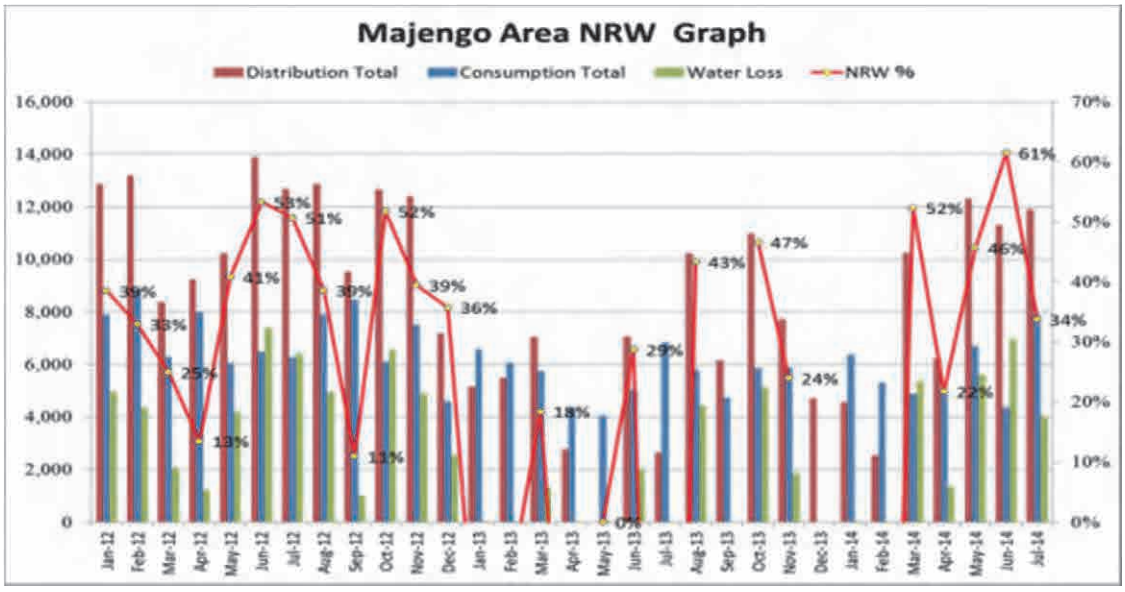
Table 4-4　Details of Narok Pilot Project Activity

Year	Activity	Details
Year 1	1.Collection and analysis of basic information 2.Preparation of current status of pipeline network map in the Pilot Project Area 3.Design of Bulk Meter installation 4.Maintenance of water meter ledger and its confirmation 5.Data maintenance of data analysis such as volume of wter distributed	Following the gathering of basic data and its analysis, details of activities that would be conducted in the Pilot Project Area were shared and discussed with the counterpart and project implementation plan was prepared By May 2011, a preliminary survey on the pipeline network, water treatment facilities and customer data maintenance had been conducted. In Majengo area, there are a total of 9,000 meters of pipes, approximately 500 tap, the population living in Majengo is 18,000.　It was decided that LMB would be prepared in this area.
Year 2	・Preparation for measuring volume of water distributed in the Pilot Project area ・Confirmation of current status of pipeline network ・Measuremnt of Minimum Night Flow and its OJT ・Selection of LMB 1.2.3 and their isolation ・Survey on service pipes in Majengo, detection of leakages and repairs	・Devices to measure the volume of water distributed in the Pilot Project area were prepared in two locations in the Pilot Project Area. Pipes were in a “spaghetti” connection. The layout of the pipes was confirmed and at the same time a more simplified connection was applied. ・It was clarified that Majengo area had a chronic water shortage (a very low 12.5 L/c/d). ・Designed pipe network for uniform distribution. ・Analysis of volume of distributed water and volume of billed water in Majengo area. ・ Selection of LMB1.2.3 and additional construction to enable isolation of the LMB
Year 3-1	・ Measurement of distribution water volume of LMB1.2.3 ・Necessity of fixed point observation and monitoring and OJT ・ Pipeline data gathering using donated management equipment ・Additional construction of pipeline maintenance (Construction 1 to 5)	It was suggested that the five points of discussion in regards to the Pilot Project area be taken up as new components of the Pilot Project.　Technical assistance was provided on this basis. Activities in 2011 1.To be able to prepare pipeline network map 2.To be able to analyze volume of water distributed 3.To be able to attain uniform distribution of water by use of valves 4.To improve the quality of construction 5.To implement NRW reduction method
Year 3-2	Monitoring and confirmation of volume of water distributed	Based on the information obtained from the Pilot Project Area, management and improvement of pipeline in the Area and improvements in customer care and service

At the time of the preliminary survey conducted in 2011, it was noted that there were several flow meters to measure the volume of distributed water flowing from the treatment plan that were not functioning. For this reason, the accuracy of the volume of water treated and sold is highly doubtful. As a reference, it was reported that the NRW ratio had been around 40%.

In second year, Flow meter was installed in the Pilot Project area and a measuring hut was constructed. Leakage Monitori Blocks (LMB) was set up in the Pilot Project area for monitoring purposes. Construction of the isolation of LMB was conducted. Leakage detection, replacement of customer meters and other measures were implemented in each LMB but accuracy of data could not be obtained due to lack of water supply. Due to these difficulties, it was decided to add the five new components in the PDM at the time of mid-term evaluation.

On third year, monitoring of NRW ratio has been continuously conducted after the installation of the flow meter. Data still shows much fluctuation in 2014 due to reasons such as debris in the meter or insufficient water supply. The volume water distributed still remains inaccurate. There is still uncertainty as to whether there will be sufficient water supply after full operation of the water treatment plant, but on the other hand it is certain that the volume of water must be controlled.



Graph 4-8 NRW Ratio in Narok Pilot Project

（2） Activites for the five components

1) To be able to prepare pipeline network map

Pipeline network map was prepared in 2012 as part of GIS OJT, but the use of GIS proved to be very difficult. For this reason, it was suggested that the network map for distribution pipes and service pipes be redone by hand. The data was then inputted into the system for GIS map.

Diagram 4-9　Pipeline Network Map of Narok Pilot Project

2) To be able to analyze volume of water distributed

There was no flow meter installed in Pailot Project area. Pailot area is not distributed sufficient water volume at the end of this project. Measuring trouble is remaining by lack of water.
However, under such circumstances, water distribution monitoring for the analysis are done daily, techniques of monitoring stored is considered to be utilized in future.

3) To be able to attain uniform distribution of water by use of valves

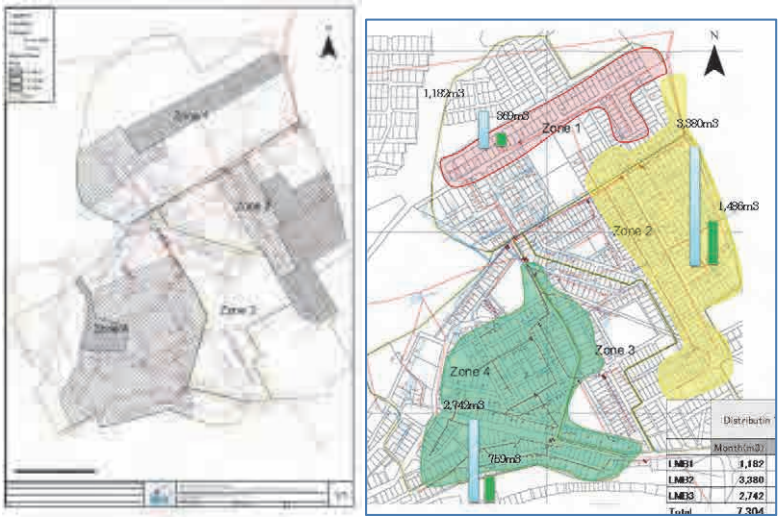


Diagram 4-10　Uniform Water Distribution in Narok Pilot Project Area

（Left：before installing gate valve：difference is there between each zones
Right：after installing gate valve：recognized water volume each zones and be able to control distribution water volume）

Valves that were present in Majengo area were all not functioning.
The minimum number of 23 valves required to obtain data on volume of water distributed was installed. Adjustments are currently being made despite the persisting lack of water.

4) To improve the quality of construction

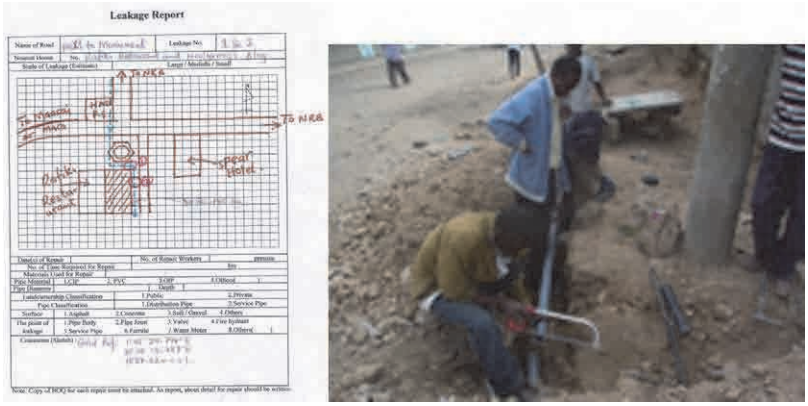


Diagram 4-11　Improvement in Quality of Construction in Pilot Project

（Left：Example of repair and construction record, Right：Start supervise at construction field）

Part of leak detection is now a regularly checked and leakage repairs are recorded and managed. Application of these methods can be expected for the old existing pipes as well.

5) To implement NRW reduction method

A NRW Reduction Plan spanning ten years starting from October 2015 has been prepared. The new water treatment plant is scheduled to operate from 2016. Narok WSP will implement their annual NRW schedule in accordance with 10 years plan including new customer management.

4-2-3 Kapsabet Pilot Project

Diagram 4-12 and Table 4-10 shows the outline of activities for Kapsabet WSP Pilot Project.

Details of the activities are also shown in Table 4-11.

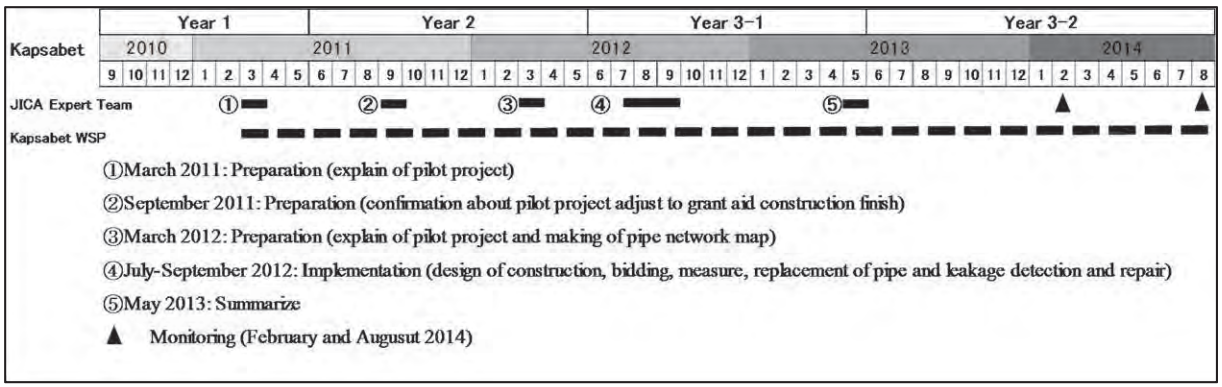


Diagram 4-12 Activities of Kapsabet Pilot Project

Table 4-5 Outline of Kapsabet Pilot Project Activities of JICA Expert Team

Year	Month	Outline of Activities
Year 1	2011/2	Explanation on Pilot Project schedule and outline to Kapsabet WSP
Year 2	2011/10 2011/11	Explanation on start up of Kapsabet Pilot Project Visitation to confirm operation and water distribution status in timing with the completion of construction of Grant Aid Project Donation of material and equipment
	2012/2 2012/3	Guidance on water meter inspection using meter test bench Preparation of pipe network map in the pilot project area, construction plan, preparation for tender, donation of equipment for maintenance and control.
Year 3-1	2012/7～9	Implementation period of Kapsabet Pilot Project (measure water flow volume in Pilot Project Area, leak detection, leak repair, consruction of measuring hut, replacement of pipes and repair of existing storage tank etc.)
	2013/5	Monitoring
Year 3-2	2014/2	Monitoring
	2014/8	Monitoring

In first year, Pilot Project explanation and equipment donations were the activities conducted. As preparation for the Pilot Project activities, positioning of existing pipes were studied.

Before the implementation of NRW reduction activities in second year, the NRW ratio was at an average of 70%. Specific activities were conducted for reduction of physical loss of water.

In third year, Kapsabet WSP concentrated on measuring water volume of each sub zones to improvement of assurance data. Second year's activities that leak detection and repair work produced good effect in third year. Third year's average NRW ratio was 39%.

It was lacking integrity about measured volume between electromagnetic flow meter and other mechanical flow meter in pilot project area. Kapsabet WSP was not reading customer meter in uniformed span, it cause variation of consumption volume. Average NRW ratio during Janualy to June was 36%.

Table 4-6 Details of Kapsabet Pilot Project Activity

Year	Activities	Details
Year 1	Explanation of Pilot Project to Kapsabet WSP	Explanation was given and understand was obtained that the third Pilot Project
Year 2	Explanation of Pilot Project to Kapsabet WSP Donation of equipment and inspection in November Observation and test running of water distribution after construction Understanding of pipeline network in the Pilot Project Area OJT on use of meter test bench Preparation of maps for the Pilot Project Area and analysis of volume of water distributed Plan for improvement of existing pipes, preparation for tender documents	Discussions were held on the implementation schedule of the Pilot Project in the following year. In November equipment was donated and preparation for the implementation such as preparing of maps were done OJT on methods of meter quality testing was conducted, using the meter quality testing system supplied by the Grant Aid Project. Pipeline network data of the whole supply area including the Pilot Project Area was obtained and inputted as soft data using the GIS software. The majority of pipes in the Pilot Project were existing pipes therefore there was room for improvement. The design for improved system and implementation plan were discussed. Tender for the construction of the new improvements were conducted.
Year 3-1	Cofirmation of zone isolation work Measuring volume of water flow in the Pilot Project Area Calculation of NRW ratio in each zone Leak detection and leak repair measuring devices, partial replacement of pipes Repair of existing tank etc. Set up monitoring system Installation of management devices as part of OJT Monitoring Remove of ACP pipe Regular monitoring of bulk meters by zone Improvements in meter reading Eliminateflat rate customer meter	NRW Reduction activities were commenced in mid July 2012. Zone 6 and Zone 8 were selected as Pilot Project Area. OJT on water volume, water pressure and meter maintenance was also conducted in regards to other Zones Kapsabet WSP replace ACP pipe and start organaize distribution pipe to new united pipe from old pararell pipes. Kapsabet WSP becoming to be able to analysis about water volume management by measuring data.
Year 3-2	Monitoring	Continuation of Observation

4-3 KEWI NRW Reduction Training Course

4-3-1 Activities leading to the establishement of the new Training Course

JICA Expert team requested for KEWI to implement basic work of establishing NRW reduction training course such prepare new curriculum, syllabus, manual and material from first year. But KEWI did not start their work up to April 2013 on the reason of lack of budget and manpower for establish new training cours.

On April 2013, KEWI CEO was changed. New leader conducted formation of planning team about training course, after then new training course establishwork became active. The team prepared Trainer's manual and Trainee's manual by the end of July 2013.

On 9th July 2013, KEWI team and JICA Expert team discussed about implementation system, factor, select of target, burden of cost, implementation schedule etc. It was decided that training course composed from three (3) modules. And each module's idea and content was also decided.

Table 4-7 KEWI Trainig Course Module

Module 1	Module 2	Module 3
Basic information and outline of NRW management	Reduction of commercial Loss	GIS outline
Basic measurements necessary for NRW management	Meter system	Implementation of GPS
Water balance	Concept of zoning	Cost-benefit analysis
Physical loss	Water pressure control	Methods of preparation of NRW Reduction Plan
Leak detection and their management		

4-3-2 Implementation of Module 1 to Module 3

NRW Reduction Training Course Module 1 was implemented in August 2013, Module 2 in October 2013 and Module 3 in March 2014.

(1) First NRW Reduction Training Course

Table 4-8 First Trainig Course

Period	26th to 31st August 1013 (6 days)
Location of Training	Kakamega
Target Course Participants	20 staff members of Western WSP
Training Course Schedule	Introduction to contents of Module 1, Practical work in the field, Preparation of Action Plan, Presentation of Action Plan, Awarding of training Certificates
Content of Training Course	Module 1
Structure of Training Course	Basic information and outline of NRW management, basic measurements necessary for NRW management, water balance, physical loss

1) Content of Implementation

There was a request from Lake Victoria North WSB, under which Western WSP fall, to focus the KEWI Training Course more on practical field aspects rather than on theoretical knowledge.

In addition to the above, there was a strong request from KEWI lecturers that had participated in the pedagogical methods, to focus the Module 1 Training Course on participatory learning rather than one directional lecture method.

As part of practical training, the water treatment plant of Western WSP in Kakamega town was visited. Location of installation of the flow meter was confirmed. Another activity experienced was to

use the flow meter measuring device to measure the volume of flow water in the pipe. Leak detection device was used to survey leak detection in service pipes to improve the technical skill of the particpants.

2) Results of Training Course Evaluation by the Training Course Participants

At the end of the course, feedback questionnaires were circulated to all participants to the Training Course. Results show that 90% of the participatns were satisfied with the Training Course.

3) Others

The last activity of the Training Course was to prepare a NRW sample action plan as group work and the leader of each group presented the action plan. Participants to the Training Course submitted their Action Plan to Lake Victoira North WSB within one or two weeks after the completion of the Trainign Course.

(2) Second NRW Reduction Training Course

Table 4-9 Second Trainig Course

Period	14th to 19th October 2013 (6 days)
Location of Training	Busia Town
Target Participants	Western WSP Staff 13 participants, Eldoret WSP Staff 3 participants, Nzoia WSP Staff 5 participants, Kapsabet WSP Staff 2 participants, Amati WSP Staff 2 participants Total of 25 participants
Training Course Schedule	Introduction to contents of Module 2, Practical field work, Preparation and presentation of Action Plan
Content of Training Course	Module 2
Structure of Training Course	Reduction of Commercial Loss, Oultine of Zoning, Meter System

1) Content of Implementation

Similar to the method applied in Module 1 Training Course, an interactive approach between the lecturer and the participants were taken for Module 2. Using this method, the outline and introduction were given to the participants in the beginning of the Training Course.

In practicial training, participants to the Training Course physically visited households to read the meters. Other practical activities included demonstrating volume of flow water at the Busia town treatment plant and at the primary school. Participants to the Training Course participated in taking measurements. Locations of non-metallic pipes were detected using non-metallic pipe leakage detection device.

2) Results of Training Course Evaluation by the Training Course Participants

At the end of the course, feedback questionnaires were circulated to all participants to the Training Course. Results show that 90% of the participatns were satisfied with the Training Course.

3) Others

An important point raised by both KEWI Training lecturers and the training participants was that there were too many types of water meters in the market, those made in England, Italy, China, Japan and others. This made meter reading difficult.

On the last day of the Training Course, similar to Module 1 Training Course, the participants prepared a draft Action Plan as group work and the each work was presented to the whole group. Two weeks after the completion of the Training Course, particpants of the Training Course submitted a detailed Action Plan to Lake Victoria North WSB.

(3) Third NRW Reduction Training Course

Table 4-10 Third Trainig Course

Period	24th to 29th March 2014 (6 days)
Location of Training	Nairobi City, Embu Town
Target Participants	Western WSP Staff, Eldret WSP Staff, Kapsabet WSP Staff, Amathi WSP Staff, Naivasha WSP Staff and others, Total of 8 participants
Training Course Schedule	Guidance of course and lecture outline of GIS at KEWI in Nairobi Visitation of GIS Utilization at Embu WSP, Practical training using GPS terminal Preparation group work of NRW Reduction plan at KEWI in Nairobi, Awarding certification
Content of Training	Module 3
Structure of Training	GIS outline、Implementation of GPS、methods of preparation of NRW Reduction Plan

1) Content of Implementation

Before the start up of the Training Course, the Course outline and the method of teaching the Module 3 were explained to the participants at KEWI in Nairobi.

Practical fieldwork was arranged with Embu WSP. Embu WSP had implemented a Pilot Project in this Project and had attained results from the activities that were implemented in the Pilot Project.

In Embu WSP, usage of GIS was observed and all explanations on the GIS in Embu WSP was given by Embu WSP staff. Intake and the water treatment plant were visited. Practical training using GPS terminal to obtain location data and information was conducted.

Back at KEWI in Nairobi, GPS data and information obtained in Embu were inputted as soft data. The participants also received explanation on NRW Reduction Plan and worked on a draft NRW Reduction Plan as group work.

2) Results of Training Course Evaluation by the Training Course Participants

At the end of the course, feedback questionnaires were circulated to all participants to the Training Course. Results show that 80% of the participatns were satisfied with the Training Course.

3) Others

Participants to the Training Course showed much interest in GIS and many questions were raised to

the Embu WSP on this topic. Explanations were iven on NRW Reduction Plan and preparation of the plan was started but due to lack of time, some participants were unable to finish this exercise.

(4) Summary of Training Course

It can be seen by the above that three Training Courses, Module 1 to 3 were conducted by KEWI by March 2014. The evaluation questionnaires filled by all participants to the Training Course show above 80% satisfaction in the Training Course. KEWI plans to continue to implement the Training Courses in the future. Furthermore, KEWI is currently in the process of planning an improved Training Course by involving successful WSP as it did in Module 3 Training Course.

4-3-3 Movements for the Improvement of the Training Course

Since May 2014, KEWI has been making improvements to the current Training Course. KEWI is receiving feedback and opinion from participants to the KEWI Training Course. Some suggestions that have been made are, to "combine the three modules into one single Module", and "each Module to have explanation on preparation of NRW Reduction Plan". These suggestions have been considered by KEWI and it is currently planning on implementing three one-module courses. This new Module will be two weeks longs and will be implemented in April, August and December.

In parallel to the above, KEWI is developing a new Training Module for the WSP Management level. The plan by August 2014 was to develop a two-day course.

KEWI presented the results of the Training Courses, the suggestions and development of a new Module for the WSP Management at the Final Workshop held on 26th August 2014 and the information was made open to all participating WSB and WSP.

4-4 Nationwide Dissemination Activity by WASREB

4-4-1 Dissemination Seminars

Between May and June 2014, seven seminars on NRW Reduction Standards were conducted in seven different locations. At each seminar, participants were introduced to NRW Reduction Standards composed of the Manual and Guideline.

The schedule of activity is shown in Table 4-16 below.

Table 4-11 Dissemination Seminars Schedule of Implementation

Description	Group-1	Group-2	Group-3	Group-4	Group-5	Group-6	Group-7
Name of WSB	RVWSB	TWSB	NWSB	AWSB	TaWSB	LVN/SWSB	CWSB
Venue	Nakuru	Nyeri	Isiolo	Nairobi	Machakos	Kisumu	Mombasa
Date	May 14-16	May 21-23	May 28-30	Jun 4-6	Jun 11-13	Jun 18-20	Jun 25-27

In preparation for the implementation of dissemination seminars, a Dissemination Activity Implementation Plan was prepared. In this Plan, the dates of the seven seminars, participant list for each seminar, Time Table and work sheets for group work during the seminars are included. The draft of the

Dissemination Activity Implementation Plan was prepared one week before the implementation of Group 1 seminar, during the meeting held for the facilitators to the seminars.

Table 4-12 Dissemination Seminar Participant List

PLACE		No of WSB and Name		No of WSPs	No of staff / Manager @2.per WSP	No of staff /Manager @2.per WSB	No of County Director	No of MEWNR/ WASREB	S.Total	Dissemination Team	Grouping	Total no.of Expected Participants
A	Nakuru	1	RVWSB(Rift Valley)	9	18	2	5	2	27	7	G-1	34
B	Embu	2	TWSB (Tana)	13	26	2	4	2	34	7	G-2	41
		3	NWSB (Northern)	8	16	2	4	2	24	7	G-3	31
C	Nairobi	4	AWSB (Athi)	11	22	2	2	2	28	7	G-4	35
		5	TaWSB (Tanathi)	12	24	2	4	2	32	7	G-5	39
D	Kisumu	6	LVN WSB (Lake Victori North)	5	10	2	5	2	19	7	G-6	46
		7	LVS WSB (Lake Victori South)	7	14	2	4		20			
E	Mombasa	8	CWSB (Cost:Mombasa)	6	12	2	4	2	20	7	G-7	27
Total				**71**	**142**	**16**	**32**	**14**	**204**	**49**	**-**	**253**

Table 4-13 Time Table of Dissemination Seminars (Day 1 taken as example)

Day	Time	Theme	Topic	Remarks
Day-1	8:30-9:00	Registration		-
	9:00-9:15	Welcome and Overview of the Training / Workshop and the Outline		-
	9:15-9:30	Opening Speech		CEO WSB
	9:30-10:00	✓ Introduction of IMPACT	✓ Status of NRW in Kenya	-
	10:00-10:30	**Tea Break/Group Photo**		-
	10:30-11:00	✓ What is NRW? ✓ Why do we need to reduce the NRW?	✓ Introduction of Manual Version-4 ✓ Description of terminology	-
	11:00-11:30	✓ How to Reduce the NRW	✓ Introduction of Guideline ✓ Description of terminology	-
	11:30-12:00	✓ Example activities of NRW By leading County	Introduction of NRW activity (Lake Victoria North)	Director-Nandi County
	12:00-12:30	✓ Example activities of NRW By leading WSB	✓ Introduction of NRW activity (TANA WSB or Selected WSB)	-
	12:30-13:00	✓ Example activities of NWR By leading WSP	✓ Introduction of NRW activity (EMBU WSP or Selected WS)	-
	13:00-14:00	**Lunch Break**		
	14:00-14:45	✓ Create a Basic Interpretation Table	✓ Fill in **Form-1** by separately WSB each	WSB creates
	14:45-15:45	✓ Create a Summary of all WSPs' Self-Assessment Matrix)	✓ Fill in **Form-2** by separately WSB each	WSP creates
	15:45-16:00	✓ Create an Analysis Table of Self-Assessment based on **Form-2**	✓ Create **Form-3** by separately WSP each	WSP creates
	16:00-16:30	Tea Break		
	16:30-17:30	Feed Back		-
	17:30	Guest leave		-

4-4-2 Implementation of Dissemination Activities

The target group of the dissemination seminars was the WSB of each region and the WSP falling under the jurisdiction of the chosen WSB. The first item on the dissemination seminar agenda was always the explanation on NRW reduction. Each WSP and WSB embarked on the preparation of NRW Reduction Plan as group work. On the last day of the seminar, each group presented its work to the whole group. The goal in the future is to have all the WSB and WSP submit the NRW Reduction Plan to WASREB.

Chapter 5 Reslut of Inputs

5-1 Input of JICA Experts

5-1-1 Japan Side

(1) Dispatch of Experts

As an input from the Japanese side, a total of eleven (11) Experts were dispatched for the implementation of the Project. Details of the Experts dispatched are shown in Table 5-1.

Table 5-1 Results of Experts Dispatched

No.	Name of Expert	Responsiblity	Year 1 Sep 2010～ May 2011	Year 2 June 2011～ May 2012	Year 3 July 2012～ Oct 2014	M/M
1	Shigeru Ueda	Chief adviser / NRW management A	6.5	4.5	3.9	**14.9**
2	Syozo Yamazaki	Assistant adviser / NRW management B	1.5	2.0	0.5	**4.0**
3	Junichi Takahashi	Facility management / NRW reduction technology A	5.5	6.5	6.5	**18.5**
4	Naoto Koike	Facility management / NRW reduction technology B	1.0	6.0	2.0	**9.0**
5	Wataru Shimizu	Facility management / NRW reduction technology C			3.0	**3.0**
6	Satoshi Sibazaki	Facility management / NRW reduction technology D			4.0	**4.0**
7	Masayuki Kikuchi	Leakage monitoring		3.0	1.0	**4.0**
8	Kazumi Suwabe	Information management / customer management	1.0	3.5	1.5	**6.0**
9	Keinosuke Koike	Assistant adviser /Training management	3.5	2.0	11.5	**17.0**
10	Yuichi Mukainakano	Coordinator / Assistant NRW management A		2.0	2.0	**4.0**
11	Daijyu Igarashi	Coordinator / Assistant NRW management B			2.0	**2.0**
		総 M/M	**19.0**	**29.5**	**37.9**	**86.4**

The three local consultants were also involved in this Project. The local consultants supported the Experts during the Experts assignment in Kenya and also during the absence of Experts.

Table 5-2 Results of Local Consultants Assigned

No.	Name	Resposibility	Year 1 Sep 2010～ May 2011	Year 2 June 2011～ May 2012	Year 3 July 2012～ Oct 2014	M/M
1	Keith Diniz	High Class Enginner	4.0	8.4	7.1	19.5
2	Yoko Seki	Middle Class Engineer	4.0	8.3	7.1	19.4
3	Shinichi Ino	GIS system/AUTO CAD Expert	4.0	8.3	1.8	14.1

(2) Training in Japan

As Input from Japan side, five (5) people involved in this Project participated in the training in Japan that was implemented in October 2011.

Table 5-3 Time Table of Training in Japan

Date		Training Cotent	In Charge	Notes
10/15 Sat		Departure from REPUBLIC OF KENYA		
10/16 Sun		Entry into JAPAN	JICA OSAKA international center	
10/17 Mon	AM	Orientation	JICA OSAKA international center	
	PM	Transfer from OSAKA to KANAZAWA		
10/18 Tue	AM	Beginning lecture / Orientation	JICA HOKURIKU branch office	
	PM	Courtesy call / Presentation of Country Report	JICA HOKURIKU branch office	
10/19 Wed	AM	Waterworks of JAPAN / Waterworks of ISHIKAWA prefecture	ISIKAWA prefecture	
	PM	Exchange of Views	ISIKAWA prefecture	
10/20 Thu	AM	Field trip for the source of water supply and water purification	ISIKAWA prefecture	TEDORI dam
	PM	Operation of water purification	ISIKAWA prefecture	TEDORI river water purfication office
10/21 Fri	AM/PM	Asset Management of Waterworks	ISIKAWA prefecture	
10/22 Sat				
10/23 Sun				
10/24 Mon	AM	Water service plan of KANAZAWA city	KANAZAWA city	KANAZAWA Utilities Bureau
	PM	Delivery water system of KANAZAWA city	KANAZAWA city	〃
10/25 Tue	AM	Structure of process of clean water and filtration plant	KANAZAWA city	Sue Plant Flitration Section
	PM	Piping work and Water leak repair	KANAZAWA city	〃
10/26 Wed	AM	Consumer Services	KANAZAWA city	KANAZAWA Utilities Bureau
	PM	Field trip for the inspection of water meter	KANAZAWA city	〃
10/27 Thu	AM	Train Staffs / In-house Training	KANAZAWA city	KANAZAWA Utilities Bureau
	PM	Preparations for the Presentation of Report	JICA HOKURIKU branch office	
10/28 Fri	AM	Presentation of Report	JICA HOKURIKU branch office	
	PM	Courtesy call of completion / Completion ceremony	JICA HOKURIKU branch office	
10/29 Sat		Transfer from KANAZAWA to OSAKA		
10/30 Sun		Return to REPUBLIC OF KENYA		

Table 5-4 Participants of Training in Japan

Name of Training	NRW Reduction Course
Period	15 October 2011 to 30 October 2011
Training Venue	JICA OSAKA international center, JICA HOKURIKU branch office, ISIKAWA prefecture, TEDORI dam, TEDORI river water purfication office, KANAZAWA Utilities Bureau, Sue Plant Flitration Section

Name of Participant	Title	Organization
Mr. Peter M. Njaggah	Head, Regulatory Services	WASREB
Mr. Fredrick Muriithi	Lecturer	KEWI
Mr. Morris Muteti Waweru	JICA NRW Coordinator	Tana WSB
Mr. Christopher Bwire	JICA NRW Coordinator	Lake Victoria North WSB
Ms. Lucy Wangari Mburu	JICA NRW Coordinator	Rift Valley WSB

5-1-2 Counterpart

(1) Counterpart Allocation

As input from the Kenya side, 17 people were allocated. From MEWNR there was a Director, Project Manager and Project Coordinator; others were allocated to the Project from WASREB, KEWI, WSB (Embu, Narok, and Kapsabet), WSP (Tana, Rift Valley, and Lake Victoria North).

(2) Facility Input from Counterpart

Kenya side provided a Project Office within the Ministry of Environment, Water and Natural Resources for the whole duration of the Project.

During the implementation of the Pilot Projects, at each WSP an office for the JICA Experts was provided within the WSP.

Throughout the Project and in accordance with the activities all necessary facilities required for the implementation of the activities were always provided.

(3) Funds required for implementation of Project activities

From the Kenya side, a total of KES 3,125,000 has been inputted into the Project from the startup up to November 2013.

Table 5-5 Allocation from Kenya Side

No.	Name	Role in this Project	Organization	Period
1	Mr. Robinson K. Gaita	Director	MEWNR	July 2013~
2	Mr. S.A.O. Alima	Project Manager/Deputy Director, Department of Water Service	MEWNR	Sep 2010~ Nov 2011
				Apil 2014~
3	Mr. Gatere Kuria	Project Manager/Deputy Director, Department of Water Service	MEWNR	Nov 2011~
4	Mr. David Mabonga	Project Coordinator/ Senior Superintendent Water Engineering	MEWNR	Sep 2010~
5	Mr. Robert N. Gakubia	CEO	WASREB	Sep 2010~
6	Mr. Peter M. Njaggah	Head, Regulatory Services	WASREB	Sep 2010~
7	Ms. Leunita A.Sumba	Acting Director	KEWI	July 2013~
8	Mr. Geoffrey Magondu	Senior lecturer, NRW KEWI Coordinator	KEWI	Sep 2010~
9	Mr. Morris M. Kiruja	JICA NRW Coordinator, Engineer	Tana WSB	Sep 2010~
10	Ms. Lucy Mburu	JICA NRW Coordinator, Engineer	Rift Valley WSB	Sep 2010~
11	Mr. Isaac Ruto	JICA NRW Coordinator, Engineer	Lake Victoria North WSB	Sep 2010~
12	Mr. H. M. Karugendo	Managing Director	Embu WSP	Sep 2010~
13	Mr. Jim Irongo Maina	JICA NRW Team Leader, Engineer	Embu WSP	Sep 2010~
14	Mr. Wilson L. Pere	Managing Director	Narok WSP	Sep 2010~
15	Mr. Davies Tarkash	JICA NRW Team Leader, Engineer	Narok WSP	Sep 2010~
16	Mr. Peter Wawire	Acting Managing Director	Kapsabet WSP	Sep 2010~
17	Mr. Gilbert Rotich	JICA NRW Team Leader, Engineer	Kapsabet WSP	Sep 2010~

5-2 Donation of Equipment and Materials

(1) Donation of Equipment and Materials

As Input from Japan side, approximately JPY 19,987,000 worth of equipmen and materials have been donated in total. These were donated to the three WSP that implemented the Pilot Projects and to KEWI where NRW Reduction Training Course will be implemented.

Table 5-6 Equipment Donated in Year One

No	Donated Equipment	Piece	Unit Priece	Quantity	Total Amount	Recipient Party	Status of maintenance
1	Customer Meter（15mm）	pc	2,108	200	421,600	EMBU WSP	Good
2	Bulk Meter (63mm)	pc	11,455	1	11,455		Good
3	Bulk Meter (90mm)	pc	14,616	1	14,616		Good
4	Gate Valve（63mm）	pc	4,039	1	4,039		Good
5	Gate Valve (90mm)	pc	25,512	1	25,512		Good
6	Gate Valve （150mm）	pc	44,646	1	44,646		Good
7	Gate Valve （25mm）	pc	1,701	10	17,010		Good
8	Gate Valve （50mm）	pc	4,039	10	40,390		Good
9	Gate Valve （63mm）	pc	17,008	5	85,040		Good
10	Gate Valve （90mm）	pc	25,512	2	51,024		Good
11	Gate Valve （63mm）	pc	4,039	15	60,585		Good
12	(1) Sludge Valve (Saddle Clamp160mm-63mm）	pc	1,807	2	3,614		Good
	(2) Sludge Valve（Saddle Clamp 90mm-32mm）	pc	1,169	2	2,338		Good
	(3) Sludge Valve（Galvanized nipple 25mm）	pc	64	1	64		Good
	(4) Sludge Valve（Galvanized nipple 32mm）	pc	85	2	170		Good
	(5) Sludge Valve (Gate Valve PN16-25mm)	pc	1,701	1	1,701		Good
	(6) Sludge Valve (Gate Valve PN16-32mm)	pc	1,701	2	3,402		Good
13	Air Valve（63mm）	pc	17,008	3	51,024		Good
	Butterfly Valve	pc	9,036	3	27,108		Good
14	Distirubtion Pipe 63mm	m	155	204	31,620		Good
15	Distribution Pipe 20mm	m	102	300	30,600		Good
16	Distribution Pipe	m	249	200	49,800		Good
17	Pressure Reducing Valve (50mm）	pc	40,394	4	161,576		Good
18	Pressure Reducing Valve （63mm）	pc	112,667	1	112,667		Good
19	Pressure Reducing Valve （90mm）	pc	137,127	1	137,127		Good
20	Ultrasonic Flow Meter	pc	1,079,878	1	1,079,878		Good
21	Water Pressure Data Logger	pc	119,691	5	598,455		Good
22	Communication Data Logger	pc	354,858	1	354,858		Good
23	Electromagnetic Flow Meter	pc	699,300	1	699,300		Good
24	Road Counter	pc	15,120	1	15,120		Good
25	Leak Detection Device	pc	627,480	1	627,480		Good
26	Listening Stick	pc	27,720	3	83,160		Good
27	GPS Hand Terminal	pc	494,019	1	494,019		Good
28	GIS Interphase Software and Installation Pack	pc	8,416	1	8,416		Good
				Total	**5,349,414**		
				Rounded off	**5,349,000**		

Table 5-7 Equipment Donated in Year Two

No	Donated Equipment	Piece	Unit Price (Yen)	Qtty	Embu WSP	Narok WSP	Kapsabet WSP	KEWI	Total Amount	Status
1	Customer Meter（15mm）	pc	2,350	450	100	150	200		1,057,589	Good
2	Block Meter（50mm）	pc	8,150	5	5				40,753	Good
3	Block Meter（63mm）	pc	12,501	5	5				62,505	Good
4	Block Meter（75mm）	pc	13,501	3			3		40,503	Good
5	Block Meter（90mm）	pc	16,501	7	2	4	1		115,509	Good
6	Block Meter（100mm）	pc	21,501	2		1	1		43,003	Good
7	Gate Valve（50mm）	pc	2,436	1			1		2,436	Good
8	Gate Valve（63mm）	pc	14,501	26	5	20	1		377,030	Good
9	Gate Valve（90mm）	pc	27,842	6	2	3	1		167,053	Good
10	Gate Valve（150mm）	pc	38,863	3	2		1		116,589	Good
11	Pressure Reducing Valve: PRV（32mm）	pc	14,501	7	4		3		101,508	Good
12	PRV（50mm）	pc	44,083	9	4	2	3		396,752	Good
13	PRV（63mm）	pc	64,965	8	4	2	2		519,722	Good
14	PRV（90mm）	pc	149,651	6	4		2		897,912	Good
15	PRV（150mm）	pc	446,635	2	2				893,271	Good
16	Sludge Valve（25mm）	pc	870	4		2	2		3,480	Good
17	Sludge Valve（32mm）	pc	1,044	4		2	2		4,176	Good
18	Air Valve（25mm）	pc	6,380	4		4			25,522	Good
19	Air Valve（32mm）	pc	6,380	8	4	2	2		51,044	Good
20	Air Valve（50mm）	pc	13,921	12	4	4	4		167,053	Good
21	Gate Valve（25mm）	pc	870	55		50	5		47,854	Good
22	Gate Valve（32mm）	pc	1,044	10		5	5		10,441	Good
23	Gate Valve（50mm）	pc	2,436	10		5	5		24,362	Good
24	Gate Valve（63mm）	pc	14,501	5			5		72,506	Good
25	Gate Valve（90mm）	pc	27,842	5			5		139,211	Good
26	Distribution Pip（50mm）	m	139	1,150		1,150			160,093	Good
27	Distribution Pip（63mm）	m	208	2,000		2,000			417,633	Good
28	Distribution Pip（90mm）	m	498	500		500			249,420	Good
29	Distribution Pip（20mm）	m	25	1,000			1,000		25,522	Good
30	Distribution Pip（25mm）	m	34	1,100		1,100			38,283	Good
31	Service Piple（32mm）	m	61	500			500		30,742	Good
32	Service Piple（38mm）	m	81	500			500		40,603	Good
33	Ultrasonic Flow Meter	pc	969,980	4		4			3,879,920	Good
34	Pressure Gauge	pc	125,010	15	5		5	5	1,875,150	Good
35	Communication Data Logger	pc	331,118	2		2			662,236	Good
36	GPS Terminal	pc	397,445	4		4			1,590,180	Good
37	GPS Installation Pack	pc	85,745	4		4			342,980	Good
								Total	**14,638,500**	
								Round down to the 1,000	**14,638,000**	

Table 5-8 Equipment Donated in Year Three

No.	Donated Equipment	piece	Unit Price (Yen)	Qtty	Total Amount	Recipient	Status of Maintenance
1	Float Valve	pc	207,212	1	207,212	Kapsabet WSP	Good

5-3 Local Costs

5-3-1 Costs Borne by Japan

As Input from Japan side, approximately JPY 27,693,000 has been spent for local costs for this Project from its startup to the end of November 2013.

Table 5-9 Cost Borne by Japan

Currency: Japanese Yen

Item	Year One Sep 2010 to May 2011	Year Two June 2011 to May 2012	Year 3 June 2012 to Nov 2013	Total
Local Staff Personnel Cost	4,183,756	7,510,479	6,443,151	18,137,386
Equipment Maintenance Cost	27,784	368,478	234,332	630,594
Expendable Supplies Cost	15,157	21,463	109,932	146,552
Travel/Transport Cost	331,270	756,291	1,064,093	2,151,654
Report Preparation Cost	0	0	144,250	144,250
Local Training Cost	718,476	527,441	4,038,511	5,284,428
Others	730,620	212,598	255,591	1,198,809
Total	**6,007,063**	**9,396,750**	**12,289,860**	**27,693,673**

5-3-2 Cost Incurred for Kenya Side

During the implementation of the Pilot Project in Embu WSP, the construction cost was borne by Kenya side, and a part of the equipment cost was also borne.

Ministry of Environment, Water and Natural Resources paid part of the venue cost for the Second Workshop.

Table 5-10 Cost Borne by Kenya

Currency: (Kenya Shillings)

Item	Responsible	Total
Distribution pipe construction costs / Material and Equipment introduction costs	Embu WSP	2,925,000
Part of venue costs for Second Workshop	MEWNR	200,000
	Total	**3,125,000**

Chapter 6 Changes in the PDM

At the mid-term review, numerical goals were set to the progress of the activities and at the same time Indicators and Outputs were reassessed. At the Third JCC Meeting, improvements were made to the PDM and PDM1 was changed to PDM2. Table 6-1 and 6-2 shows the changes that were made to the PDM. Table 6-3 shows the PDM2 that was approved by the Third JCC Meeting.

Table 6-1 Changes in the PDM (Overall Goal, Project Purpose and Output 1)

Original PDM (PDM_1)	Current PDM (PDM_2)
Overall Goal	**Overall Goal**
Kenya's water resources are effectively utilized by reducing non-revenue water (NRW)	Kenya's water resources are effectively utilized by reducing non-revenue water (NRW)
Indicator for Overall Goal	**Indicator for Overall Goal**
The NRW ratio is reduced to 10% by 2020 nationwide	Average NRW ratio within regulated WSPs is reduced to 20-25% by 2020
Project Purpose	**Project Purpose**
Kenya's systems, mechanisms and capacity for supervision, implementation and dissemination of NRW reduction are consolidated and strengthened	Kenya's systems, mechanisms and capacity for supervision, implementation and dissemination of NRW reduction are consolidated and strengthened
Indicator for Project Purpose	**Indicator for Project Purpose**
1. KEWI conducts training for NRW reduction based on the human resource development 2.All WSBs to prepare a NRW Reduction Plan 3. NRW data from all WSP is utilized for summarize the annual report by WASREB	1. Three WSPs, namely, Embu, Narok and Kapsabet, start the implementation of their NRW Reduction Plan 2. WSPs which participate in KEWI's NRW reduction training start producing their NRW Reduction Plan
Output 1	**Output 1**
Manual/Guidelines for NRW reduction are compliled through implementation of pilot projects	Manual and Guidelines for NRW reduction are developed taking into consideration experience learnt during the implementation of pilot projects
Indicators for Output 1	**Indicators for Output 1**
1. NRW reduction plan drafted in the pilot project sites Embu (by MM 20XX) Narok (by MM 20XX) Kapsabet (by MM 20XX) 2. Reduction of NRW Embu (X1%-X2%) Narok (X3%-X4%) Kapsabet (X5%-X6%) 3. Manual of NRW reduction for WSP (draft) is prepared by XX 20XX and the guideline of NRW reduction for WSB (draft) is prepared by XX 20XX	1. Three (3) WSPs' and three (3) WSBs' NRW Reduction Plans Tana WSB, Embu WSP (by Mar. 2013), Rift Valley WSB,Narok WSP (by Mar. 2013), Lake Victoria North WSB , Kapsabet WSP (by Mar. 2013) 2. NRW ratio in the pilot project area is reduced by half comparing with that prior to the project. In Narok, in particular, the following should be accomplished: 1) mapping is created; 2) the volume of distributed water is analyzed; 3) equal water distribution can be conducted through valve operation; 4) the quality of construction is improved; 5) NRW reduction measures are implemented 3. Draft NRW Reduction Manual (for all WSP) and draft Guideline (for all WSB) are prepared by May 2013.

Table 6-2 Changes in the PDM (Output 2, Output 3 and Output 4)

Output 2	Output 2
NRW data from all WSP is utilized for summarize the annual report by WASREB	Kenya's NRW Reduction Standards are developed and WASREB strengthens its capacity to lead WSBs and WSPs in reducing NRW
Indicator for Output 2	**Indicator for Output 2**
1. The Standards of NRW management is approved by MWI and published by WASREB MM 20XX 2. A dissemination plan of the standards of NRW reduction measures prepared by WASREB by MM 20XX 3. The Standards for Human Resource Development MM 20XX	1. Kenya's NRW Reduction Standards are approved by WASREB Board by June 2013 and published by WASREB by September 2013 2. WASREB develops a NRW Reduction Standards Dissemination Plan by June 2013 3. WASREB develops a Human Resources Development Standard by September 2012
Output 3	**Output 3**
KEWI develops and strenghten training capacity on NRW reduction measures to WSPs	KEWI develops and strenghten training capacity on NRW reduction measures to WSPs
Indicators for Output 3	**Indicators for Output 3**
1. Five (5) KEWI staff certified the training courses of NRW reduction measures and the pedagogical methods 2. KEWI develops curricula, syllabi and training materials on NRW Reduction measures by MM 20XX 3. Participants in KEWI training courses level of satisfaction indicate over 80% 4. KEWI develops the Human Resources Development Plan by MM 20XX	1. Five (5) KEWI staffs complete instructors courses on NRW reduction measures and pedagogical methods of teaching 2. KEWI develops curricula, syllabi and training materials on NRW Reduction measures by March 2013 3. Participants in KEWI training courses level of satisfaction indicate over 80% 4. KEWI develops the Human Resources Development Plan[4] by December 2012 5. The number of participants who completed KEWI training courses (60 participants)
Output 4	**Output 4**
The activities for dissemination of "The Standards of NRW Management" are implemented by WSBs	WASREB disseminates the Kenya's NRW Reduction Standards to WSBs and WSPs
Indcators for Output 4	**Indcators for Output 4**
1. WASREB conducts a seminar for the 8 WSBs on “The Standard of NRW Management” more than 2 times. 2. NRW Reduction Plans in all WSBs are developed in line with the Kenya's NRW Reduction Standards by MM 20XX 3. Coordination meetings between WSBs and WSPs are holding on NRW reduction measures as the agenda over 6 times. 4. All the WSPs report on NRW to WASREB in 2012-2013 Kenyan fiscal years.	1. WASREB organises seminars on Kenya's NRW Reduction Standards at least two (2) times for all WSBs and all WSPs 2. NRW Reduction Plans in all WSBs are developed in line with the Kenya's NRW Reduction Standards by July 2014 3. All WSPs submit reports in accordance with the Kenya's NRW Reduction Standards to WASREB 4. The coordination meetings among WSBs and all WSPs to address Kenya's NRW Reduction Standards at least four (4) times.

Table 6-3 PDM２

Project Design Matrix (PDM) Ver.2

as of September 6th, 2012

Project Name	The Project for Management of Non Revenue Water in the Republic of Kenya
Project Period	4 years (September 2010 - October 2014)
Project Site	Nairobi and regions of Tana WSB, Lake Victoria North WSB, and Rift Valley WSB
Target Groups	Ministry of Water and Irrigation (MWI) (Operation and Maintenance Department) Water Services Regulatory Board (WASREB) Kenya Water Institute (KEWI) Water Services Boards (WSB): Tana WSB, Lake Victoria North WSB, Rift Valley WSB Water Services Providers (WSP) : Meru WSP, Embu WSP, Kapsabet WSP, Narok WSP

Narrative summary		Objectively verifiable indicators	Means of verification	Important assumptions
Overall Goal	Kenya's water resources are effectively utilized by reducing non-revenue water (NRW).	Average NRW ratio within regulated WSPs is reduced to 20-25% by 2020.	Performance Report of Kenya's Water Services Sector, "IMPACT"	
Project Purpose	Kenya's systems, mechanisms and capacity for supervision, implementation and dissemination of NRW reduction are consolidated and strengthened.	1. Three WSPs, namely, Embu, Narok and Kapsabet, start the implementation of their NRW Reduction Plan	1. Project progress report	MWI takes necessary measures for NRW reduction. Budget is continually secured for NRW reduction activities.
		2. WSPs which participate in KEWI's NRW reduction training start producing their NRW Reduction Plan.	2. Project progress report	
Output 1	Manual[1] and Guidelines[2] for NRW reduction are developed taking into consideration experience lernt during the implementation of pilot projects.	1. Three (3) WSPs' and three (3) WSBs' NRW Reduction Plans Tana WSB, Embu WSP (by Mar. 2013), Rift Valley WSB,Narok WSP (by Mar. 2013), Lake Victoria North WSB , Kapsabet WSP (by Mar. 2013)	1. NRW Reduction Plans developed by three (3) WSBs (Tana, Lake Victoria North and Rift Valley) and three (3) WSPs (Embu, Kapsabet and Narok)	Staffs who have acquired technologies through the Project remain in their organizations.
		2. NRW ratio in the pilot project area is reduced by half comparing with that prior to the project. In Narok, in particular, the following should be accomplished: 1) mapping is created; 2) the volume of distributed water is analyzed; 3) equal water distribution can be conducted through valve operation; 4) the quality of construction is improved; 5) NRW reduction measures are implemented.	2. Three (3) WSP's monthly report	
		3. Draft NRW Reduction Manual (for allWSP) and draft Guideline (for all WSB) are prepared by May 2013.	3. NRW Reduction Manual (for all WSPs) NRW Reduction Guideline (for all WSBs)	

Output 2	Kenya's NRW Reduction Standards[3] are developed and WASREB strengthens its capacity to lead WSBs and WSPs in reducing NRW.	1. Kenya's NRW Reduction Standards are approved by WASREB Board by June 2013 and published by WASREB by Septmeber 2013	1. Kenya's NRW Reduction Standards	
		2. WASREB develops a NRW Reduction Standards Dissemination Plan by June 2013	2. Kenya's NRW Reduction Standards Dissemination Plan	
		3. WASREB develops a Human Resources Development Standard by September 2012	3. Human Resources Development Standard	
Output 3	KEWI develops and strenghten training capacity on NRW reduction measures to WSPs.	1. Five (5) KEWI staffs complete instructors courses on NRW reduction measures and pedagogical methods of teaching.	1. Project progress report	
		2.KEWI develops curricula, syllabi and training materials on NRW Reduction measures by March 2013	2. The revised curricula, syllabi and training materials	
		3. Participants in KEWI training courses level of satisfaction indicate over 80%	3. Report on participant's survey questionnaire	
		4. KEWI develops the Human Resources Development Plan[4] by December 2012	4. KEWI's Activity Report	
		5. The number of participants who completed KEWI training courses (60 participants)		
Output 4	WASREB disseminates the Kenya's NRW Reduction Standards to WSBs and WSPs.	1.WASREB organises seminars on Kenya's NRW Reduction Standards at least two (2) times for all WSBs and all WSPs.	1. Project progress report	
		2. NRW Reduction Plans in all WSBs are developed in line with the Kenya's NRW Reduction Standards by July 2014	2. NRW Reduction Plan developed by each WSB	
		3. All WSPs submit reports in accordance with the Kenya's NRW Reduction Standards to WASREB	3. Performance Report of Kenya's Water Services Sector, "IMPACT"	
		4. The coordination meetings among WSBs and all WSPs to address Kenya's NRW Reduction Standards at least four (4) times.	4. Performance Report of Kenya's Water Services Sector, "IMPACT"	

Table 6-3 PDM₂

Narrative summary		Objectively verifiable indicators	Means of verification	Important assumptions
Activity 1	Manual and Guidelines for NRW reduction are developed through implementation of pilot projects.	Inputs		Input of C/Ps to the Project is not constrained by external conditions.
1-1	A project team for NRW reduction is organized in Tana WSB which includes selected members of WASREB, KEWI, Tana WSB, Embu WSP and Japanese experts to develop Tana WSB and Embu WSP NRW Reduction Plan respectively taking into consideration the process and experience gained in Meru.	Kenyan	Japanese	
1-2	The project team trains Embu WSP staffs on basic NRW technologies and conducts On-the-Job Training (OJT) at the pilot project site.	* Project Manager	* Experts: 1- Chief Adviser/NRW management 2- NRW reduction technology 1(Leakage monitoring) 3- NRW reduction technology 2(Facility management/ Execution management (including distribution network analysis)) 4- Training Management 5- Information/Customer Management * Training in Japan * Provision of equipment 1-Bulk meter(s) 2-Consumer meter(s) 3-Portable ultra-sonic	
1-3	The project team develops Manual and Guideline for NRW reduction based on the results of Activity 1-2.	Deputy Director, Department of Water Services, MWI * Assignment of C/Ps 1- MWI (Deputy Director of Operation and Maintenance Division, Senior Superintendent of Water Supply) 2- WASREB (Technical Manager, Compliance Enforcement Manager, Technical Assistance) 3- KEWI (Deputy Director Training, 3 Lectures and 2 Technicians) 4- WSBs (Technical Manager, Water Provider Manager, Engineers and Technician) 5- Regulated WSPs (Managing Directors,		
1-4	a) A project team is reorganized in Lake Victoria North WSB to include members of WASREB, KEWI, Lake Victoria North WSB, Kapsabet WSP and Japanese experts. The project team: (i) develops Lake Victoria North WSB and Kapsabet WSB NRW Reduction Plans respectively based on the Manual and Guidelines developed in Activity 1-3, (ii) trains Kapsabet WSP staffs, and (iii) implement OJT for NRW reduction measures. b) A project team is reorganized in Rift Valley WSB to include members of WASREB, KEWI, Rift Valley WSB, Narok WSP and Japanese experts. The project team: (i) develop Rift Valley WSB and Narok WSP NRW Reduction Plan respectively based on the Manual and Guidelines developed in Activity 1-3, (ii) trains Narok WSP staffs, and (iii) implement OJT for NRW reduction measures			
1-5	The project team revises the Manual and Guidelines for NRW reduction based on results of Activity 1-4.			
Activity 2	Kenya's NRW Reduction Standards are developed and WASREB strengthens its capacity to lead WSBs and all WSPs to reduce NRW.			
2-1	WASREB improves the NRW monitoring system and instructs WSBs and WSPs.			
2-2	WASREB prepares a draft on Kenya's NRW Reduction Standards building up on Manual and Guidelines in Activity 1-5.			
2-3	WASREB Board approves Kenya's NRW Reduction Standards after being reviewed by stakeholders.			
2-4	WASREB prepares Kenya's NRW Reduction Standards dissemination plan approved in Activity 2-3.			

2-5	WASREB prepares Kenya's Human Resources Development Standard.	Commercial Managers, Technical Managers, Engineers and Technician NRW Reduction Team Members) * Facilities: 1-Office and furniture for Japanese experts 2-Room and facilities necessary for installation and storage of the equipment in selected facilities 3-Training facilities 4-Existing facilities owned by WSBs and WSPs	flow meter(s) 4-Leak detector(s) 5-Leak noise cor-relator(s) 6-Water pressure gauge(s) 7-Data logger(s) 8-Meter rectification unit(s) 9-Valve(s) 10-Equipment for data processing 11-Other equipment necessary for monitoring and NRW reduction etc. * Local consultant cost	
Activity 3	KEWI develops and strenghtens capacity for training on NRW reduction measures.			
3-1	Japanese experts conduct technical training to KEWI instructors on NRW reduction measures, including OJT and pedagogical methods of teaching.			
3-2	KEWI revises the curricula, syllabi and training materials based on the Manual for NRW Reduction.			
3-3	KEWI conducts training based on revised materials and training results are evaluated.			
3-4	KEWI formulates a "Human Resources Development Plan" referring Human Resources Development Standard and implements training for WSPs nationwide.			
Activity 4	WASREB disseminates Kenya's NRW Reduction Standards to WSBs and all WSPs.			
4-1	WASREB conducts seminars on Kenya's NRW Reduction Standards for all WSBs and all WSPs.			
4-2	WASREB sends notice requesting all WSBs to develop a NRW Reduction Plan for their respective service area. All WSBs develop their own NRW Reduction Plan and also request each WSP under their jurisdiction to submit its own WSP NRW Reduction Plan			
4-3	WASREB continuously monitors the implementation of NRW reduction measures.			
4-4	WASREB continuously disseminates Kenya's NRW Reduction Standards through coordination meetings among WSBs and all WSPs.			

1: Manual refers to the document used by WSPs to implement NRW reduction measures.2: Guideline refers to the document used by WSBs to monitor WSP activities and conduct asset management.3: NRW Reduction Standards describe measures which should be taken by WSBs and WSPs in nationwide. NRW Reduction Standard includes the Manual for NRW Reduction, the Guideline for NRW Reduction, unified data and item which should be measured by regulated WSPs, and specification for NRW equipments.
4: KEWI's Human Resources Development Plan describes procedures how KEWI provides support to WSBs/WSPs and how WSBs/WSPs develop human resources on NRW reduction.

Chapter 7 Additional Methods Implemented for Project Operation and Lessons Learnt

7-1 Additional Methods Implemented for Project Operation

7-1-1 Establishment of PMC and PIC

PMC and PIC were established with the goal of ensuring smooth and peaceful implementation of activities across the many related organizations in this Project.

PIC was composed of members from WSB, WSP and KEWI, working under the guidance of WASREB. The results of PIC meetings were compiled by PMC. The role of PMC was to compile the discusions and make recommendations to the Ministry of Water, Environment and Natural Resourses.

It was appropriate to have established the two committees PMC and PIC, however on the ground, the main focus of activities was the examination and revision of the Manual and the WSP and WSB preparation of NRW Reduction Plan. There was much expectation that the two committees PMC and PIC would play a cross-sectional role to ensure operation of these activities, however these committees did not manage to play a key role in the NRW Reduction dissemination activities for the WSP. In the future, utilizing either or both these organizations for the dissemination of NRW reduction activities may be another option of operation.

7-1-2 Additional Method Preparation of Manual and Guideline

This Project started with the implementation of Meru WSP Case Study. The results of the Case Study were compiled to prepared Manual / Guideline Version 1. Three Pilot Projects were then implemented with water companies to examine sustainable operation management. The Pilot Projects were implemented in Embu WSP, Narok WSP and Kapsabet WSP. Results from each of these Pilot Projects were included in the Manual / Guideline, to prepare Version 2, Version 3 and Version 4. Each time improvements were made to the versions these improvements were presented at the next Workshop to weigh the usefulness by the WSB and WSP.

Manual / Guideline Version 4 was approved by the WASREB Board as NRW Reduction Standards and WASREB embarked on the dissemination of the standard nationwide.

By establishing a framework for operation as explained above, the progress of this Project was presented at least once a year at the Project Workshop. Technical transfer to related organizations and related persons were thus ensured.

This facilitated the understanding of NRW Reuction Standards for the technical staff involved in NRW reduction.

7-1-3 Reduction of NRW ratio in the Pilot Projects

In this Project, much importance was placed on the counterparts implementing the Pilot Projects themselves.

Pilot Projects were implemented in Embu WSP, Narok WSP and Kapsabet WSP. Each WSP had their difficulties. In each case, most appropriate methods for reducting NRW were discussed with the counterpart and the implementation plan was drawn. The counter part organization implemented the

activities. JICA Experts got involved at the time of analyzing the results of the implemented activities to formulate the next step forward.

The NRW ratio before and after the implementation of the Pilot Project using the above method, is shown in Table 7-1.

Table 7-1 NRW Ratio Before and After the Pilot Project

	Before (%)		After (%)	
Embu WSP Pilot Project Area	**68**	Octover 2010	**7**	June 2014
Whole supply area Embu	46		48	
Narok WSP Pilot Project Area	**61**	March 2011	**44**	July 2014
Whole supply area Narok	39		41	
Kapsabet WSP Pilot project Area	**69**	Februaly 2012	**36**	June 2014
Whole supply area Kapsabet	63		40	

Embu WSP is located at the foot of Mt. Kenya. Due to topographical reasons, there is high water pressure. Activity plans for Embu WSP were planned and structured with this in mind.

In Narok WSP, the original plan was to implement NRW reduction methods as well. However the preliminary survey conducted in Narok WSP showed that fundamental measures were necessary first. Therefore, activities such as preparation of distribution pipe network map, preparation of customer ledgers and observation of distribution and service pipes constructions were conducted.

Kapsabet WSP was the recipient of JICA Grant Aid for the construction of a new water treatment plant and pumping station and distribution pipes have also been upgraded. There was however lack of staff training. In this Project therefore technical guidance was given to the staff on method of measureing volume of distributed water, volume of water used and method of analysis, maintenance of customer ledgers and examining customer meters and detection of water leakages per area sections.

7-1-4 Establishment of NRW Reduction Training Course

NRW Reduction Training Course that was established in KEWI has only just started implementing its courses. Three Modules were formulated to tackle training on Physical Loss, Commerical Loss and GIS / NRW Reduction Plan preparation. Feedback from the participaticipants of the different Modules showed that many participants desired to receive training on all three Modules, but all combined into one training course. As a result, since October 2014 KEWI is making improvements to its Training Course to accommodate the feedback.

Never before has a Training Course been implemented specifically on NRW Reduction. From this point of view alone, the significance of the newly established NRW Reduction Training Course in this Project is big. Interest in regards to NRW Reduction seems to be increasing, and one such example was to a request by Mombasa WSP for an implementation of a Training Course.

An example of an additional effort or method applied for smooth operation of the Project was to take KEWI lecturers of the Training Course for practical field training in Narok. This method helped KEWI lecturers to gain field experience first-hand and formed the basis of giving practical field knowledge in addition to NRW theory to the participants.

Another method applied was to include KEWI lecturers in the WASREB led dissemination of NRW Reduction Standards seminars as facilitators. The facilitators were in a position to teach how to prepare the NRW Reduction Plan to the participants from WSB and WSP. By participating in the process of preparing the NRW Reduction Plan together with the participants, KEWI was able to obtain more feedback and different opinion that could be linked to its Training Course.

Pending items that need to be confirmed in the near future are, the speedy completion of curriculum improvement, secure funding from Ministry of Environment, Water and Natural Resource to ensure continued and sustainable implementation of activities, establishing a structure to monitor and evaluated KEWI activities by MEWNR and WASREB.

7-1-5 Completion of NRW Reduction Standards and Dissemination Activities

WASREB completed the preparation of the NRW Reduction Standards and in August 2014 were distributed to participants at the Final Workshop. At the dissemination seminars that were conducted preceeding the Final Workshop, not only the Standards were explained but the participants took part in group work to learn the process of preparing a NRW Reduction Plan. This group work structure was a suggestion made by the JICA Expert Team and a sample draft NRW Reduction Plan and forms were also submitted to WASREB. WASREB customized the sample forms to accommodate the needs for Kenya and used in the seminar.

7-2 Lessons Learnt

NRW measures have been implemented for a long time in other parts of the world, and the implementation methods do not differ whether the measures are implemented in developed or developing countries. The important point is to understand and select the measures that are most suitable to that country or to that water company.

In Kenya, the attitude of being “recipients” to assistance was very strong. This resulted in lack of leadership and ownership in taking the Project forward. In regard to the preparation of NRW Reduction Plan, the usual comments of water companies were that there were lacking equipment such as measuring devices and lack of funds.

To achieve results for the Objectives of the Project, the activities in year One were planned and implemented with JICA Experts playing key roles.

From the second year of the Project, a different approach was taken. No matter how long the process took, the Project ensured that Kenya side implemented the activities. In regards to implementation in WSP with little experience, it was decided to start NRW activities with measuring volume of water flow before progressing into other activities. The goal was to establish this process as a standard to all WSP nationwide.

The results however, are not immediately visible. Apart from Embu WSP, implementation of activities in the other WSP tended to slow down when JICA Experts were absent. One of the aims of this Project therefore became to instill more motivation for the implementation of NRW Reduction

activities. In reality, it was not possible to implement all NRW reduction activities with JICA funds. The key point of this Project was therefore to find a balance between raising motivation, which meant the WSP themselves implementing NRW reduction activities themselves, and providing appropriate advice and technical guidance.

This was a Project to provide technical assistance for the reduction of non-revenue water, but it was during this Project that many realized that NRW Reduction activities constitute just a part of the whole water work management. Full satisfactory results cannot be obtained by work done by the NRW reduction team alone. Activities against fisical loss (leakage) and commercial loss should be implemented by all over the water company.

Furthermore, it was realized that one water company alone cannot organizationally or financially successfully reduce NRW. In this Project, small results were seen but nationwide results could not be achieved.

Kenya's water works structure has been reorganized but in order for NRW Reduction to progress positively, all influencing factors must function in coordination with each other. This starting with the policies, decision–making and funds arrangement of higher authorities such as MEWNR and WASREB; activities of each water company and capacity building of their staff and also assistance from donors.

7-3 Suggestions

As part of future NRW Reduction activities, securing of funds and the roles and responsibilities of each counterpart organization must be clarified. With reforms taking place, it is important for each counterpart organization to understand each other's roles and responsibilities and work closely together to provide appropriate guidance and advice to WSP in their implementation of their NRW Reduction activities. In the past, WASREB and KEWI were parallel organization, and it is necessary for the two organizations to continue working together closely. The items that will need to be implemented by each counterpart organization are summarized below.

7-3-1 Ministry of Environment, Water and Natural Resources

(1) Sustainablilities of measures and funds

In order to ensure the sustainability of NRW reduction activities, the measure need to be sustainable and funds needs to be secured. KEWI requires funds to continue implementing its Training Course and WSB will need funds for equipment.

(2) Evaluation structure for KEWI NRW Training Course

In order to improve the quality of NRW Reduction Training Course, KEWI is currently establishing a structure where the NRW Reduction Training Course could be evaluated by related organizations. A good evaluating structure would be for MEWNR and WASREB to join forces to evaluate the Training Course.

7-3-2 WASREB

(1) Cooperation with County Government

WSB's authority will be transferred to the County in the future. WASREB has requested the 8 WSB to each prepare the NRW Reduction Plan, but in the future NRW Reduction Plan will be prepared in cooperation with the County Government, therefore it is necessary give guidance to WASREB accordingly.

(2) Continuous Support to WSP

It is recommendd that WASREB continue to disseminate the NRW Reduction Standards. It is important for WASREB to strengthen its monitoring of WSB to ensure that WSBs are supervising the WSP activities.

(3) Establish standard of distribution pipe and survice pipe and prepare construction manual

As the next step forward, WASREB will prepare standardization of distribution pipes and service pipes and construction manual for the replacement of pipes.

(4) Asset management of water facilities

Standards for management of assets of water facilities should be introduced and operational guidelines should be advised to water works organizations.

7-3-3 KEWI

(1) KEWI Training Course Implementation Plan

KEWI must prepare an annual and mid-term Training Course implementation Plan. It is important for KEWI to revise its Training Course as they are implemented over and over again. OJT is particularly important for WSP staffs. In such cases, OJT should be considered with the involvement of experienced WSP such as Embu WSP and implement activities together.

After participating in KEWI Training Course, the participants of KEWI Training Course should be in a position to apply the methods used to prepare the NRW Reduction Plan and apply the knowledge learnt.

(2) New Module for the Management Level

It was demonstrated through this Project that, for a successful preparation of NRW Reduction Plan and implementation, it is necessary to have strong management leadership. KEWI must now establish a new training Module for the management staff such as Managing Directors. At the Final Workshop, KEWI suggested structuring a Module that would take two days. When the new Module is prepared, its implementation must also follow closely.

7-3-4 WSB

WSB was in charge of monitoring, inspecting and evaluating WSP activities. With the reforms that have taken place in accordance with the new constitution, these roles and responsibilities will now be transferred to the County. For sustainable and continuous implementation of activities it is important to clarify these roles and responsibilities.

7-3-5 WSP

(1) Preparation of NRW Reduction Plan and Implementation of NRW Reduction Activities

Under the supervision and guidance of the WSB, each WSP is required to prepare the NRW Reduction Plan.

The process of preparation begins with the WSP attending the NRW Reduction Standards dissemination seminar organized by WASREB or attend a KEWI NRW Training Course to learn how to prepare the NRW Reduction Plan. After this, the WSP must prepare its own NRW Reduction Plan and submit it to WSB. The prepared Plan must then be implemented and it is recommended that the Manual is used to implement the NRW Reduction activities.

(2) Role of Embu WSP, Narok WSP and Kapsabet WSP

Embu WSP, Narok WSP and Kapsabet WSP that implemented Pilot Projects in this Project have also each prepared the NRW Reduction Plan. They are encouraged to implement the activities according to plan and regularly review and revise their Plans. As these three WSP are leaders in NRW Reduction Plan preparation and its implementation, visits from other WSP could be organized for practical learning or dispatching staff for helping other WSP on their grounds. Such ripple effects of results can be expected from this Project in the future.

Chapter 8 Record of Meeting

Record of meeting such as seminars, JCC were carried out in this project are as follows.

8-1 JCC

Item	Date	Participants
First JCC Meeting	24th September 2010	MWI, WASREB, KEWI, JICA HQ, JICA Kenya Office, JICA Expert Team
Second JCC Meeting	27th April 2011	As above
First PIC Meeting	9th September 2011	MWI, WASREB, KEWI, TANA WSB, RV WSB, LVN WSB, Meru WSP, Embu WSP, Narok WSP, Kapsabet WSP, JICA Kenya Office, JICA Expert Team
First PMC Meeting	30th September 2011	
Mid-Term Review Mission	21st August – 7th September 2012	MWI, WASREB, KEWI, Tana WSB, RV WSB, Embu WSP, Narok WSP, Kapsabet WSP, GIZ, JICA Expert Team, JICA Kenya Office
Third JCC Meeting	6th September 2012	MWI, WASREB, JICA Mid-Term Review Mission, JICA Expert Team, JICA Kenya Office
Second PIC Meeting	31st May 2013	MWI、WASREB、KEWI、TANA WSB、RV WSB、LVN WSB、Meru WSP、Embu WSP、Narok WSP、Kapsabet WSP、JICA Kenya Office、JICA Expert Team
NRW Reduction Plan Meeting	21st June 2013	WASREB、TANA WSB、RV WSB、LVN WSB、JICA Expert Team
Terminal Evaluation JCC Meeting	12th March 2014	Terminal Evaluation Team, MEWNR, WAREB, KEWI, JICA Kenya, JICA Expert Team

8-2 Workshop

Item	Date	Details/Participants
First Workshop	17th February 2011	Venue ; Utalii Hotel / 160 participants
Second Workshop	22nd November 2011	Venue : Utalii Hotel / 130 participants
Third Workshop	29th November 2012	Venue : Nakuru / 65 participants
Fourth Workshop	4th July 2013	Venue : Utalii Hotel / 163 participants
Final Workshop	26th August 2014	Venue : Utalii Hotel / 160 participants

8-3 Seminors

Item	Date	Details / Participants
First NRW Management Seminar	26th November 2010	Host: Tana WSB. 50 WSP under Tana WSP. Presentation on Meru WSP Case Study, Outline of Embu Pilot Project, Introduction of NRW Reduction Activities of Nyeri
First Embu Mini Seminar	8th April 2011	Embu Pilot Project Progress Seminar
Visit of Embu Pilot Project hosted by WASPA		45 participants from WSPs
Second Embu Mini Seminar	5th July 2011	EWASCO internal seminar on NRW reduction activities
Third Embu Mini Seminar	5th – 7th September 2011	Instructions on use of EPANET
Fourth Embu Mini Seminar	3rdOctover 2011	Examination of water pressure in service pipes
Fifth Embu Mini Seminar	9th 10th November 2011	Progress of Embu Pilot Project, Water tight test on different models of jointing
KEWI Training of Trainers	10th – 14th September 2012	5 participants from KEWI, 1 participant from WASREB, 3 participants from WSB, 3 participants from WSP
KEWI・GIS Training	10th – 24th September 2012	Site training at Ruiru Juja WSP GIS training to KEWI staff (Mr. Eric)
Embu WSP Site Training	24th September 2012	Embu WSP, Narok WSP, Nyeri WSP, Tana WSB
EPANET Training	5th 6th September 2012	Embu WSP, Nyeri WSP, Tana WSB, other 15 participants from KEWI etc.
KEWI 1st Training Course	26th-31st August 2013	At Kakamega city. Target: Staff of Western Water Service Ltd. 20 participants. Implementation of OJT with Module 1 of KEWI's Training Manual.
KEWI 2nd Training Course	14th-19th October 2013	At Busia city. Target :Staff of Western Water Service Ltd., Eldret WSP, Kapsabet WSP, AmatiWSP and others 25 participants Implementation of OJT with Module 2 of KEWI's Training Manual.
WASREB 1st Dissemination Seminar of NRW Standards	18th-22th November 2013	At Naivasha City. Target: Tana WSB, Rift Valley WSB, Lake Victoria North WSB, KEWI, MEWNR. Revise of Manual and Guideline and making of farther dissemination schedule.
KEWI Third NRW Reduction Training Course	2nd to 7th March 2014	Nairobi City. Target Group: WSPs falling under the jurisdiction of Coast WSB, with Mombasa WSP as focus point. 18 participants. Training was based on KEWI Training Course Module 1
KEWI Fourth NRW Reduction Training Course	24th to 29th March 2014	Nairobi City / Embu Town. Target Group: Staffs of Western Water Service Ltd., Eldoret WSP, Kapsabet WSP, Amati WSP. 8 participants. Training was based on KEWI Training Course Module 3
WASREB 2nd NRW Stadnard Dissemination Seminar	14th-16th May 2014	Nakuru City. Target: Rfit Valley WSB, assoiciate WSPs and County of directors of Water of Rift Valley Regions
WASREB 3rd NRW Stadnard Dissemination Seminar	21st-23th May 2014	Nyeri City. Target: Tana WSB, assoiciate WSPs and County of directors of Water of Tana Regions
WASREB 4th NRW Stadnard Dissemination Seminar	28th-30th May 2014	Isioro City. Target: North WSB, assoiciate WSPs and County of directors of Water of North Regions
WASREB 5th NRW Stadnard Dissemination Seminar	4th-6th June 2014	Nairobi City.Target: Athi WSB, assoiciate WSPs and County of directors of Water of Athi Regions
WASREB 6th NRW Stadnard Dissemination Seminar	11st-13th June 2014	Machakos City. Target: Tanathi WSB, assoiciate WSPs and County of directors of Water of Tanathi Regions
WASREB 7th NRW Stadnard Dissemination Seminar	18th-20th June 2014	Kisumu City. Target: LVN WSB and LVS WSB, assoiciate WSPs and County of directors of Water of LVN and LVS Regions
WASREB 8th NRW Stadnard Dissemination Seminar	25th-27th June 2014	Mombasa City. Target: Coast WSB, assoiciate WSPs and County of directors of Water of Coast Regions

8-4 Others

Related Organization	Date	Details
Water Sector Conference	24th February 2011	Attendance
JICA Embu Visit	22nd March 2011	Mr. Suemori, Senior Advisor Miyazaka Global Environmental Department/JICA Headquarters
First WASPA Annual International Conference &Exhibition	8th September 2011	Attendance
IWA Conference	17th October	Participated as a panelist

Chapter 9 Others

9-1 Movements in the structure of Water Sector in accordance with the New Consitution

In accordance to the new constitution, forty-seven (47) Counties have been established and and their boundaries have been determined. WSP will fall under the jurisdiction of the County. Work between the Ministry of Environment, Water and Natural Resources and the County has been demarcated.

9-2 Responsibilities of MEWNR

WASREB will fall under the umbrella of the Ministry of Environment, Water and Natural Resources. As in the past, WASREB will continue to hold ownership of WSP treatment plants, raw water transmission, distribution pipeline facilities and water facility assets. On the ground, the water works facility will be managed by WSB that have been entrusted by WASREB.

9-3 Responsibilities of the County

County has the responsibility to give out licenses to WSP, and the WSP is responsible for the management and operation of the water works. WSP is supervised by a committee, which is formed by County Director of Water (despatched from the Ministry of Environment, Water and Natural Resources), County Chief and organizations such as the Rotary Club. WSP is fundamentally an independent organization therefore staff salary and water works facility maintenance costs are paid through income from water charges, however the water company should end in red figures and it is for the County to assist the water company.

9-4 Status of the Project as at October 2014

As the transition of work responsibilities are currently taking place, there seems to be some disorder and confusion however WASREB has continued to function as per the Water Act 2002 and is giving advice and guidance to the County. When the current Water Bill is enacted into law and becomes Water Act 2012, the roles and responsibilities of organizations in the implementation of water works will be discussed.

Water Bill will approved by end of 2014 in Kenya congress. By that Water bill, WASREB will be changed their name to Water Service Regulatory Commission (WSRC). And 8 WSBs will unite 1 WSB and be changed name to Water Works Development Board (WWDB).