

**The Project for
Strengthening Addis Ababa Water and Sewerage
Authority's Management Capacity of Non-
Revenue Water Reduction
Terminal Evaluation Report**

March 2025

**Japan International Cooperation Agency
Global Environment Department**

GE
JR
25-0069

Table of Contents

Chapter 1. Introduction	1
1.1 Project Background.....	1
1.2 Project Overview.....	2
1.3 Objectives of Terminal Evaluation	3
1.4 Schedule of the Joint Terminal Evaluation	3
1.5 Joint Terminal Evaluation Team.....	3
Chapter 2. Evaluation Methodology	4
2.1. Framework of Terminal Evaluation.....	4
2.2. Terminal Evaluation Component.....	4
2.2.1 Verification of Achievement.....	4
2.2.2. Implementation Processes.....	5
2.2.3 Evaluation by Using Six Criteria	5
2.3 Data Collection Methodology.....	5
2.4 Status of Data Collection	6
2.5 Limitation of Evaluation	6
Chapter 3 Achievement of Project.....	7
3.1. Inputs.....	7
3.1.1 Inputs from Japan.....	7
3.1.2 Inputs from Ethiopia	8
3.2 Output	9
3.2.1 Achievement of Output 1	9
3.2.2 Achievement of Output 2.....	13
3.2.3 Achievement of Output 3	18
3.2.4 Achievement of Output 4.....	19
3.2.5 Achievement of Output 5.....	20
3.2.6 Achievement of Project Interim Purpose	21
3.2.7 Achievement of Project Purpose.....	22
3.2.8 Likelihood of Achievement of Overall Goal	23
Chapter 4. Implementation Process	24

4-1 Progress of Activities.....	24
4.2 Implementation of the Project.....	24
4.3 Monitoring	25
4.4 Communication.....	25
4.5 Collaboration with Other project /Donors.....	26
4.6 Ownership of the Project.....	26
4.7 Changes of PDM.....	27
Chapter 5 Evaluation Results.....	29
5.1 Relevance.....	29
5.2 Coherence.....	31
5.3 Effectiveness	32
5.4 Efficiency	34
5.5 Impact	37
5.6 Sustainability.....	38
5.7 Conclusion	39
Chapter 6. Recommendation.....	41
6.1 Recommendations to the Project.....	41
6.2 Recommendations to AAWSA	43
6.2 Recommendation to JICA	45
Chapter 7. Lessons Learnt.....	46

List of Tables

Table 1 Project Outline	2
Table 2 Member of Evaluation Teams.....	3
Table 3 Terms and Definitions used in PDM	4
Table 4 JICA's Evaluation Criteria.....	5
Table 5 Summary of JICA experts.....	7
Table 6 Summary list of materials and equipment from Japan.....	7
Table 7 Summary of Trainings in Japan	8
Table 8 Summary of Participation of Counterparts	8
Table 9 Achievement of Output 1	9
Table 10 Summary of target branches forming pilot Kirkos branch	9
Table 11 Summary of pilot and twinning blocks.....	12
Table 12 Output 2 and its achievement of OVIs.....	13

Table 13 Key issues and hampering factors of NRW reduction.....	14
Table 14 Summary of sample HHS results.....	17
Table 15 Billing amount before and after the NRW reduction in K-1 (North).....	17
Table 16 Billing amount before and after the NRW reduction in K-1 (South).....	17
Table 17 Output 3 and its achievement of OVIs.....	18
Table 18 Summary of selected cost-benefit indicators	18
Table 19 The results of Cost-benefit analysis of K-1	19
Table 20 Output 4 and its achievement of OVIs.....	19
Table 21 No of workshops and participants in the project.....	20
Table 22 Output 5 and its achievement of OVIs.....	20
Table 23 Details of Twinning blocks.....	21
Table 24 Summary of each block and customer data collection activities	21
Table 25 Project Interim Purpose and its achievement of OVIs	21
Table 26 Project Purpose and its achievement of OVIs.....	22
Table 27 Overall Goal and its likelihood of achievement of OVIs.....	23
Table 28 Summary of JCC meetings	24
Table 29 Changes of PDM (Version 1 to 3)	27

List of Figures

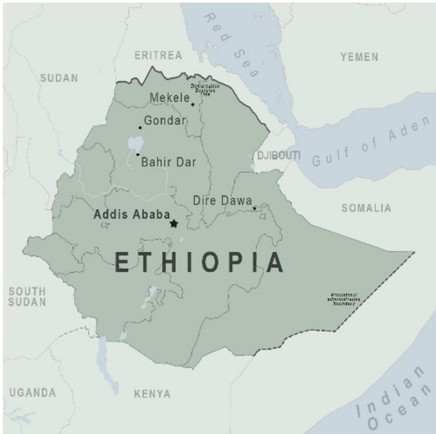
Figure 1 Pilot Kirkos branch and block systems.....	10
Figure 2 Monthly NRW ratio of K-1 North.....	12
Figure 2 Monthly NRW ratio of K-1 North.....	12
Figure 3 Spaghetti line and redesigned pipe line	14
Figure 4 Evaluation of working relationship with CPs/experts	25
Figure 5 Evaluation of communication between CPs and experts.....	26
Figure 6 Evaluation of CP's ownership of project	26
Figure 7 Global Agenda 19 Spiral of Growth of water utility	32
Figure 8 Evaluation of input (Experts)	35
Figure 9 Evaluation of input (Equipment)	35
Figure 10 Evaluation of input (Trainings in Japans).....	36
Figure 11 Evaluation of input (Counterparts)	36
Figure 12 Evaluation of input (Budget and Inkind).....	37

Annex

- Annex 1: Terminal Evaluation Schedule
- Annex 2: Proposed PDM version 4
- Annex 3: Comparison table of changes in PDM 3 and 4

Project Implementation Map

Map of Ethiopia



Center for Disease Control, US Gov. wwwnc.cdc.gov/travel/destinations/traveler/none/Ethiopia

Map of Addis Ababa City



Final Long Term Road Map and Strategic Document for Water Supply and Sewerage Services, AAWSA, Metafelia Consulting Plc. 2017

Survey Photographs



Installed Electromagnetic Flow Meter



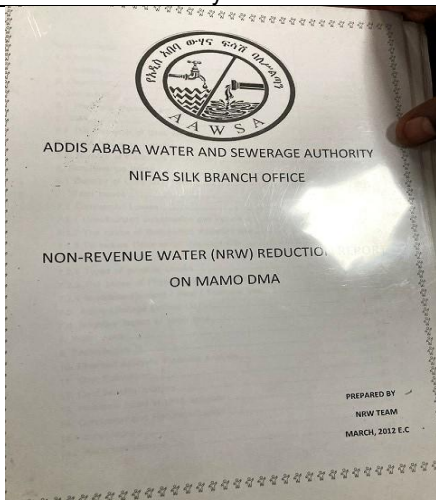
Data logger



Customer Meter with Improper Installation
(Before Correction)
Photo Provided by Mekanisa Branch



Customer Meter after Installation Correction
Photo Provided by Mekanisa Branch



DMA activity report



Road after Completion of the Corridor Project



Excavated Area of the Corridor Project
(Exposed Pipes)



House Damaged by the Corridor Project



Water Leakage Point



Visit to the Corridor Project Area



Area Cleared by the Corridor Project



Survey Team Visiting the Corridor Project
Area



Participants of the JCC (Including AAWSA Executives)



Heads of the Japan-Ethiopia Evaluation Team and Deputy Manager of Water Division



Discussions with Counterparts



Joint Terminal Evaluation Team Members



AAWS Headquarters



Nifas Slik Branch Office

Abbreviation and Acronym

Abbreviation and Acronym	Full Name
AAWSA	Addis Ababa Water and Sewerage Authority
CAD	Computer Aided Design
CP	counterpart
DGM	Deputy General Manager
DMA	District metered area
ETB	Ethiopian Birr
HDPE	High-Density Polyethylene
HHS	Household Survey
ICT	Information and Communication Technology
IWA	International Water Association
JICA	Japan International Cooperation Agency
JCC	Joint Coordinating Committee
MM	Minutes of Meeting
NRW	Non-Revenue Water
OVI	Objectively Verifiable Indicators
PDCA	Plan-Do-Check-Action
PO	Plan of Operation
PDM	Project Design Matrix
R/D	Record of Discussion
SDGs	Sustainable Development Goals

Chapter 1. Introduction

1.1 Project Background

The Ethiopian government formulated the Ten Years Development Plan 1 (2021-2030), a national 10-year development plan in 2021, and is implementing water resource development and water supply projects with the goal of achieving water supply of 25 L/day/person in rural areas and 100 L/day/person in urban areas.

The achievement rates in 2021 for rural and urban areas were approximately 55% and 59% respectively, and more developments and improvements of water supply were required to achieve these goals.

Particularly in urban areas, water supply infrastructure has not kept up the pace of rapid population growth. The population of Addis Ababa City is estimated 5.2 million as of 2022. The population is increasing at an annual rate of approximately 4.4%¹, and is estimated to reach approximately 7.3 million in 2030.

The demand for water is rapidly increasing as the population increases. The Addis Ababa Water and Sewerage Authority (hereinafter referred to as "AAWSA") who is responsible for the water supply services of Addis Ababa, has established a "BUSINESS PLAN 2011-2020" in 2011. In its plan, the water supply amount for 2020 was set at 763,000 m³/day in order to respond to the rapidly increasing water demand. To meet this target, the city began developing new water sources and constructing water treatment plants, and set a goal of reducing the citywide Non-Revenue Water (NRW) rate to 20% in order to make the maximum use of existing water sources.

While the water demand in 2022 is estimated to be approaching 900,000 m³/day exceeding its predictions due to rapid population growth, large-scale water source development projects were still at the planning stage, and the water distribution volume in 2022 was approximately 511,000 m³/day: not able to fully respond to the demand. Additionally, the NRW ratio remains high at approximately 40%: it was estimated that 70% of its ratio is due to physical losses.

Water Resources Management Policy, the highest national policy in the Ethiopian water sector, stipulates that full cost recovery for water services should be achieved through water charges. Although AAWSA's management goal by 2020 was to gradually achieve full cost recovery and generate 25% of the financial resources needed for the construction and maintenance of water facilities from the profits, it has been relied on the subsidies from Addis Ababa City: for approximately 80% of its capital expenditures over the past 11 years is supported by the subsidies. The water tariff collection rate at the time of the detailed planning study was approximately 92%. However, the water tariffs were kept at a low level of approximately 6 yen/m³ to 85 yen/m³ (increasing rate according to the amount of water used). For AAWSA, it is necessary to raise water tariffs in order to achieve full cost recovery. Due to the low level of water services, such as intermittent water supply and insufficient water pressure, planned water tariff increases have not been materialized, and AAWSA's budget continues to rely on city's financial supports.

¹ <https://worldpopulationreview.com/cities/ethiopia/addis-ababa>

Against this background, “The Project for Strengthening Addis Ababa Water and Sewerage Authority’s Management Capacity of Non-Revenue Water Reduction” (hereinafter referred to as the Project) has been implemented. The project aims at strengthening AAWSA's ability to implement and manage NRW countermeasures in order to effectively utilize existing water resources: responding to high water demands and contribute to improving water services.

The project plans to implement NRW countermeasures that are cost-effective and based on the NRW reduction plan formulated by the project. By doing this, the management efficiency of AAWSA's water supply business is expected to improve. As the revenue base is strengthened by increasing water users' willingness to pay through improved water supply services, thereby sound water supply business management can be achieved. Furthermore, the project is consistent with AAWSA's management goal of reducing the NRW ratio to 20%. This is consistent with Ethiopia's national policy, which stipulates that water utilities to be operated under the principle of full cost recovery.

The project activities begun in 2021 for the duration of 4 years and Japanese experts have been dispatched. As the project will be completed in August 2025, the joint terminal evaluation is organized to analyze the prospects for achievement of project purpose and outputs, and evaluate the achievements by using JICA’s evaluation criteria. In addition, the evaluation will extract the recommendations for the remaining project period and lessons learned from the project which can be used for the similar JICA’s project in future.

1.2 Project Overview

The project is implemented from August 2021 for the duration of 3 years with the possibility of extension of 1 year. At the 4th Joint Coordinating Committee (JCC) meeting in July 2024, AAWSA and the experts agreed to extend the project for one year. The outline of project based on the current Project Design Matrix (PDM) version 3 is described in Table 1.

Table 1 Project Outline

Goals	Narrative Summary
Overall goal	AAWSA's water supply business is efficiently conducted by the cost-benefits management of NRW reduction.
Project Purpose	AAWSA's operation and management capacity of NRW reduction is strengthened.
Project Interim Purpose	Knowledge and techniques accumulated in the pilot branch office are ready to be transferred to another branch office.
Output 1	NRW monitoring system is established at selected pilot branch office.
Output 2	Capacity to implement and manage NRW reduction measures is strengthened in the pilot branch office.
Output 3	Capacity for cost-benefits analysis of NRW reduction measures by the pilot branch office is strengthened.
Output 4	Technical skills and business management capacity on NRW control is improved at AAWSA Head Office and branch offices.
Output 5	Knowledge and techniques accumulated in the pilot branch office are transferred to another branch office.

Source: PDM version 3

1.3 Objectives of Terminal Evaluation

The objective of this terminal evaluation is to confirm the project activities and achievements of outputs and project purpose and extract recommendations to the remaining project period and lessons learnt to the future project. Specifically, Joint Terminal Evaluation (hereinafter referred to as “Evaluation”) intends to:

1. To verify the level of achievement of the Outputs and the Project Purpose as indicated in PDM;
2. To identify factors that contributed or hampered the performance of the Project;
3. To analyze the JICA’s technical cooperation and overall project intervention from the point of views of the six evaluation criteria; and
4. To identify recommendations to the Project, AAWSA and JICA before and after the Project completion and extract lessons to be used for the planning and implementing similar technical cooperation projects in the future.

1.4 Schedule of the Joint Terminal Evaluation

The terminal evaluation was conducted from 26 February to 18 March 2025. The detailed schedule of evaluation is in Annex 1.

1.5 Joint Terminal Evaluation Team

This evaluation was conducted jointly by representatives of Ethiopia and Japan. The member of evaluation teams (hereafter called as the Team) is shown in Table 2.

Table 2 Member of Evaluation Teams

Country	Role	Name	Organization
Ethiopia	Team Leader	Ms. Meseret Assefa	Head of General Manager Office and Legal Advisor, AAWSA
Japan	Team Leader	Mr. Yoshiaki Yokota	Global Environment Department Japan International Cooperation Agency
	Planning	Ms. Eri Noda	Global Environment Department Water Resources Group, Japan International Cooperation Agency
	Evaluation Analysis	Ms. Hiroko Sugimoto	Japan Development Services

Source: Evaluation team

Chapter 2. Evaluation Methodology

2.1. Framework of Terminal Evaluation

The objective of this joint terminal evaluation is to assess the project's achievements against Record of Discussion (R/D), the current PDM, and the Plan of Operation (PO) so far. The evaluation team studied on the achievement of project purpose, inputs and outputs and the likelihood of achieving Overall goal. It also examined the implementation processes and conducted evaluation by using JICA's evaluation criteria shown in Table 4. The Team reviewed the project plan for the remaining implementation period, proposed recommendations for this period and after the completion of project, and extracted lessons learnt from the project. The result of evaluation was compiled into a terminal evaluation report, which was presented to the JCC for its approval. The decision by JCC was recorded in Minutes of Meeting (MM) which was agreed and signed by the Ethiopian and Japanese representatives.

2.2. Terminal Evaluation Component

There are three components in this terminal evaluation: 1. Verification of Achievement, 2. Implementation Processes, and 3. Evaluation by using six criteria. Each detail of component are shown below.

2.2.1 Verification of Achievement

The evaluation team assessed the achievements of Project Purpose and Outputs against current version of PDM (Version 3), Plan of Operation (PO) and RD. PDM is the framework of project where Overall Goal, Project Purpose, Outputs and Inputs were defined. These achievements are measured by the achievement of Objectively Verifiable Indicators (OVIs). When a set of OVIs are achieved, Overall Goal, Project Purpose and Outputs are considered as achieved. Table 3 presents the terms and definition used in PDM.

Table 3 Terms and Definitions used in PDM

Terms in PDM	Definitions
Overall goal	Development effects expected in about 3-5 years after the completion of project. The effects will be realized as a result of the achievement of project purpose.
Project Purpose	Objective that is expected to be achieved by the end of project. It should be described as a specific benefit or impact given to the target group.
Outputs	Objectives/services to be realized in order to achieve project purpose through implementing a series of project activities.
Activities	Specific actions intended to produce project outputs by effective use of project inputs.
Important Assumption	Conditions required for a success of project but exist outside the control of project.
Preconditions	Requirements prior to the launch of project. Project cannot be expected to be successful if it is started before pre-conditions are met.
Objectively Verifiable Indicators	Indicators to verify achievements of project purpose outputs and Overall goal. Indicators should be objectively verifiable and measurable.
Means of Verification	The data sources required to verify OVIs.
Inputs	Inputs are human, financial, and material resources required for each project activity.

Source: JICA Project Evaluation Guideline 2010

2.2.2. Implementation Processes

In the implementation processes, the Team reviewed the functionality of project management such as decision making, timeliness of implementation of activity, communication, and project monitoring. Ownership of project by AAWSA counterparts (CPs) and cooperation with other donor's project were also studied.

2.2.3 Evaluation by Using Six Criteria

Based on the information collected, the Team evaluated the project achievements by using six evaluation criteria shown in Table 4.

Table 4 JICA's Evaluation Criteria

1. Relevance	The extent to which the intervention objectives and design respond to beneficiaries, global, country, and partner/institution needs, policies, and priorities, and continue to do so if circumstances change.
	• Whether the Project responds to the needs of target group and society in Ethiopia • Whether the methodology taken in the Project is appropriate • Whether the Project is in line with Ethiopia (AAWSA)'s development goal in water sector
2. Coherence	The compatibility of the intervention with other interventions in a country, sector or institution.
	• Whether the Project is consistent with the Japan and JICA's assistance policy for Ethiopia • Whether the Project is in line with international goals and initiatives such as SDGs
3. Effectiveness	The extent to which the intervention achieved, or is expected to achieve, its objectives, and its results, including any differential results across groups.
	• Current achievement of project outputs and project purpose. • Effects by external factors as well as contributing/hampering factors for the achievement of project purpose and outputs.
4. Efficiency	The extent to which the intervention delivers, or is likely to deliver, results in an economic and timely way.
	• Whether activities were enough/relevant to produce expected project outputs. • Whether inputs by Ethiopia (AAWSA) and Japanese were appropriate for the achievement of project purpose.
5. Impact	The extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects.
	• Likelihood of achieving Overall goal in a few years after the completion of project. • Positive and negative impacts which are not assumed at the time of project design. • Impacts to social system and rules, happiness of people, human rights, gender and environment.
6. Sustainability	The extent to which the net benefits of the intervention continue, or are likely to continue.
	• Sustainability of achievement of project after the completion of project, assessed in policy, resources such as human and financial, and skills and knowledges gained in the project.

Source: Definition of six evaluation criteria by OECD DAC Network on Development Evaluation,
<https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm>
JICA Project Evaluation Guideline

2.3 Data Collection Methodology

To collect the information and data necessary for the evaluation, following methods were used.

- Document study: existing documents such as monitoring sheets, experts' reports, meeting presentations, aid strategies, materials produced by the Project, and other documents related with the Project were reviewed and analyzed.
- Questionnaires: Questionnaires were sent to JICA experts and AAWSA CPs and their responses were collected.
- Interviews: The Team interviewed experts, CPs and donors either in person or via online.
- Observation: the Team visited the site and/or observed project activities.

2.4 Status of Data Collection

Status of data collections are as follows.

- Total 49 persons both online and in person were interviewed. The numbers are JICA experts (8); local project staff (2); 38 AAWSA managers and staff (38) and donor (1).
- Total 22 questionnaires were returned (responses from 8 experts and 14 AAWSA managers and staff)
- Experts' monthly reports, completion reports, JCC meeting minutes and presentation, national strategy and detailed planning study reports and other documents were reviewed.

2.5 Limitation of Evaluation

Some of the limitation of data collection and analysis are:

- In some interviews, language (English-Amhara) was barrier. Lack of local language skill of interviewer was challenge to understand documents written in Amhara;
- Due to limited available time, site visits were not conducted;
- AAWSA manager and staff who were not in target branches were not interviewed hence the degree of expansion of project activities could not be confirmed.

Chapter 3 Achievement of Project

3.1. Inputs

Inputs are the resources delivered to the project to implement project activities. Inputs from Japan and Ethiopia were studied.

3.1.1 Inputs from Japan

Inputs from Japan are in the form of: 1. Experts 2. Equipment and Materials and 3. Trainings in Japan. Dispatch of experts and delivery of equipment were affected by COVID-19, internal conflict and other external factors.

1. Experts

As of Feb. 2025, total 12 experts were dispatched from Japan. The summary of experts is shown in Table 6. The first expert arrived in Ethiopia in August 2021 due to COVID19 travel restriction, the arrival was delayed for a few month.

Table 5 Summary of JICA experts

Title	Name	Person/Month
Chief Advisor / NRW Control 1 Pipe Renovation Plan1/ Construction Supervision1	Toru AOKI	16.56
Co-Chief Advisor / NRW Control 2	Takehiko OGA	4.83
Business Management	Daizo IWATA	9.32
NRW Reduction Plan	Hiroshi HIROWATARI	3.53
	Hideo ISHII	2.93
Pipe Renovation Plan	Yuichiro KONNO	1.5
Pipe Renovation Plan2	Masataka KURODA	4.63
	Shinkichi KOBAYASHI	
Leakage Detection	Junichi TAKAHASHI	7.8
Pipe Joining Technology	Satoru HADA	4.83
Tariff Collection / Commercial Loss	Akino KITAZUME	9.27
Procurement Plan	Masahiro KAWAMOTO	5.1
	Total	70.3

Source: Experts' monthly reports

2. Materials and Equipment

List of materials and equipment provided from Japanese side in Phase 1 and 2 are shown in Table 6. The procurement expert indicated that the arrival of equipment such as electromagnetic flow meters experienced delay due to the conflict in the Middle East as the fleet with the consignments had to be rerouted, adding extra time for the delivery.

Table 6 Summary list of materials and equipment from Japan

Phase 1	Phase 2
Listening sticks, customer meters, data loggers and receivers, Portable flow meters and censors, water pressure data loggers, leak detector, air compressor, portable meter test	Pipes of various sizes, electromagnetic flow meters, pressure sensor, data logger, flange adopters, dismantling joints, flange spigot, collars, joints, gate bulbs, head hooks

bench, butt fusion, electro fusion, generator, water pressure measurement, wrenches, pipe cutter, impact drill, HDPE pipes, HDPE connections, butterfly, engine air compressor	
--	--

Source: Experts list

Further, Japanese side sub-contracted the local contractors for the construction of flow meter chambers. The cost of constructions had to be revised due to high inflation in Ethiopia.

3. Trainings in Japan

Trainings in Japan were implemented three times. Total 22 AAWSA CPs received trainings in Japan. The first training planned in 2022 was canceled. Rescheduled the same training was implemented in the second phase. The summary of each training in Japan is shown in Table 7.

Table 7 Summary of Trainings in Japan

Training date	No of participants	Target group	Location	Training Concept
Sept. 24-Oct 6, 2023	8	Managers and officers from NRW sections	Kitakyushu, Japan	NRW management
Aug. 18-31, 2024	6	Management	Kitakyushu, Japan	NRW management focusing on commercial losses reduction
Sept.29-Oct.12, 2024	8	Engineers and Technician (mainly for water distribution)	Kitakyushu, Japan	NRW management focusing on Block system

Source: Training reports

In the questionnaires, almost all respondents evaluated the content of trainings in Japan as “very good”. Some of the participants felt the training period was short. Towards the end of the trainings, the participants formulated the Action plans which incorporating their learnings from the trainings to apply their work in AAWSA.

3.1.2 Inputs from Ethiopia

Inputs from AAWSA are counterparts and budget for project activities.

1. Counterpart

A hundred (100) AAWSA managers, engineers, officers and technicians participated in the project activities. Table 8 shows the summary of CPs and their departments.

Table 8 Summary of Participation of Counterparts

Belongings/Output	CP number
AAWSA Headquarters	18
Branch (Megenagna)	26
Branch (Nifas Silk)	16
Branch (Mekanisa)	17
Branch (Akaki)	11
Output 3	12
Total	100

Source: from experts

2. Budget for the activities

AAWSA provided the project budget in the form of human resources and materials (pipes and meters). Budgets were used for the payments of household survey. At the beginning of the project, the budget for the necessary activities of the project were not provided. But the budgets were provided in the 3rd and 4th year of the project.

3.2 Output

The evaluation team confirmed the achievements of Outputs against OVIs. The team found some of the OVIs were not clear of their achievements or difficult to confirm intended achievements. The team describes levels of achievements as following: the OVI that is already achieved is described as “Achieved”; the OVI that is not achieved and can’t be determined if it will be achieved by the end of the project is described as “Not yet achieved”; the OVI that is likely to be achieved by the end of the project is described as “Likely to be achieved”; the OVI that is less likely to be achieved by the end of the project is described as “Less likely to be achieved”; the OVI that will not be achieved is described as “Will not be achieved”.

3.2.1 Achievement of Output 1

Output 1 and its achievement of OVI is shown below. At the time of this evaluation, the monitoring system for NRW in pilot branch has not been established and it is less likely that the system will be established by the end of project.

Table 9 Achievement of Output 1

Output 1	OVI	Achievement
NRW monitoring system is established at selected pilot branch office.	1-1 Establishment of proper and accurate monitoring system.	Less likely to be achieved

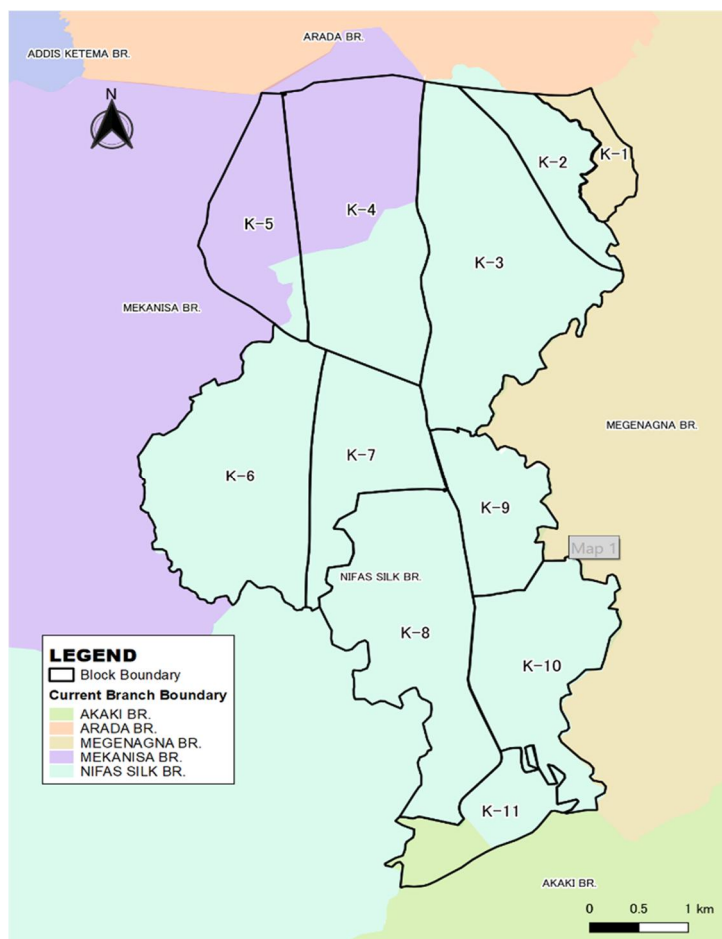
1-1 Establishment of proper and accurate monitoring system.

At the planning survey of this project, it was agreed that one branch will be selected as the target branch where initial project activities will be conducted. Criteria for the selection of one pilot branch was agreed during the survey. At the inception of the project in August 2021, the experts’ team collected information/data necessary for the selection of pilot branch from existing eight (8) AAWSA branches. Upon the completion of data analysis, the experts recommended two candidate branches (Nifas Silk and Mekanisa) to AAWSA. In November 2021, AAWSA proposed that Kirkos branch to be selected as the pilot branch. AAWSA has a plan for restructuring current branches from 8 to 12 branches and the Kirkos branch is one of the branches to be established in future. The parts of existing four (4) braches (Akaki, Megenagna, Mekanisa and Nifas Silk) form the Kirkos branch. The area and size of Kirkos branch is shown in Figure 1 and Table 10. Since Kirkos branch has not been established yet, the project agreed to implement activities in four existing branches.

Table 10 Summary of target braches forming pilot Kirkos branch

Branch	Area (%)	Customer	
		Number	Percentage (%)
Nifas Silk	81.8	41,525	80.6
Mekanisa	14.0	9,227	17.9
Megenagna	2.4	648	1.3
Akaki	1.8	97	0.2
Total	100	51,497	100

Source: The experts' monthly report September 2022



Source: The experts' monthly report

Figure 1 Pilot Kirkos branch and block systems

At the time of this evaluation, the Kirkos branch has not been established. From the interviews, the branch office's construction is ongoing. However, the exact date of establishing Kirkos branch has not been decided.

In this evaluation report, Kirkos branch is called as pilot branch or Kirkos branch area and the four branches are called as target branches.

1. Introduction of block system

R/D signed in 2019 indicated that the one pilot branch is selected to implement project activities. After the selection of pilot branch, the experts proposed the Kirkos branch to be divided into block distribution system (hereafter called as block system). The recommendation of establishing block system came from the

expert from the Kitakyushu Waterworks where the block system is used to manage the NRW and water distribution.

The block system was proposed as effective approach for physical loss reduction. The system is hydrologically isolated with one or a few inlets and outlets. The initial survey of existing system of Kirkos branch area had 23 crossings points with other branch boundaries that the monitoring of many flow meters was considered as challenge in terms of work load and maintaining the accuracy of measurements. In addition, block system is easier to manage NRW activities. The plan was to divide the Kirkos branch area into 11 blocks shown in Figure 1.

At the time of this evaluation, K1 block has been established and the water volume in the block has been monitored. Establishment of remaining blocks faced following challenges and no other blocks has been established.

- Agreements of the locations of flow meter installations and constructions of meter chambers took longer than the plan. The initial arrangements of construction of meter chambers by AAWSA was changed that the experts outsourced the construction of chambers which took extra time to procure. AAWSA agreed to provide the construction supervision.
- Lengthy process of obtaining construction permits of chambers from the city authority and other permits further delayed the construction.
- Procurement and delivery of electromagnetic flow meters were delayed due to the disruption of ocean transport due to the international conflicts. Existing mechanical flow meters were installed while waiting for the arrival of electromagnetic flow meters.
- Existing AAWSA's pipe network data was outdated and CAD (Computer Aided Design) data in smaller size pipes were not available. Pipe network data on the paper differed size, material and locations of pipes on the ground, pipes recorded on the ground were not found or unknown pipe networks was found in the map. This caused the major delay.
- The Corridor project, the road expansion and area development project, affected the project. In March 2023, the demolition of roads and structures surrounding areas caused the damages on water pipes and meters. The demolitions was implemented in very short notice (a day), staff from the water distribution departments both main office and branches were occupied with the responses to the Corridor project, reducing available manpower for the block system. Also, the planned installation of meter chambers within the Corridor project area had to be changed or stop until the project is completed.
- Discrepancy of pipe network data or locations bulbs are also caused by the Corridor project. Branches replaced pipes which are not updated or those changes affected the initial isolation plan.
- Further the coordination is required due to divided responsibilities of AAWSA's water distribution departments by the sizes of pipes and requiring to deal with different departments in head office and branches.

The latest report by the experts (January 2025) indicates that the isolation of K-11 block has been completed. As the establishment of entire block system is taking much longer time than planned, the experts

and AAWSA agreed to prioritize establishing some blocks (K-5, K-7 and K-11) over other blocks (hereafter called as priority blocks) in Phase 2 period². The latest reports by the experts indicate that the separation of K-5 and K-7, K-6 and K-7, and K-7 and K-8 still have challenges of hydrological separations.

Table 11 Summary of pilot and twinning blocks

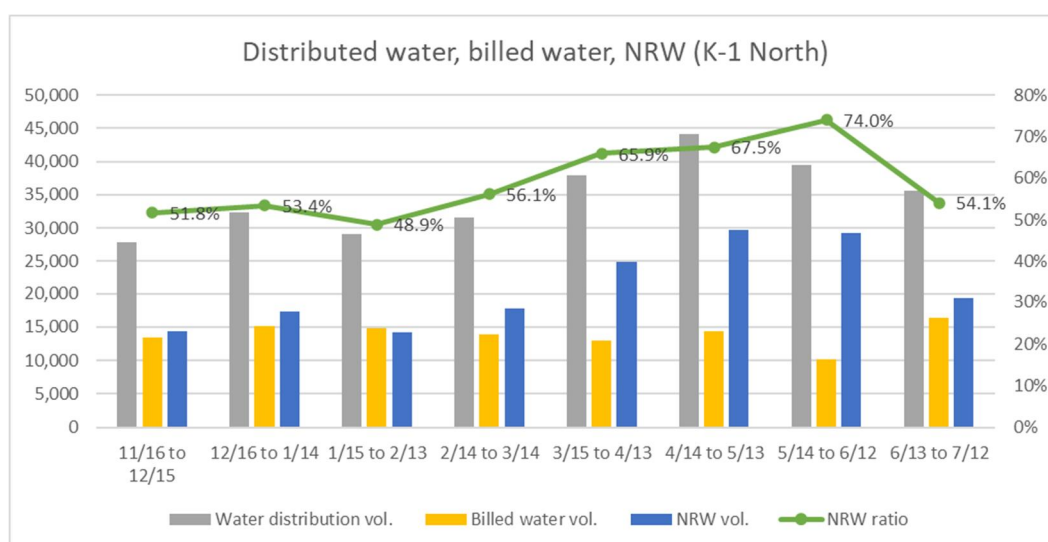
Name of block	Branch	Area (ha)	No of customer
K1	Megenagna	55	687
K5	Mekanisa and Nifas Silk	180	2,893
K7	Nifas Silk	206	2,120
K11	Nifas Silk and Akaki	119	433

Source: experts' monthly report

Monitoring of NRW

In December 2023, monitoring of water volume in K-1 block has started and the NRW baseline ratios have been established as 50.8% (K-1 North 52.1% and K-1 South 25.7%).³ The monthly trends of NRW ratio of K-1 (North) from Nov/Dec 2023 to June/July 2024 is shown below.

Figure 2 Monthly NRW ratio of K-1 North



Source: Progress report Phase 2

Figure 3 Monthly NRW ratio of K-1 North

The experts express a concern about the high fluctuation of monthly NRW ratios of K-1 North indicating whether the NRW ratio will reflect the effects of NRW activities properly.

Although only one block system (K-1) is established, AAWSA managers and staff consider the block system as an effective approach of NRW management. In their interviews, the managers and sub-process owners explained that AAWSA have been trying to reduce NRW though District Metered Area (DMA)

² The project is implemented into three phases. Phase 1. April 2021-Sept. 2023; Phase 2 April 2023-September 2024; Phase 3 October 2024 –August 2025. These phases are the contractual phases between experts and JICA. Project activities were continued without stopping.

³ Source experts' monthly report Jan. 2024.

approach but the area that covers by DMA is small (less customers) and the impact of NRW reduction activities was limited. In some cases, when established DMA is not monitored, it disappeared due to the development of area where DMA is located. For AAWSA, the block system offers benefits such as impact of NRW reduction activities is greater and the ease of control of water distribution with a few inlet and outlet.

AAWSA other branches outside of target branches are also establishing pilot blocks. Megenagna branch established one additional block after K-1, and will plan to create other blocks in their branch.

It is fundamental to establish monitoring system of each block and calculate NRW baseline values. The evaluation team recommends the project team (experts and CPs) to discuss and agree on speeding up the establishment of block system in pilot branch as soon as possible.

3.2.2 Achievement of Output 2

As the establishment of monitoring system in Output 1 has been in delay, the project agreed that activities in Output 2 to focus on K-1 (North and South) as a pilot block and three additional blocks (K-5, K-7, K-11) to be twinning blocks. The NRW activities of Output 2 in K-1 will be replicated in those twinning blocks in Output 5.

The evaluation team found that the determining the achievements of OVIs of Output 2 is a challenge. OVIs do not include measurable goals/targets. Therefore, the team described the activities and their results related with the indicators and assumed their achievements if the activities produced the results. Further, the team recommends the revisions of OVIs to clarify the achievements. Output 2 and its achievement of OVIs are shown below.

Table 12 Output 2 and its achievement of OVIs

Output 2	OVI	Achievement
Capacity to implement and manage NRW reduction measures is strengthened in the pilot branch office.	2.1 Pipe network renovation plan	Not yet achieved
	2.2 Action plan of NRW reduction activities	Achieved
	2.3 Results of OJT	Achieved

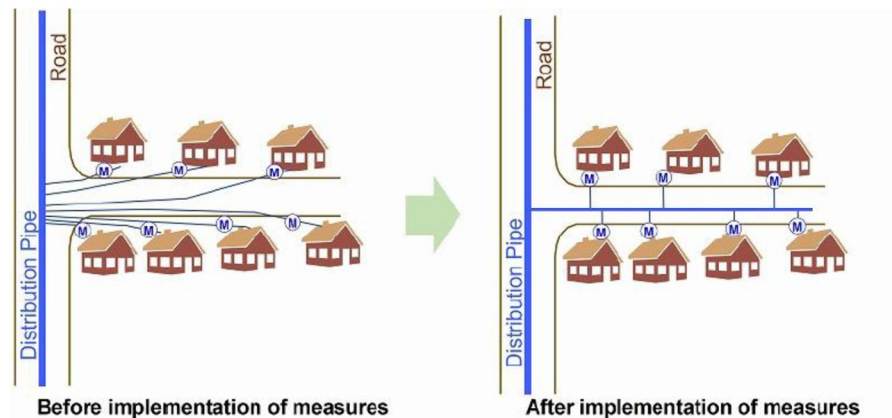
2.1 Pipe network renovation plan

In this OVI, the evaluation team considered that the formulation of pipe network plan and its implementation in K-1 as the achievement.

To understand the situation of pipe network of the pilot branch, the project conducted the field survey and reviewed existing distribution network drawings and customer data. Replacement of pipes can reduce water losses and NRW reduction. This effect of pipe replacement was to be demonstrated in K-1.

In October 2021, the project started to collect the network data necessary to understand the situation of pilot branch, existing pipe installation plans, construction capacity for pipe replacement and cost of pipe replacement were assessed. In February 2023, the list of priority activities were presented and candidate blocks for the replacement were selected. The replacements of spaghetti pipes (Figure 3) were considered as

effective pipe replacement activities for physical losses. The pipe network plan for K-1 has been created and the replacement plan was to be implemented in 2025. However, the Corridor project demolished the houses where the replacement of pipes were planned. With remaining fewer customers, the effect of replacement of pipe may be minimum. The experts and Megenagna branch are discussing alternative location of pipe replacement. Therefore, this OVI has not been achieved.



Source: Progress report Phase 2

Figure 4 Spaghetti line and redesigned pipe line

2.2 Action plan of NRW reduction activities

Based on the pilot block activities, the Action plan for NRW reduction is formulated and implemented. The evaluation team considers that the formulation of Action plan for K-1 is the achievement of this OVI.

Based on the information collected from the field study earlier, Table 13 shows the summary of key issues and hampering factors of NRW reduction at AAWSA.

Table 13 Key issues and hampering factors of NRW reduction

Area	Key issues and hampering factor
Water distribution	• Intermitted water supply • Difficulty of maintaining water pressure due to hilly landscape • Aged pipes and use of less durable plastic pipes
Water distribution monitoring	• Water distribution volumes were measured by each branch. On the boundaries, there were multiple flow meters (in some are too many) which make getting accurate measurement more challenging. • Too many flow meters (more than 100) complicate the calculation of NRW baseline volume. • Some places do not have flow meters • Water sourced inside branch makes the calculation of water distribution complicated.
NRW reduction activities	• DMA based NRW reduction activity is effective in limited area and its impact is small, sustainability of activity is low • Only visible (surface) leak detections were conducted but invisible (underground) leak detections were not conducted. • Pipe network map was not updated with the low accuracy and necessary information to understand the pipe locations was missing. • Many destructions of pipes by constructions not by AAWSA.

	• Customer meters with older than 20 years have not been replaced. • Zero reading consists 10% of meter readings, suspecting improper meter readings
--	---

Source: experts report phase 2

The most prominent challenge according to the expert's report is that lack of accurate water measurement and analysis. AAWSA calculates NRW ratios by using water balance sheet of International Water Association (IWA), but water volumes were largely estimated. The reports suggest that intermitted water supply makes continuous monitoring and measurement of water volume challenging for AAWSA and accurate monitoring and measurement of water in blocks is the first step for the NRW reduction.

Based on above findings, the project initially formulated the NRW Action plan for the pilot branch and presented to AAWSA in July 2022. At the time of this evaluation, the experts stated that 5 year NRW reduction strategic plan for pilot Kirkos branch is under the discussion with AAWSA. Based on the reduction plan, the project will formulate action plan for 4 target branches. Since the plan is already formulated, this OVI has been achieved.

2.3 Results of OJT

The evaluation team considered that the implementation of On the Job Training (OJT) as the achievements of OVI. By the time of this evaluation the both physical losses and commercial losses NRW reductions activities have been conducted in K-1. Therefore, this OVI has been achieved.

1. Physical losses reduction in K-1

In K-1, the physical losses reduction activities such as leak detection and pipe repair training were conducted through OJT and trainings.

1. Leak detection skills

In April 2024, the leak detection activities started and have been completed. Due to intermitted water supply in K-1, the leak detection activities could only be conducted in the days where water supply is available in target area. Detecting leaks by using listening sticks is common among AAWSA technicians. The household leak detections for 577 households of entire K-1 North were conducted. As result, 26 suspected leakage points were identified, among them 13 leakages were repaired by CPs. For unidentified leaks, use of step test to narrowing down the potential leakage points were introduced. Intermitted water supply in AAWSA makes leakage detection difficult as the available day or hours of leak detection is limited. As an alternative method, the expert introduced the leak detection by using air compressor. The demonstration of this skill was done in Nifas Silk and Megenagna branches. Engineers and technicians at the Megenagna branch said that before the project, leak detections were carried out only by customers' complains for leaks or DMA based activities. It was the first time to conduct looking for water leakages of all the customers.

Pipe repair skills improvement

Baseline report for assessing the current capacity of pipe connection and repair was presented in Oct 2022 and the four targets for the increasing the capacity of pipe connection were proposed.

1. To acquire basic knowledge and appropriate installation/maintenance work methods, and improve the quality of pipe laying work, joint technology, pipe repair work, and customer line works.
2. To prepare a manual to clarify work procedures, understand the items described in the manual, and ensure that all staffs acquire appropriate installation/maintenance techniques.
3. To reconsider the items to be recorded in the maintenance records, organize the monitoring results, and be able to analyze problems and issues.
4. To improve the technical specifications of pipe and fitting materials procured by AAWSA for appropriate material procurement.

Between October and December 2023, plumbing trainings were conducted and attended by 50 engineers and technicians. Initial training was conducted by the expert and AAWSA engineers. The second training was conducted only by AAWSA staff. The training introduced new technologies such as electro fusion and butt fusion for welding of HDEP pipes. For AAWSA engineers and technicians, it was the first time learning this kind of welding skills. Technicians who attended the training confirmed that they gained knowledge about new skills but lack of equipment/machine prevent them to use those skills and teach others. AAWSA is in the process of procuring some equipment so that the skills learnt from the training can be applied.

The expert in charge of pipe repair introduced repair reporting system by using mobile application. At AAWSA, the pipeline repair records were focused on the time spent on the repair work and there was no information on the detail of repair work such as type and sizes of repaired pipes, location etc. Availability of repair data can help planning and maintenance of pipe. Repair reporting by using mobile application Epicollect version 5 (epicollect5) was done at the pilot level in May 2024 and will be expanded to other branches. The introduction of epicollect5 was well accepted by the technicians but not everyone, particularly among the technicians, has a smart phone. Comparability of application with Ethiopian calendar was another issue raised from the pilot level. In the interview, engineer and technician explained that they use epicollect5 in their daily work and this tool eased the cumbersome recording works on paper, reducing some tasks.

2. Commercial losses reduction in K-1

Activities of commercial losses started from the baseline assessment. In September 2022, the findings of preliminary study about the commercial losses reduction were presented at the 2nd Joint Coordinating Committee (JCC) meeting. The study showed that meter reading errors, data handing and accounting errors, unauthorized connections and customer meter inaccuracies are the key areas of commercial losses to be tackled with.

From October to December 2022, the project conducted sample household survey (HHS) in K-5 and K-7 blocks with total 600 customers representing the 10% of total customer, to identify possible commercial losses interventions. Pilot HHS were conducted in steps.

1. House visits to collect customer information and taking photos of meter settings.

2. Existing customer data including billing and payment data.

The summary survey results (Table 14) was presented in July 2023. The results indicates data management and customer meter functions and meter setups are the major problems of commercial losses.

Table 14 Summary of sample HHS results

Key areas	Findings
Customer category	15% (75 households) of customers were in wrong category. The information of customer in database for the billing and field data do not match
Customer meter data	Customer data is different from customer's data on the ground data (meter size, category, meter key number and age)
Odd meter readings	53.4% (267 households) of the customer meter readings were abnormal
In correct meter set up ⁴	Out of 500 customer meters, 60% (300 meters) showed some abnormalities. (1.6% Non-functional, 7.8% unclear windows, 36% incorrect setups, 14.6% risk of illegal connection.)

Source: Experts' report

The management of AAWSA responded to these findings immediately and ordered those issues to be corrected. In the interviews, managers and officers of their branches confirmed that they are tackling issues raised from the findings of HHS. In Nifas Silk, 400 out of 1000 meter set up problems (meters not horizontally installed) have been already corrected.

In K-1, HHS (total no. of customers is 657) was conducted for entire households. 89 % (591) of customer data from the house visits and 98% (654) of customer data from the database were collected. The findings presented in November 2023 showed that meter set-up problems were found in 72.4% (427) of customers; 23% (134) of customer meters were over 20 years old; and 19.3% of meters found to be some risks of illegal connections. Based on these findings, the commercial losses activities (meter replacements and set up adjustment) were implemented in K-1. Table 15 and 16 present the comparison of billing amount before and after the commercial NRW reduction activities. Both in K-1 North and South, the billing amount increased after the changes of customer meters, or combined with meter change and set up adjustments. While meter exchange only or meter exchange and adjustment of setup increased the amount of billing data, the result of adjustment of setup only does not show much effect in terms of billing amount.

Table 15 Billing amount before and after the NRW reduction in K-1 (North)

	Before NRW activity Average Sep 23-Mar 24	After NRW activity July 24	Volume increased	Increased (%)
Meter change (MC)	632.57	1162.00	529.43	83.7
Set up adjustment (SP)	405.00	332.00	-73.00	-18
MC & SP	1159.14	1644.00	484.86	41.8
All (MC+SP+MC&SP)	2196.71	3138	941.29	42.8

Source: experts' monthly report

Table 16 Billing amount before and after the NRW reduction in K-1 (South)

⁴ *Incorrect setup includes: inclined/unstable meter support, a meter covered by objects, a meter buried in ground, a meter without-standard alignment/ distance from the objects/ diversion of pipes, etc. Not all incorrect setups lead to the commercial losses

	Before NRW activity Average Sep 23-Mar.24	After NRW activity July 24	Volume increased	Increased (%)
Meter change (MC)	0	0	0	0
Set up adjustment (SP)	581.86	616.00	34.14	5.9
MC & SP	196.57	319	122.43	62.35
All (MC+SP+MC&SP)	778.43	935	156.57	20.1
K1 (North and South)	2975.14	4073	1097.86	36.9%

Source: experts' monthly report

Functionality of customer meter

After the old meters were replaced, the project conducted the accuracy tests of old meters (136 meters) by using meter test bench. The test results showed the older meters tend to register less water volume, causing potential revenue losses. There are meters from 8 manufactures. The test results showed meters of particular manufactures have higher errors (over or under registries). Preliminary results indicated that the exchanges of old meters over 20 years of particular manufactures can increase the billing amount. Since the total sample was small, the further research on customer meters is necessary.

3.2.3 Achievement of Output 3

Output 3 and achievements of its OVIs are shown in Table 17. Similar to Output 2, OVIs of Output 3 do not indicate what to be achieved. Therefore, the team describe activities and results related with the indicators and determined the achievements of OVIs.

Table 17 Output 3 and its achievement of OVIs

Output 3	OVI	Achievement
Capacity for cost-benefits analysis of NRW reduction measures by the pilot branch office is strengthened.	3.1 Selected cost-benefit performance indicator	Achieved
	3.2 Cost-benefit monitoring report	Achieved

3.1 Selected cost-benefit performance indicator

The activities to select cost-benefit performance indicators started by collecting necessary financial and other data. Since pilot Kirkos branch has not been established, the project selected to take the data from the Nifas Silk branch which occupies 80% of Kirkos area. By September 2024, the revenue and expenditure analysis of Nifas Silk has been completed. Based on the information and analysis, following three indicators were selected as cost-benefit performance indicators. Table 18 is showing the summary of each indicator.

Table 18 Summary of selected cost-benefit indicators

Indicator	(1) Cost per unit saved water	(2) Recovery period of NRW reduction countermeasure costs	(3) Cost Benefit Ratio
Meaning	Unit countermeasure cost necessary to reduce 1m ³ of NRW	The period for which the revenue can recover the NRW countermeasure cost.	It is calculated by benefit divided by cost. Comparison of benefit and cost.

How to judge	If this is lower than unit production cost, this means cheaper water production measure than existing water scheme.	If this period is shorter than effect continuation period, the revenue can recover the cost.	If the value is larger than 1, benefit is more than costs. NRW countermeasure won't make losses.
--------------	---	--	--

Source: Progress report Phase 2

For the activities of Output 3, two groups of CPs were formed: main group and sub-group, representing from finance, planning, the Information Communication Technology (ICT) and customer service departments. Effect of NRW activities may take time to appear on the NRW ratio, the expert in charge of Output 3 demonstrated the application of selected indicators by using estimated NRW data to present for the Midterm review. The results of Cost benefit analysis of K-1 is shown below.

Table 19 The results of Cost-benefit analysis of K-1

Group	NRW reduction activities	Cost for the activities(ETB)	Estimated benefit	Benefit/Cost ratio
Physical loss activities	Leak detection/ Leak repairs (14 locations)	256,910	588 M ³ /mo. leak detection	1.02
Commercial loss activities	Meter replacement (138 meters)	1,225,655	Equivalent to 2,290,035 ETB Increase of billed water: 460 M ³ /mo. <Breakdown> 249 M ³ /mo. by replacement 211 M ³ /mo. by correct set up	1.87
	Correct set-up (168 locations)			
Total		1,482,565	2,552,734	1.72

ETB: Ethiopian Birr. Source: the expert's presentation

3.2 Cost-benefit monitoring report

The results of estimated cost-benefit analysis was presented during JCC in July 2024 which was attended by AAWSA management.

3.2.4 Achievement of Output 4

Table 20 shows Output 4 and its achievements of OVI. Similar to Output 3, OVIs of Output 4 do not indicate what to be achieved. Therefore, the team describe activities and results related with the indicators and decided about the achievements of OVIs. At the time of this evaluation, Output 4 has been achieved.

Table 20 Output 4 and its achievement of OVIs

Output 4	OVI	Achievement
Technical skills and business management capacity on NRW control is improved at AAWSA Head Office and branch offices.	4.1 Results of training	Achieved
	4.2 Report of project activities to AAWSA management officials	Achieved

4.1 Results of training

Table 21 indicates the number of workshops/seminars conducted to improve technical skills and business management capacity of NRW control in Phase 1 and 2. The total number of training participants in both Phases were 652. In addition, “technical training seminar” was conducted (41 participants) in 2022. As

indicated above, trainings in Japan were organized 3 times attended by 22 participants. Since trainings were conducted wide ranges of subject covering from NRW management to business management, this OVI has been achieved.

Table 21 No of workshops and participants in the project

Training theme	Phase 1		Phase 2	
	No of workshop conducted	Total no of participants	No of workshop conducted	Total no of participants
NRW reduction plan	4	22	0	n/a
Pipe renovation plan	8	34	3	8
Leak detection	3	31	13	117
Pipe joint technology	2	21	5	60
Commercial Losses	8	44	27	194
Business Management	9	36	16	85
	34	188	64	464

Source: evaluation team based on the experts' plan

4.2 Report of project activities to AAWSA management officials

In addition to JCC, the project has been regularly reporting to DGM of water sector and submitting the progress report. Interviews from the management and experts indicated that it took time for the AAWSA managements to understand about JICA's technical cooperation project. The progress reporting to AAWSA managements led them to understand that this project is to build capacity of AAWSA staff and activities to be implemented by AAWSA staff with the support provided by the experts. This realization let the management to increase the support and their involvements to the project. Therefore, this OVI has been achieved.

3.2.5 Achievement of Output 5

Table 22 shows Output 5 and its achievements of OVIs. At the time of this evaluation, Output 5 has not been achieved. Changes of activities in Output 5 was approved during the 3rd JCC in 2024. The target of twinning was changed from twinning branch to twinning blocks of K-5, K-7 and K-11.

Table 22 Output 5 and its achievement of OVIs

Output 5	OVI	Achievement
Knowledge and techniques accumulated in the pilot branch office are transferred to another branch office.	5.1 Pipe network renovation plan in twinning branch office	Likely to be achieved
	5.2 Action plan of NRW reduction activities in twinning branch office	Likely to be achieved
	5.3 Results of OJT in twinning branch office	Not yet achieved

5.1 Pipe network renovation plan in twinning branch office

Data collection to formulate pipe network plans of twinning blocks K-5, K-7 and K-11 started in late 2024. At the time of this evaluation, the plans were formulated and materials were about to be prepared. However the Corridor project may be implemented in K-5 area and so the plan will be implemented in K-7 first while further situation of K-5 will be assessed. Therefore, this OIV has not been achieved.

5.2 Action plan of NRW reduction activities in twinning branch office

At the time of this evaluation, the 5 year NRW Reduction Strategic Plans for target branches have been formulated based on already developed NRW reduction plan. The 5 year plan for Nifas Silk branch is focused on blocks in Kirkos areas. The plan for Megenagna branch is focused on another block established by the branch after K-1. The formulation of 5 year plan for Mekanisa and Akaki branches will be followed after plans of Nifas Silk and Megenagna. Hence this OVI will be achieved by the end of the project.

5.3 Results of OJT in twinning branch office

Engineers and technicians of target branches continue implementing leak detection activities in twinning blocks of K-5, 7 and 11. The number of houses visited for the leak detection is shown in Table23.

Table 23 Details of Twinning blocks

Block	Branch	Target households	No of houses completed (2024/12)	No of houses completed (2025/1)	No of houses completed (2025/2)	Total	Percentage (%)
K-5	Mekanisa	2,577	145	289	911	1,345	52
	Nifas Silk	371	0	115	256	371	100
K-7	Nifas Silk	2,131	0	0	0	0	0
K-11	Nifas Silk	711	369	342	0	711	100
	Akaki	90	95	0	0	95	105

Source: Monthly report Feb. 2025

In commercial reduction, HHS and data collections from the customer data base have started in K-5, K-7 and K-11. Table 24 indicates the summary of each block's customer data collection activity implemented so far (July 2024). Further activities to reduce commercial losses will be implemented in Phase 3.

Table 24 Summary of each block and customer data collection activities

Block No	Branch	No of customers	Activities completed
K-5	Mekanisa	2,549	HHS and customer data collection 86-96% completed
	Nifas Silk	366	HHS and customer data collection around 90% completed
K-7	Nifas Silk	2,200	HHS 18% and customer data 2% completed
K-11	Nifas Silk	719	HHS and customer data collection completed
	Akaki	90	HHS and customer data collection completed

Source: Experts report on July 2024

3.2.6 Achievement of Project Interim Purpose

Table 25 shows the Project Interim Purpose and achievement of their OVIs. The achievement of Project Interim Purpose was approved at the 4th JCC in July 2025.

Table 25 Project Interim Purpose and its achievement of OVIs

Project Interim Purpose	OVI	Achievement
Knowledge and techniques accumulated in the pilot branch office are ready to	Capacity for NRW reduction activities is enhanced.	Achieved
	Cost-effectiveness indicators for reducing NRW are identified.	Achieved

be transferred to another branch office.	Creation of block water supply system and installation of monitoring system are implemented.	Achieved
--	--	----------

During the planning survey of this project, it was agreed that the project will be implemented in two steps: Step one is the first 3 years when the activities of this step will focus on Output 1 to 4 of the pilot branch. Step 2 is the 4th year and the activity will be expanded to other branches (Output 5). Project Interim Purpose had three OVIs.

At the end of Step 1, the joint evaluation to be conducted to assess the achievements of interim purpose and determine about the continuation to the Step 2 or termination of project. The joint evaluation of project interim purpose conducted by the experts and CPs. At 4th JCC in July 2024, AAWSA recognized that the capacity of AAWSA managers and officers to reduce NRW has been increased by the project and requested for the continuation of project. The results of evaluation is as follows:

1. Capacity for NRW reduction activities is enhanced.

AAWSA and experts evaluated the capacity of NRW reduction in four areas (commercial and physical losses, block creation and budget) of Megenagna branch where NRW reduction activities were conducted. They concluded that the capacity of NRW reduction activities was enhanced.

2. Cost-effectiveness indicators for reducing NRW are identified.

Cost-effectiveness indicators of NRW reduction activities in K-1 were calculated. The result indicated that the cost-benefit ratio of commercial and physical activities were above 1 indicating those activities were cost-effective.

3. Creation of block water supply system and installation of monitoring system are implemented.

At the time of evaluation, one block system (K-1) has been established and NRW reduction activities were implemented.

3.2.7 Achievement of Project Purpose

Table 26 shows the Project Purpose and its achievement of OVI. At the time of this evaluation, Project Purpose has not been achieved.

Table 26 Project Purpose and its achievement of OVIs

Project Purpose	OVI	Achievement
AAWSA's operation and management capacity of NRW reduction is strengthened.	Key Performance Indicators agreed and applied among all AAWSA	Likely to be achieved

Key performance indicators agreed and applied among all AAWSA

At the time of this evaluation, Key Performance Indicators (KPI) for NRW reduction have not been selected. According to the experts, the discussion about the indicators with AAWSA will take place along with the discussion of 5 year NRW reduction strategic plans. The results of commercial and physical losses reduction activities in K-1 can be used to list the indicators for NRW reduction. When the NRW reduction

activities are implemented in twinning blocks, these KPIs may be revised if necessary and the selection of KPIs to be finalized and agreed.

AAWSA's annual action plan have KPIs to measure their achievements annually. These KPIs are approved by the Planning Department of Addis Ababa City. The term KPI may cause confusion, therefore, the KPIs selected in this project is called KPI for NRW management or Performance Indicator. At the time of this evaluation, OVI has not been achieved but it is expected to be achieved by the end of the project.

3.2.8 Likelihood of Achievement of Overall Goal

Overall goal is the goal expected to be achieved in 3 to 5 years after the completion of project that will be realized as a result of the achievement of project. In this evaluation, the likelihood of achievement of Overall goal was not assessed.

Table 27 Overall Goal and its likelihood of achievement of OVIs

Project Purpose	OVI	Likelihood of Achievement
AAWSA's water supply business is efficiently conducted by the cost-benefits management of NRW reduction.	1. NRW ratio (X% decrease from the baseline)	Not able to evaluate
	2. Cost-recovery ratio (X%)	Not able to evaluate

At the time of this evaluation, both the target ratio of both OVIs have not been set. Therefore, the evaluation team was not able to determine any likelihood of achievement. Hence the team recommends that the project to set the baseline and target values of both OVIs.

Chapter 4. Implementation Process

4-1 Progress of Activities

In the progress of activities, the evaluation team assessed whether the activities were carried out as planned. Implementation of project were affected several external factors which caused the delays.

1. Spread of COVID 19 globally delayed the arrival of expert in Ethiopia for 5 months. The first expert arrived in Ethiopia in August 2021 against the plan of arrival in April 2021.
2. Due to the state of emergency in Ethiopia, the experts had to leave Addis Ababa in November 2021. They could not return to the country until April 2022. During this period, most of on the ground activities had to be stopped. Procurement of equipment was also affected as the goods were not imported to Ethiopia.
3. The Corridor project, road rehabilitation and area development project in Addis Ababa city, caused damages of water supply systems (pipes and meters). AAWSA CPs, especially Water supply departments were occupied for responses to the Corridor project and they were not available for project activities.
4. Arrival of equipment (ex. Electromagnetic flow meters) were delayed due to international conflict which caused the rerouting of shipping route from Europe to Ethiopia.
5. Houses in K-1 were demolished by the Corridor project and the number of customer were reduced dramatically. Pipe replacement plan in the area need to be revised. Replacement of pipe by the Corridor project is affecting the hydrological separation of planned block system.

4.2 Implementation of the Project

JCC is the overall decision making body. During the project period, JCC meetings were held for four times. The summary of JCC is shown below.

Table 28 Summary of JCC meetings

No	Date	No of participants	Key decisions and discussion points
1	28 April 2022	29 including online participants	Approval of work plan and selection of pilot branch. Introduction of block system and selection of CPs
2	22 September 2022	25	Progress reporting (establishment of block system) Request by AASWA to the experts to provide project budget and NRW reduction target
3	20 December 2023	23	Progress reporting (HHS, pipe repair training) Modification of PDM
4	10 July 2024	35	Evaluation of Interim Project Purpose and decision to continue project to the next phase. Presentation of results on HHS Modification of PDM

Source: JCC meeting minutes

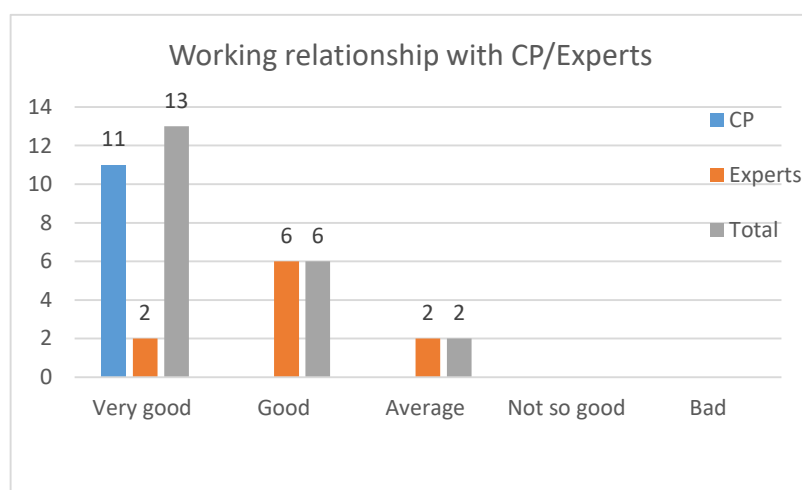
Except JCC, there are no regular meetings to monitor the progress of the project as a whole. Individual meetings per Outputs have organized between the expert and CPs. For example, Output 3 groups held regular meetings/trainings for main and sub groups.

4.3 Monitoring

The project was monitored by submitting monitoring sheets to JICA in every 6 months. The draft monitoring sheets were shared among counterparts and approved by project director and expert's team leader. The project has been reporting to Deputy General Manager (DGM) of Water Distribution on the progress of project activities.

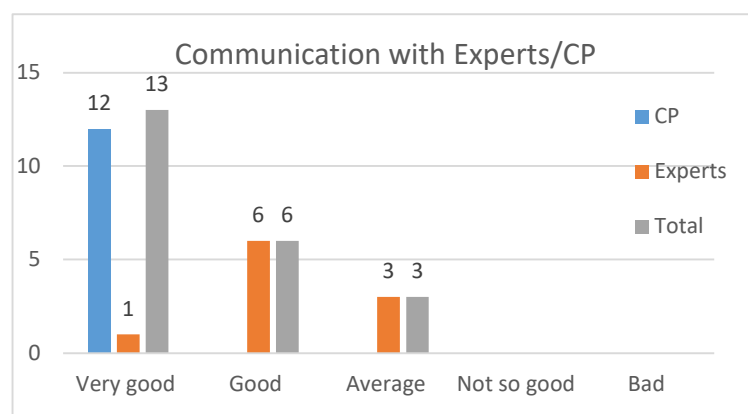
4.4 Communication

From the questionnaires, the results of evaluation about the working relationship and communication between CPs and the experts are positive. (Figure 4 and 5) CPs evaluated working relationship and communication as “very good” or “good”, more experts evaluated them as “good” or “average”. Some experts commented that physical distance between their office and AAWSA offices hampered the frequent communication among them.



Source: Evaluation questionnaire responses

Figure 5 Evaluation of working relationship with CPs/experts



Source: Evaluation questionnaire responses

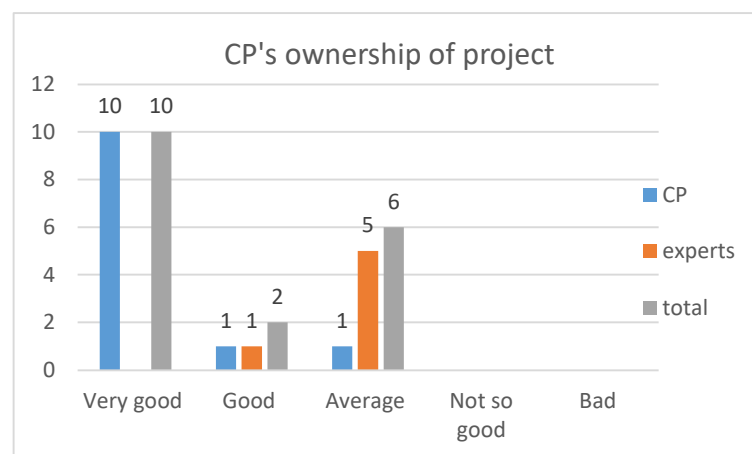
Figure 6 Evaluation of communication between CPs and experts

4.5 Collaboration with Other project /Donors

World Bank and VEI had/have been implementing project for NRW reduction for AAWSA. Performance based contract by the World Bank is implemented by the project department of AAWSA. CPs of this project were not involved. Some of the technicians were trained by VEI who implemented DMA based NRW reduction activities. The evaluation team did not find any direct collaborations with those project.

4.6 Ownership of the Project

Ownership of the project refers to in what degree CPs consider this project as their own project. In the interviews, both AAWSA management and experts stated that JICA's technical corporation was not well understood by AAWSA at the beginning of the project. Since AAWSA have been used other donors' infrastructure development projects or budgets supports for NRW reduction, the initial expectation of AAWSA from this project was similar inputs (budgets or equipment) and the result which consultants implement the project (ex. reduction of NRW ratio). Many experts commended that this lack of understanding was the reason of low motivations for the project among CPs. As the project activities started showing the tangible results, AAWSA managers begun understanding the project. Trainings in Japan also contributed for enhancing the understanding of this project. At the 4th JCC meeting, AAWSA requested to continue the project for another year. In the questionnaire, the majority of CPs evaluated that their ownership is "very good". The same response by the experts are lower. This may be that the experts evaluated the overall ownership which includes the initial phase of project. However, the experts agree that CPs ownership has been increased.



Source: Evaluation questionnaire responses

Figure 7 Evaluation of CP's ownership of project

The evidence of AAWSA's strong ownership is shown that project activities have been implemented without experts. For example, the first pipe repair training was conducted by the expert and AAWSA engineer. Soon after, AAWSA conducted the 2nd training themselves. CPs continue conducting households'

survey for leak detections during the absence of expert. HHS for the commercial losses reduction were conducted in the remaining branches of AAWSA and the replacement of old meters have been accelerated. These are the indications of AAWSA's strong ownership of this project.

4.7 Changes of PDM

By the time of this evaluation, PDM has been changed two times. This evaluation is conducted based on PDM version 3 approved by the 4th JCC in July 2024. Table 29 below shows the changes of PDM (version 1 to 3).

Table 29 Changes of PDM (Version 1 to 3)

	PDM Version 1	PDM Version 2	PDM Version 3	Note
Project Interim Purpose OVIs	1. Key performance indicators agreed and applied in the pilot branch office 2. AAWSA head office, pilot branch office and twinning branch office agreed to conduct twinning activities.	1. Capacity for NRW reduction activities is enhanced. 2. Cost-effectiveness indicators for reducing NRW are identified. 3. Creation of block water supply system and installation of monitoring system are implemented.		Change approved by 3 rd JCC
Output 1 Activity	1-4: To procure and install flow meters and water pressure gauges.	1-4: To procure and install flow meters and water pressure gauges, and create block water supply system		
Output 1 Activity	1-5: To monitor NRW ratio at branch office level and compile data in head office.	1-5: To monitor NRW ratio in the created blocks and compile data in head office.		
Output 2 Activity		2-4: To replace a part of pipelines based on the "pipe network renovation plan" by Activity 2-3		
Output 4 Activity	4-1: To conduct NRW management trainings to AAWSA management officials.	Eliminated	4-1: To conduct NRW management trainings to AAWSA management officials.	
Output 5 Activity	5-1: To select a twinning branch office.	5-1: To select twinning blocks in the pilot branch office.		
Output 5 Activity	5-2: To transfer technology and knowledge regarding Output 2 & Output 3 from the pilot branch office to twinning branch office through twinning activities.	5-2: Trained staffs through the project activities share/transfer their knowledges and experiences to other staffs through the activities in the twinning blocks.		

Source: PDM Version 1-3

Chapter 5 Evaluation Results

Based on the confirmation of achievements of outputs, project purpose and implementation processes, the evaluation team conducted the evaluation by using JICA's six evaluation criteria. The definitions of each criterion is shown in Table 5 of JICA's evaluation criteria in Section 2. The team evaluated the project in the following scales: very high, high, moderately high, moderately low and low.

5.1 Relevance

Relevance is considered as very high with the following reasons.

1. Relevance with Ethiopia and AAWSA's development goal and strategy

In Ethiopia's Ten Years Development Plan for 2021-2030 sets the targets for water resource development. In this plan, the country will increase the access to tap water for urban residents of grade one cities to 100 liters per person per day. The detailed planning survey of this project indicated that the average volume of water use of AAWSA customer was 74 litter/per/day in 2019. The survey also points out that the number of customers increased in 1.9 times, but available water resources increased only 1.6 times, thus water resources is not increasing at the necessary speed. To meet the demand of the water resources, it is necessary to reduce losses of available water. AAWSA's NRW ratio was 40% at the times of planning survey, the reduction of NRW is crucial to meet the water demand of Addis Ababa. The Ten Year Plan sets the target of water losses reduction from 39% to 20% by 2030 nationally. Addis Ababa city has by far the largest population, about 10 times larger than the second largest city of Dire Dawa. To meet the national target of water loss reduction, reducing water losses in Addis Ababa has the large impact of the water loss reduction in Ethiopia. The project is to build the AAWSA's capacity for NRW reduction, therefore the project is in line with Ethiopia and AAWSA development goals.

Ethiopia's Water and Sanitation Policy stipulate that all water supply undertakings adequately address the cost associated with operation and maintenance and based on the cost-recovery principal. The detailed planning survey indicates that 80% of AAWSA's budget, especially infrastructure development, is depended on the subsidies from Addis Ababa city. As the water tariff increase is not implemented as planned, increasing the revenue by reducing the NRW is the important way to increase the revenue if AAWSA is to meet full cost recovery.

1. Responding to the needs of target organization

In AAWSA, available water resources are not meeting the water demand due to high population growth. AAWSA has number of plans to develop the water resources but the development of dams has been in delay. To meet the demand of the water, it is necessary to reduce water losses. Over the years, AAWSA's NRW ratio has been around 40% regardless of various NRW projects by donors and implementing the NRW reduction activities at branch levels. AAWSA manager indicated that the challenge of NRW reduction activity is the sustainability: while the donor project is implemented, the NRW ratio goes down

but when the project ends, the ratio goes up. AAWSA implements the NRW reduction activities following the NRW Strategic Plan. From the interviews, branches were implementing the NRW reduction activities at DMAs. However, small customer size of DMA has little impact even the NRW has been reduced. Based on these, this project proposed NRW reduction activities to be implemented at a branch wide, proposing an alternative to DMA based activities by addressing the issue of sustainability. As the project aims at increasing the capacity of AAWSA staff so that manager and staff can implement the activities after the project ended. The evaluation team considers that the design and target of this project is responding to the needs of AAWSA.

2. Appropriateness of target selection

Although the Kirkos branch was selected as the project's pilot branch, the branch has not been established. The project activities were implemented in parts of four existing branches (Megenagna, Nifas Silk, Mekanisa, Akaki). These areas will form the new Kirkos branch. On the paper, it is one pilot branch but actual targets are four branches. The experts evaluated the advantages and disadvantages of implementing the activities in multiple branches.

- With limited number of experts and the period of dispatch, it was challenge to allocate time and resources to four branches as the resources were planned for targeting one branch originally. To cover all four branches, the depth of support and follow up by the experts may have been compromised as the experts time had to be stretched out.
- Implementing activities in four branches naturally increased the number of CPs as beneficiaries of project activities. More CPs have gained skills and knowledge than originally planned.
- Since CPs are busy with their daily tasks and they may not have much time participating in project activities every day, the experts could allocate their time each branch once or twice a week and CPs could join the project activities.
- Since Kirkos branch has not been established, there is uncertainty when or if the branch will be established. Also the coordination between branches after the establishment of Kirkos branch may be challenging.
- Having activities in several branches gave the project opportunities to do trial and error for the improvement. Also it was easy to share the experiences among branches.

3. Appropriateness of approach used for the project

The initial project set the NRW activities at branch level. At the beginning of the project, the experts proposed the introduction of block distribution system. The block system is to divide water supply area into smaller areas and set up one (or a few) inlet area and install flow meters.

The advantage of the block system over the branch level of NRW management was explained during the first JCC and this idea was approved. Block system would be easier to monitor the water supply, carry out physical loss activities and monitor the effects of NRW reduction activities. This recommendation was

based on the baseline assessment, the experts thought the accuracy of monitoring of NRW at the branch level would be a challenge with too many flow meters. The block system is implemented in Kitakyushu Water Works. Some of the experts are from the Works so the experience of Kitakyushu can be utilized. CPs found that the block system provides a better solution for NRW reduction activities using DMAs. At the time of this evaluation, only 1 block system out of 11 proposed blocks has been established. The project activities in Output 2 and 3 are implemented in K-1. Due to this delay, advantage of block system has not been fully demonstrated. The evaluation team is not able to conclude the appropriateness of block system but the team recommends the block system to be completed as soon as possible so that the advantage of NRW reduction base on the block system can be demonstrated.

5.2 Coherence

Coherence is considered as very high with the following reasons.

1. Coherence with Japan's assistance policy for Ethiopia

Support for the quality infrastructure development is one of the four pillars of Japan's assistance strategy for Ethiopia. In the pillar, Japan supports for infrastructure development, human development and strengthening management capacity for the sustainable water and sanitation services. Since the project aims at strengthening the capacity of NRW management to increase the quality of water services, the project is coherent with the Japan's assistance strategy for Ethiopia.

2. Coherence with JICA's Global Agenda 19

JICA sets the Global Agenda 19 "Sustainable Water Resources Management and Water Supply" focusing on society that with well managed water resource contributes to the universal and sustainable access of drinking water to all. One of the Agenda's key targets is supporting growth of water utilities. Through this agenda, JICA's support aims at turning AAWSA into the spiral of growth shown in the diagram. Specifically, the project fits in the approach 2 of enhancing the capacity for reduction of NRW. In the diagram, the success of reduction of NRW feeds into the improvement of business management. Improvement of water services can read to increase the customer satisfaction then utility's revenue. As the utility has more revenue, they can invest in the water infrastructure. By addressing the NRW reduction, the success of project can contributing to the reducing water losses and increase the revenue of AAWSA. Hence, the project is coherent with JICA's global agenda.

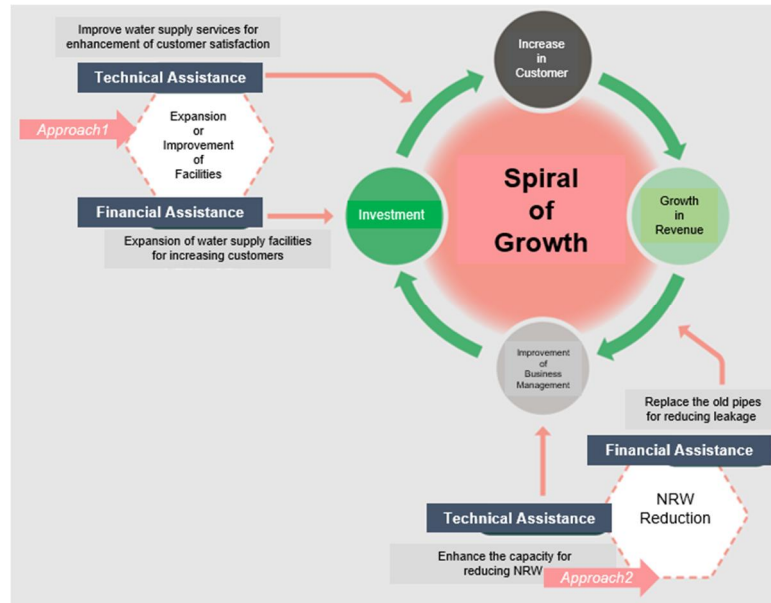


Figure 8 Global Agenda 19 Spiral of Growth of water utility

3. Sustainable Development goals

Ethiopia's is committed to achieve Sustainable Development Goals (SDGs) 6.1 of achieving universal and equitable access to safe and affordable drinking water for all by 2030. Compared with ten years ago (56% in 2012), the proportion of population who have access to improved water source has increased to 80% in 2022. However, the percentage of people using safely managed water services remains very low (13% in 2022), even access to safe water is available for AAWSA's customers, the majority of customers receive water only a few times a week with limited hours. When the NRW is reduced and available water for distribution is increased as the result of project, it would contribute to increase the access of safely managed water services for AAWSA customers.

5.3 Effectiveness

Effectiveness is considered as moderately low with the following reasons.

1. Achievement of Project purpose and outputs.

At the time of this evaluation, the project purpose has not been achieved but it is expected to be achieved by the end of the project. The evaluation team found some of the OVI of outputs are not evaluable as the indicators do not describe what to be achieved. The team recommends that the revisions of OVIs to clarify achievements and targets for indicators.

In addition, the team indicates that the logics between OVI of Project Purpose and Outputs is weak. It is likely that the OVI of Project Purpose "Key Performance Indicators are agreed and applied in AAWSA" will be achieved by the end of the project. However, the establishment of monitoring system in Output 1 is less likely to be achieved. Hence, OVI of Project Purpose may be achieved but not all of Outputs will be achieved.

The key drawback of the project is that monitoring system has not been established in twinning blocks and in entire pilot branch (Output 1). This is affecting the activities of Output 5 as the baseline NRW ratios/volumes cannot be calculated, the effect of NRW reduction activities in twinning blocks cannot be measured. The delay of establishing branch level NRW baseline, the project reduced its target areas from twinning branches to twinning blocks.

At the time of this evaluation, physical and commercial losses activities of pilot block (K-1) have been completed. The baseline NRW ratio was calculated. The cost-benefit analysis by using selected indicators will be conducted soon. The effects of NRW reduction activities were demonstrated in K-1. (Output 2) However, the effects of NRW reduction at the pilot branch level may not be able to be measured by the end of the project. The evaluation team recommends that the project (experts and AAWSA) to accelerate the establishing the block system at most priority.

While the progress of Output 1 has been slow, the NRW reduction activities (physical and commercial) are showing the results. HHS in K-1 and sample survey of K-5 and 7 presented issues regarding customer water losses to AAWSA. These findings helped to realize AAWSA managers and staff about the importance of tackling commercial loss activities. On the physical losses reduction activities, leakage detections targeting entire household of K-1 demonstrated the active leak detection can produce results, finding many unknown leaks. Those activities will be expanded to twinning blocks. Output 3 has been achieved by selecting cost-benefit indicators, the next step is to apply the indicators on the activities conducted by the project.

2. External factors

As described in the previous section, progress of project activities and achievement were affected by several external factors. Spread of COVID-19 caused the dispatch of experts to Ethiopia. The State of Emergency in 2021 forced the experts to leave Ethiopia earlier and delayed the progress of activities on the ground.

The Corridor project is particularly affecting the block system as some of the flow meter installations had to be held till the project is completed. CPs in water distribution departments were occupied with responding to the Corridor project. Demolitions of houses in K-1 area by the project reduced the number of customers. The project may need to refocus the planned pipe replacement at K-1 to other area. In addition, high inflation has negatively affected the procurements and sub-contracts works.

Although the effect of Corridor project is mostly negative, the project forced branches to replace pipes where the Corridor project is implemented. Most of the branch managers interviewed think the replacement of pipe was good as new pipes reduced water losses and in some areas, customer get water and customer complaints have been reduced.

Contributing factor

Results of HHS and aged meter study contributed AAWSA managers and staff to change their perceptions about NRW reduction. Some CPs commented that they only knew that the NRW reduction was costly and require infrastructure investment such as pipe replacement before the project. They now realized that the reduction of commercial losses is a crucial part of NRW reduction and its activities can be done much less cost.

Trainings in Japan contributed to inspire AAWSA participants including top managers. Trainings in Kitakyushu helped CPs to understand how block system works in Kitakyushu to contain water losses and control water supply. For the branch managers, outsourcing works got their attention. One of the managers commented that the outsourcing of works has advantage for organization like AAWSA with resource limitation of man power, transportation and materials, those limitation does not affect the completion of work.

Introduction of mobile data collection platform changed the way AAWSA to conduct the data collection and recording quality of tasks completed. Initially, epicollect5 was introduced as a tool to collect and records information of HHS. But AAWSA found this technology can apply other works of organization. From the interviews, AAWSA uses epicollect5 for meter readings, leakage repair recordings (which was introduce by the project), customer satisfaction survey etc. The introduction of this technology enhanced efficiency and accuracy of data collection, storage and analysis, making CP's work easier.

Hampering factor

The progress of establishing block systems was hampered by inaccurate and outdated pipe network information as not all the pipes were recorded in CAD. The activities faced with unrecorded pipes or wrong placement of pipes and in some areas, physical digging were required to identify the right pipe location. Organizational structure of AAWSA, divided responsibility of water distribution system by pipe sizes complicates the administrative tasks and requires extra coordination among department and branches. Lack of transportation was still the major and serious hampering factor for CPs to conduct activities. In some cases, the project had to hire a car for the CPs to join field work or some CPs could not attend trainings or meetings due to the lack of transports. Intermittent water supply limits the days when leak detection activities can be implemented and finding water flow in block system. During the household survey, CPs faced angry customers who are not receiving enough water. Distance between the experts office and CPs offices affected that volume of communication between CPs and experts.

5.4 Efficiency

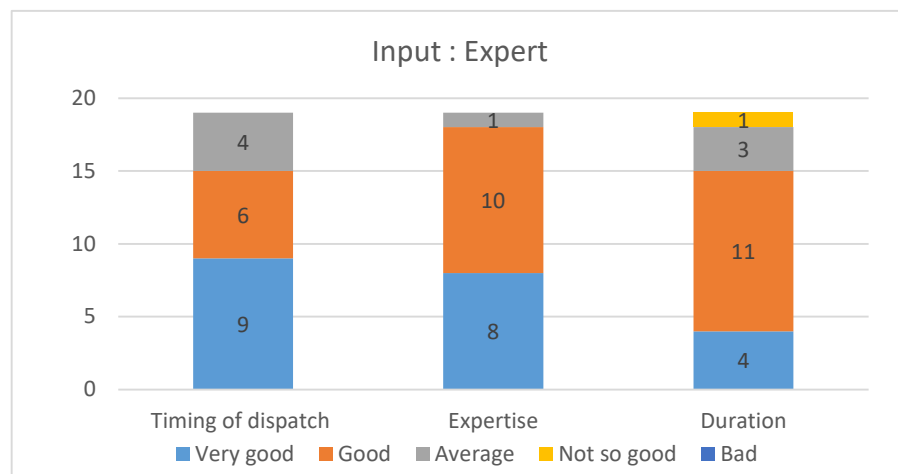
Efficiency is considered as moderately high with the following reasons.

The several factors affected the efficiency of project. External factors such as COVID-19 and insecurity in Ethiopia caused the delay of dispatch of experts and arrival of equipment. Soaring inflation in the country increased the procurement and construction costs. Cancelation and rescheduling of training in Japan resulted in additional cost.

Process of establishing block system is taking longer time than planned. This is limiting the progress of some activities as the project are not able to establish the baseline NRW of each block.

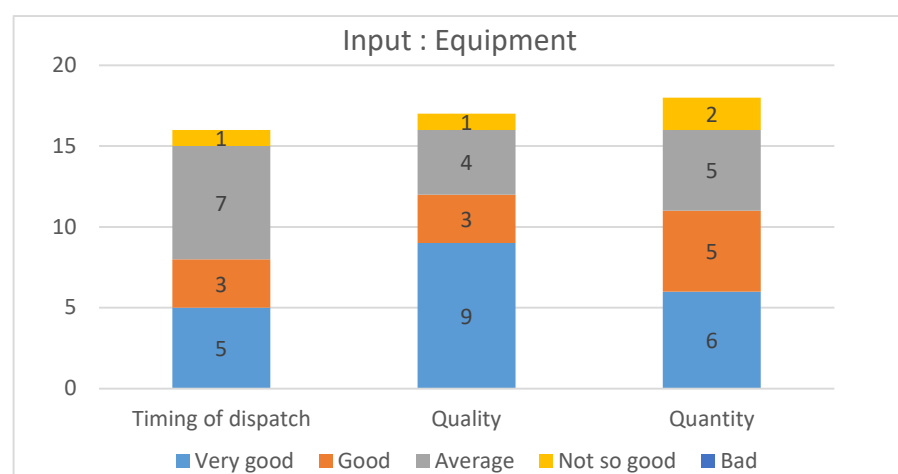
Since the project activities are implemented in four target branches against the original plan of one pilot branch, this has increased the number of CPs participating in the project activities. But the lack of means of transport at the branch levels restricted the participations of CPs to project activities and trainings. Distant location of experts' office from AAWSA affects the efficiency as either side have to travel for meetings and consultation. It also affected the level of communication between experts and CPs when sharing the work space or being near-by naturally increase the communication and opportunities to work together.

The results of evaluations by CP and experts on project input are shown below. Input of experts is generally positive as most of the respondents evaluated “very good” or “good” on dispatch timings, expertise and duration. Evaluation on equipment are also positive although the number of respondents responded the timing and quality of equipment were average.



Source: Evaluation questionnaire responses

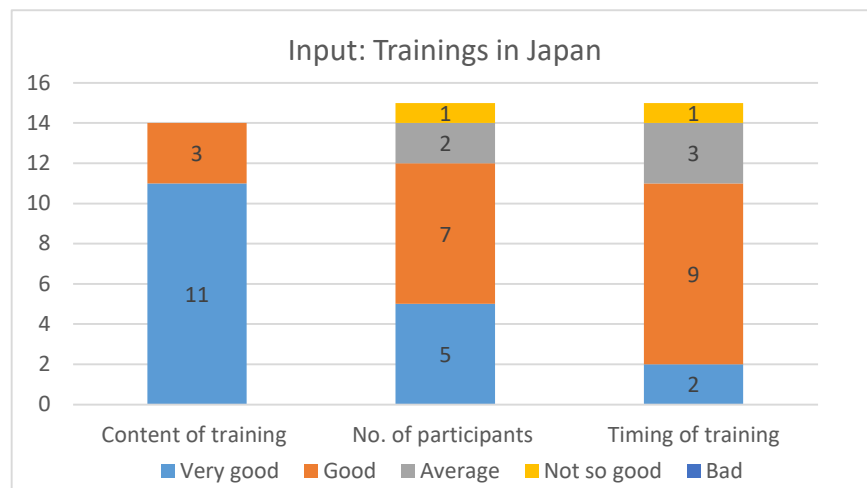
Figure 9 Evaluation of input (Experts)



Source: Evaluation questionnaire responses

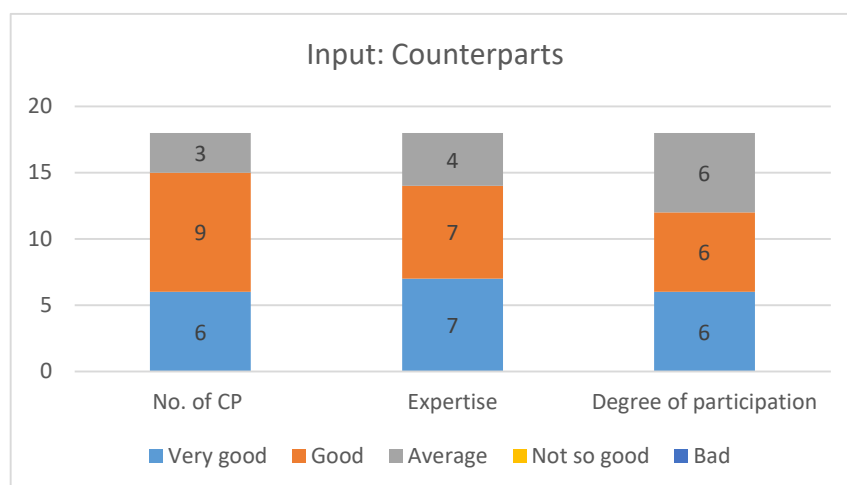
Figure 10 Evaluation of input (Equipment)

Almost all respondents evaluated the contents of trainings “very good” and the participants’ number and timing of training were also positive but more “good” than “very good.” Input of CPs are also generally positive but responses on degree of participation are divided from “very good” to “average.” This may be due to CPs were missing activities or trainings because of other engagements or lack of transportation prevent them to attend the project.



Source: Evaluation questionnaire responses

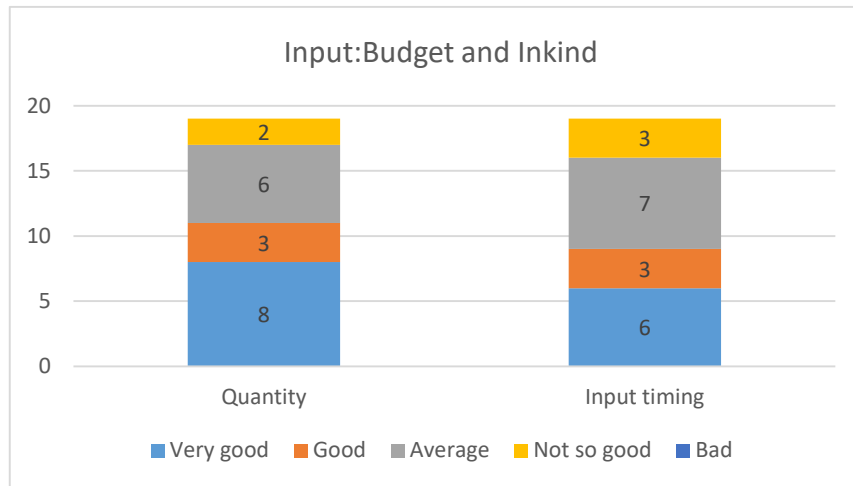
Figure 11 Evaluation of input (Trainings in Japans)



Source: Evaluation questionnaire responses

Figure 12 Evaluation of input (Counterparts)

The evaluation of input such as budget and in-kind are evaluated as “average”. Project activities were not included in the budget of braches at the beginning of the project. Also, the timing of input was evaluated as “average” but a few responses evaluated as “no so good”.



Source: Evaluation questionnaire responses

Figure 13 Evaluation of input (Budget and In-kind)

As the external factors affected the project, the activities have been delayed. Nevertheless, pilot branch has increased from original one to four branches while planned inputs such as the number of experts and trainings in Japan remain changed. This enabled more counterparts could participate in the project activities and effects of activities were spread to four branches. Based on these, the evaluation team considered effectiveness is moderately high.

5.5 Impact

Impact is considered as very high with the following reasons.

Impact is assessed by the likelihood of achieving Overall Goal and positive or negative impact that were not expected at the project design. As indicated in the previous section, it is not possible to determine the likelihood of achieving Overall Goal as its target values of OVIs have not been set. The evaluation team recommends that the target values to be determined before the completion of project.

In terms of unexpected impact, expanding project activities and approaches to other branches is a positive impact. AAWSA management saw the block system as the effective alternatives for DMA based NRW management. All the branches have created one pilot block. CP from Megenagna branch confirmed that they created one additional block since K-1 block has already been created. They have a plan to establish more blocks.

DGM of Customer Service took up the results of HHS seriously and ordered that all branches to conduct HHS. The HHS results (about 9500) were compiled and shared among the branches in December 2024. Mobile survey application Epicollect5 was introduced as the HHS data collection tool and several trainings on how to use epicollect5 were conducted. Since then, Epicollect5 has been used for meter readings as additional tool to identify meter set up issues. When meter readers find the problems of meter settings, they take photos of meters by epicollect5 and send to the customer service department. Introduction of Epicollect5 helped meter readers to read meters better. It also helped to monitor the meter readers as to take

photos, they need to “read” meters. Epicollect5 is used for other activities such as customer satisfaction survey conducted by AAWSA or recording data of pipe repairs. Not all technicians own smart phones. Only those who have smart phones or can install Epicollect5 in their mobile phones can use the application. Technicians do not have smart phones are not able to use and have to record their work on paper, consequently creating differences among workers who have smart phones and those who don’t.

5.6 Sustainability

Sustainability is high with the following reasons.

Sustainability of project activities and achievements after the completion of project are considered in different aspects: sustainability of policy, human resources, finance, technologies and approaches introduced by the project.

1. Sustainability of policy

The evaluation team believes that the sustainability of policy direction of AAWSA will continue. Ten Years Development Plan for 2021-2030 and AAWSA’s business plan set the water loss reduction target as 20% by 2030. This target is yet to be achieved. As total volume of water supply does not meet the demand and water resource development faces the financial and other constraints, the reduction of water losses is the key to increase the available water for AAWSA. Therefore, policy of reducing water losses is expected to be continued.

2. Sustainability of financial resources

Financial resources to continue implementing the project activities may have some challenges as it was experienced during project. The responses of questionnaires indicated that the financial resources and availability of materials and equipment, including vehicles, are the one of the obstacles. Although the availability of budget may be limited, when project activities such as leak detection, meter changes and HHS are included in the branches’ budgets with the support of relevant departments from the Headquarter, a certain level of budgets would be allocated. Prioritizing the NRW activities considering the cost-effectiveness is important as this analysis may help determining which activities to be prioritized. Study on meter changes of the project help identifying which meters to be changed first; meters of some manufacturers are less accurate than the others. The results can help guiding exchanges of old meters by prioritizing which meters to be changed first.

3. Sustainability of human resources

CPs who gained knowledge and skills from the project are expected to continue activities. As the most of the CPs interviewed were involved with the project from the beginning, the staff rotation are not frequent in AAWSA unlike other utilities. Some experts mentioned that technicians at the branch level may rotate among departments but may stay in their own branches. Assignments of managers and staff to the Kirkos branch when it is created will leave some uncertainty. If managers and staff who were not participated in the project are assigned, the continuation of project activities may be at risk. Further, heavy load of daily work of CPs may prevent them from continuing the project activities if those activities are not included in their

work plan. As the department and branches conduct their tasks based on the annual action plans, integration of project activities into the action plan will be the key for the continuation of project activities. It will also reduce the duplication or parallel works of CPs.

4. Sustainability of knowledge, skill and approaches

Knowledge and skills from the project may be continued to be used. As indicated in Impact, AAWSA is proactively expanding some of the project activities such as block system and HHS. AAWSA will continue trainings others after the initial training was conducted by the experts. One expert mentioned that after the 1st pipe repair training was carried out, the trained trainers voluntarily conducted the second training.

AAWSA is applying mobile application (Epicollect5) introduced for HHS data collection to other activities such as customer satisfaction survey, identifying meter set up issues.

Availability of equipment or materials such as new meters and pipes will affect the sustainability of technology or skills. Technicians and engineers received trainings said that they can't use new HDEP welding technology (Electro fusions and Butt fusions) without those equipment. Also, the lack of transport poses challenges for CPs to continue implementing NRW activities.

5.7 Conclusion

Relevance is considered as very high. Ethiopia's Ten Years Development Plan for 2021-2030 sets the reduction of water target loss as 20% by 2030. The reduction of water losses is crucial to meet water demand of Addis Ababa as the water supply does not meet water demand. AWWAS needs to reduce water losses as the available water source is limited. The project intends to strengthen the capacity of AAWSA staff for better equipped for NRW reduction measures. It is relevant with national and AAWSA's strategy and responding to the needs of AAWSA.

Coherence is considered as very high. Support for strengthening management capacity for the sustainable water and sanitation services is one of the pillar in the Japan's aid strategy for Ethiopia. The project is coherent with JICA's Global Agenda 19 of helping the water utilities for their spiral of growth. Reducing NRW can lead to increase of water revenue help utility to build healthy and sustainable finance. The project also contributes to the achievement of SDG 6.1 of increased access of population with safely managed water.

Effectiveness is considered as moderately low. The project purpose is likely to be achieved by the end of project. However, Output1 of the establishment of monitoring system has not been achieved which is affecting Output 5 activities as the baseline NRW of twinning blocks cannot be established. The link between achievement of Project Purpose's OVI and achievements of Outputs is considered as weak. External factors, COVID 19, the state of emergency in the country and the Corridor project affected timely implementation of activities. Changing the perception of commercial loss reduction among CPs, trainings in Japan and introduction of Epicollect5 contributed to the achievement of project goals. Lack of accurate pipe

network data and intermitted water supply hampered conducting physical loss activities. Lack of means of transport prevent CPs from joining the activities and meetings.

Efficiency is considered as moderately high. External factors such as COVID-19 and insecurity in Ethiopia caused the delay of dispatch of experts and arrival of equipment. High inflation caused the increased the cost of project. The number of CPs participated in the project was higher than initial plan as the project targeted four branches instead of one. Having experts' office away from AAWSA required travel for meetings and consultation as well as the level of communication. The evaluation of projects inputs by the CP and experts were generally positive. With the original input amount, the number of target branch has increased from one to four and the number of counterparts benefitted from the project have also increased, hence, the team considered the effectiveness is moderately high.

Impact is considered as very high. AAWSA is expanding the activities and approaches used in this project to other branches. Use of Epicollect5 is also expanded to other activities than originally intended in the project. The evaluation team recommends that target value of OVIs of Overall Goal to be set before the end of project.

Sustainability is considered as high. The policy direction of AAWSA and Ethiopia will be continued as the NRW reduction goal is set for 2030. In terms of sustainability of finance, the availability of budget may have limits, but if the project activities are included in the branches budgets, a certain level of budgets may be secured. Cost-benefit analysis of NRW reduction may help determining which activities to be prioritized. CPs gained knowledge and skills from the project are expected to continue activities of project. When the project activities are integrated in the branches' annual action plans, it will help continuation of activities. AAWSA is proactively expanding some of the project activities and continue trainings others. Availability of equipment or materials such as meters and pipes may affect the sustainability of technology or skills acquired by the staff.

Chapter 6. Recommendation

Based on the evaluation results, the evaluation team will recommends the followings.

6.1 Recommendations to the Project

1. Complete the block system for NRW monitoring

Establishing the block system in Output 1 is the priority of the project. The accurate baseline NRW can only be calculated when the data of system input volume became available. It has been taking longer to establish the system input due to inaccurate or outdated pipe network information and the delay of construction work. Structure of AAWSA, divided responsibility of departments by the size of pipes makes the communication and coordination more complicated. For the speeding up the completion of block system, the strong leadership and ownership by AAWSA is expected. The evaluation team recommends that AAWSA manager and staff who are responsible for the block system to form a taskforce to complete the block system with the support provided by the experts. So that the baseline NRW of each block become available to measure the effectiveness of NRW reduction activities implement in other Outputs.

2. Regular meeting to share the progress

Through the project activities, the capacity of AAWSA for NRW reductions have been strengthened. The evaluation team acknowledges that expanding the skills and approaches such as HHS and block system to other branches is encouraging sign. On the other hand, activities such as establishment of block system has been experiencing a delay.

Many experts observed that the physical distance between experts' office and AAWSA may be affecting the communication and coordination between two parties. When the experts need to meet with CPs, it is necessary to make advanced appointments which is a cumbersome process.

Currently JCC is the only forum where all of major CPs and experts meet to share the progress but it is only held in every 6 months. There is no other forum where CPs and experts meet collectively and monitor the progress activities and achievements and discuss solutions for the issues related with the project implementation. To accelerate the project activities further, the team recommends that the project to held a regular meeting (monthly or bi-monthly) where relevant CPs who are involved with the activities share their progress and discuss issues related with the project implementation.

3. Visualization of project results

Project activities are helping for AAWSA to identify issues on NRW reduction. For instance, results of HHS provided the detailed meter related commercial losses such as high percentage of improper customer meter set ups. These findings are all very important for the NRW reduction. AAWSA managers and staff have already started tackling those issues. Some of the issues can be solved easily while other may take time to rectify but the continuous efforts are the key to success. To keep motivating staff for work, it is helpful to

visualize the achievements and share them among those involved. For instance, knowing how much water or money can be saved by replacing 200 aged meters may encourage workers to continue meter exchanges. Showing how much water is saved by setting up the meters correctly. Therefore, the evaluation team recommends that the project visualize the results/achievements of work completed with everyone, particularly technicians and engineers.

4. Integration of NRW reduction plan and branches' Annual action plans

The evaluation team observed that the project activities were considered as additional activities that were not included in branches' Annual action plan. Departments and branches work according to their Annual action plans and budgets were disbursed based on the planned activities. In this project, based on the achievements of activities, the project plans to formulate 5 year NRW Action plan. It is important that the project NRW Action plan to be integrated or at least harmonized with AAWSA's Annual action plans so that the budget for the activities can be secured. It also help CPs to avoid adding extra work. Therefore, the evaluation team recommends that the project to harmonize the NRW Action plan of project with AAWSA's Annual action plan.

5. Solution for mobility problem of CPs.

Both experts and CPs raised the lack of transportation to participate project activities (field works, meetings, and trainings) are concurrent implementation problems. They all agree that target branches have limited numbers of vehicles. In some cases, the expert team had to hire the extra transportation to continue. This is not a sustainable solution. Therefore, the evaluation team recommends that AAWSA acknowledges that the issue of lack of transportation at the field level and it is crucial for the progress of activities and provides solutions for the transportation problem.

6. Extension of project period

The evaluation team recommends that the project period to be extended for 12 months from the end of the project. The project activities were affected by several external factors such as COVID-19 and evacuation due to the state of emergency, which prevented the experts from working in Ethiopia. Further, the Corridor project has been hampering the project progress, causing the delay of establishing block systems or forcing to change pipe replacement plans.

Under such a difficult situation the project could establish only one block (K-1) among the planned 11 blocks so far. This situation deprived AAWSA of many opportunities to learn various NRW reduction techniques through on-site trainings as well as NRW management knowhow using the established block system. However, the project is now catching up to establish several blocks (K-5, K-7, K-11), and NRW reduction activities and cost-benefit analysis are expected to be conducted in these blocks within the rest of the project period. Based on these experiences the target branches are further moving to formulating 5 year NRW action plan and planning the first year activities in the other remaining blocks under their initiatives.

However, their skills and experiences are still limited and the support from the expert team is strongly requested. Cognizant of the above situation, the project requires additional 12 months so that target branches can plan and apply for budget, then implement the reduction activities and review their achievements.

7. Changes of PDM

The evaluation team recommends the revisions of PDM (version 4 in Annex 2). The main reason of revision is to clarify achievements or targets of each OVI. As stated in Section 3, the evaluation team found many OVIs in the project are unclear about the achievement or goals. This made the conformation of achievement difficult in this evaluation. Another reason of revision is the changes of target of area: Initial target branch was changed to target block by the introduction of block system, consequently twinning branch was changed to twinning blocks. The comparison table of changes of PDM version 3 and 4 is shown in Annex 3.

6.2 Recommendations to AAWSA

1. Providing necessary equipment for utilizing acquired skills

The evaluation team recommends that AAWSA to provide materials and equipment so that trained CPs can use their skills to improve the quality of work. For example, electric fusion and butt fusion techniques for HDPE welding were introduced in the pipe repair trainings. Technicians commented those technologies are useful for HDPE connection. However due to the lack of equipment, they cannot use learned skills in their work or teach skills to others. Some of the equipment are available locally. The additional equipment can enhance the quality of pipe connection work hence reducing the future water losses. On the other hand, there are skills and technologies do not require new equipment such as proper digging of trenches and technicians and engineers who attended the trainings are expected to use available skills to their daily tasks.

2. Continuation of establishing block system

The team recommends AAWSA to continue establishing block system. The demonstration of effectiveness of block system is limited to K-1 at this moment. Nevertheless the block system offers some advantage over DMA. When NRW reduction activities were implemented, the impact is larger than DMA. The block system provides convenience of managing water distribution as the water inlet and outlets were controlled.

3. Annual action plan to include NRW reduction activities of the project

The evaluation team recommends that the target branches (and pilot Kirkos branch) to include NRW reduction activities of the project in their Annual action plan. When the activities are proven to be effective, branches can include those activities and secure the budget and human resources.

4. Standardized meter installation and its monitoring

The results of HHS indicated that more than half of customer meters have some setup problems. Many of meter set up problems can be avoided if the customer meters were installed by following the meter installation standard. To do this, technicians responsible for the installations must know the standard (assuming there is a meter installation standard). Additional trainings on the installation and availability of standard will help. Further, it is crucial to monitor the finished installation to ensure that the installations are done according to the standard.

5. Continuation of trainings of technicians

Throughout the OJT activities in Output 2, many technicians participated in the field based activities and trainings. From the interview and experts' reports, in AAWSA, opportunities for technicians to receive trainings are generally limited. AAWSA management needs to acknowledge that technicians are the closest to the customers and their quality of work directly affects the NRW. Therefore, improving quality of skills and knowledge of technician is crucial for reducing and maintaining low NRW. Therefore, the evaluation team recommends AAWSA to continue providing trainings to technicians.

6. Information sharing and peer to peer learning

AASWA's department and branches have divided responsibility. The experts observed that the information sharing across the departments or branches are limited. Further, the available data and information tends to be concentrated onto few individuals and are not shared widely. This may decrease the efficiency of daily operations.

Further, peer to peer learning, learning from the same level of employees or managers, have been introduced in many water utilities; success stories on operations or solutions to common problems were shared among the peers. Benchmarking of achievements are another activities to encourage the peer learnings. The team recommends that AAWSA to encourage the information sharing among staff and managers and encourage peer to peer learnings.

7. Place trained managers and staff in new Kirkos branch

The evaluation team recommends that when Kirkos branch is established, the consideration is given that the placement of managers and staff who participated in the project to be given as priority so that the new branch have capacity to continue project activities.

8. Documentation of project activities

AAWSA can benefit by documenting materials and training texts used by the Project so that they can be shared widely. Documentation can be in the form of videos of field works. Visual materials are easy to understand and shared to others staff and technicians who did not attended the project. Therefore, the evaluation team recommends that AAWSA to consider documenting project activities and materials for their future use.

6.2 Recommendation to JICA

Timely review of the PDM and POs is necessary whether the review is requested by experts or not requested. The evaluation team recommends that PDM (especially the indicators) is reviewed and revised if necessary. The situation surrounding the project may change during the implementation period due to the external or internal conditions, in such case, PDM may not be in line with the situation that were initially assessed. Further, importance of OVI in terms of measuring the progress need to be acknowledged by the project manager and those who monitor the progress. SMART principal (Specific, Measurable, Achievable, Relevant, and Time-based goal setting) should apply for the indicators so that the evaluation can be conducted by using those indicators.

Chapter 7. Lessons Learnt

1. Effectiveness of trainings in Japan

For AAWSA, the project is the first JICA's technical cooperation project and they had little understanding about what is technical cooperation project and how it operate. This has caused misunderstanding at the beginning of project. Trainings in Japan contributed to improve the understandings about the project among participants who experienced the operations of Kitakyushu and saw how block system is used. These trainings motivated CPs for continuing the project activities. Rescheduled trainings in Japan for AAWSA managers accelerated their understandings. Not only they saw the operations of Kitakyushu, participants valued the attitude and mindsets of employees of Kitakyushu Water Works, their dedications to the work, time management etc. This kind of experiences could not have been obtained without trainings in Japan. Learning lessons from this is that using trainings in Japan with clear intention can help increasing the motivations of CPs and gaining support of management as after the training in Japan, the support of project by AAWSA managements seemed to be increased.

2. Importance of sharing work space between the experts and CPs.

Due to the limited availability of space at AAWSA, the office space of experts and local staff is located away from AAWSA. The experts admit that the physical distance from CPs affect the amount of communication they have with CPs. It also increased the needs for coordination to set up the meetings. Sharing the work space or even located in the same building with CPs have great advantage for project implementation. It will enhance communications in both ways: it will be easier for the experts to talk and meet with CPs and CPs can approach the experts to ask questions and their guidance easily. Lessons learnt from this is that it is important that the work space between experts and CPs to be closer if not shared for better communication and coordination.

3. NRW reduction activities under intermitted water supply

Due to the shortage of water resources, AAWSA customers receive intermitted water supply. The degree of rationing varies from 1 day a week to a few days a week for few hours. This situation makes conducting some of the NRW activities a challenge. Leak detection activities can only be implemented when the water is available. During household surveys, the enumerators encountered customer complaints or uncooperative attitude to data collections out of frustration of not receiving water. Intermitted water supply is common in many developing countries where NRW projects are implemented. Although supply conditions may vary, target area of this project seem to have very limited water supply which made the implementation of activities challenging. The expert in charge of leak detection introduced technique of using air compressor to detect leakages. However this technique requires complicated settings. Lessons learnt from this is that water supply condition should be taking into serious considerations when scheduling NRW activities. Place like the target areas, extra days need to be allocated for the activities.

4. Implementations of activities in multiple branches

While pilot Kirkos branch has not been established, the project activities were implemented in four target branches. There are some advantages and disadvantages of targeting four branches.

The first advantage of targeting four branches is that the increased number of CPs benefitted from the project compared with the original plan of one branch. Implementing in four branches means the lessons from the first branch could be used in another (next) branch so that the activities can be improved. When targeting multiple branches, technology and knowledge transfer of one branch to another branch was possible within the project. CPs who are teaching other branches could also learn by the teaching others. Lastly, in case of targeting only one branch, if CP is busy, the expert need to wait for CPs. Since CPs are many (four branches and head office), the experts did not have to wait for CPs to become available.

The disadvantage is the organizing the activities in five locations (four branches and head office) require moving to five different locations. As the number of CPs increases, so are the workload of experts. Also, experts were not able to concentrate to one branch, sometimes responses and/or follow up of activities of each branch may be compromised. Lessons learnt from the above is when the project targets multiple branches, it is important to consider the distance and select appropriate (workable) number of branches.

5. Secondment of CP to the project office

When the project faces the challenges, the experts try to solve problem. The similar challenge may arise when CPs are implementing the project activities after the completion of project. Considering the sustainability of project, when CP is sharing the work space with experts, he/she can learn how the experts solved the challenges or CP can contribute for the solution. In the project, one CP is seconded to the project and working in the project office from January 2025. Having CP in the same office can enhance the communication between the experts and other CPs. This CP can learn from the experts as they work together. When the experts' office is away from CP, having CP in the project office can bring alternative solution.



Annex 1. Evaluation Study Schedule (as of 13 Mar 2025)

Date		Schedule of mission from 26/02/2025 to 18/03/2025		Accommodation
		Consultant (Ms. Sugimoto)	JICA HQ (Mr. Yokota/ Ms. Noda)	
26-Feb	Wed	Ms.Sugimoto: Arrive at Addis Ababa PM: Meeting with JICA experts		Addis Ababa
27-Feb	Thu	09:00 interview with AAWSA Head office (Mr. Habtamu) 10:00 interview with AAWSA HQ (Mr. Gatenet) 11:00 interview with AAWSA HQ (Mr. Henok) 14:00 interview with AAWSA HQ (DGM Mr. Mogeus and Mr. Hailu) 15:00 interview with AAWSA DGM (Mr. Fekadu) 16:00 Briefing to Ethiopian evaluation team (Ms. Meseret)		Addis Ababa
28-Feb	Fri	8:30 interview with Megenaga Branch (B manager Mr.Debere) 10:00 interview with Megenaga Branch (Mr.Shamusu) 11:30 interview with Megenaga Branch (Mr.Abel/ Technicians) 14:00 interview with Megenaga Branch (Mr.Fasil/Technicians) 15:00 interview with Megenaga Branch (Mr.Yohanis/Technicians)		Addis Ababa
1-Mar	Sat	11:00 interview with expert (Mr.Aoki) Pm: Documentation		Addis Ababa
2-Mar	Sun	Documenation		Addis Ababa
3-Mar	Mon	8:30 interview with Nifas Silk Branch (B.Manager Mr.Yoseph) 10:00 interview with Nifas Silk Branch (Mr.Birhanu/Technician) 11:30 interview with Nifas Silk Branch (Mr.Natnael/ Technicians) 14:00 interview with Nifas Silk Branch (Mr.Ababa/Technicians) 15:00 interview with Nifas Silk Branch (Mr.Yonatan/Technicians)		Addis Ababa
4-Mar	Tue	8:30 interview with Mekanisa Branch (B. Manager Ms.Hawi) 10:00 interview with Mekanisa Branch (Mr.Mustefe) 11:30 interview with Mekanisa Branch (Mr.Chalachew/ Mr.Antene) 14:00 interview with Mekanisa Branch (Mr.Fikadu) 15:00 interview with Mekanisa Branch office (Mr.Teshafun)		Addis Ababa
5-Mar	Wed	9:00 interview with Output 3 Team (Balemlay, Lakech,Bedilis etc.) 10:30 Interview with Akaki branch (B manager Mekanis, Mr Yalegal, Mr. Abiot) 13:00 interview with expert (Mr. Hada) 14:00 interview with expert (Ms. Kiatazume) 15:00 interview with expert (Mr. Hirowatari)		Addis Ababa
6-Mar	Thu	9:30 interview with VIE (online) 11:00 interview with HQ NRW dept engineers (Ms.Sebele, Mr.Mengistu, Mr.Mohammed)		Addis Ababa
7-Mar	Fri	AM: Drafting of report 14:00 Interview with CP (Mr. Sammy) 14:30 Interview with local staff (Ms. Assagedetch) 15:00 Discussion with the experts on revision of PDM		Addis Ababa
8-Mar	Sat	Drafting ofreport		Addis Ababa
9-Mar	Sun	AM Drafting of report 13:00 Debrefing for JICA HQ evaluation members	Arive at Addis Ababa	Addis Ababa
10-Mar	Mon	10:00AM interview with AAWSA GM 11:00 Am Discusison with the Experts PM : Discussion with the Experts		Addis Ababa
11-Mar	Tue	10:00AM interview with Planning Bureau Addis Ababa city 3:00PM Draft Report Discussion with Joint Evaluation Team		Addis Ababa
12-Mar	Wed	9:00-11AM Discussion with key CPs (Getanet, Habtam,branch managers) PM Finalization of draft report, submit to GM and DGM(Mr.Fekadu) for their review		Addis Ababa
13-Mar	Thu	Documentation and preperation for JCC		Addis Ababa
14-Mar	Fri	10:00AM 5th JCC Presentation of evaluation result and discussion		Addis Ababa
15-Mar	Sat	Documenation		Addis Ababa
16-Mar	Sun	Documenation		Addis Ababa

Annex 1. Evaluation Study Schedule (as of 13 Mar 2025)

Date		Schedule of mission from 26/02/2025 to 18/03/2025	Accommodation
17-Mar	Mon	(AM: Backup day for JCC) Mr. Yokota, Ms. Sugimoto : Departure at Addis Ababa	Addis Ababa
18-Mar	Tue	AM or PM Ms.Ito and Noda visit EWTI to discuss new PJ Ms.Noda: Departure at Addis Ababa	Addis Ababa

Prior to arrival in Ethiopia, online interviews were conducted to experts (19 March Mr. Iwata and Mr. Takahashi, 10 March Mr. Kawamoto, 24 March Mr. Oga) Kick off meeting for this evaluation was conducted on March 24th via online.

Annex 2
Project Design Matrix (PDM)

Version 4 (14 March 2025)

Project Title: The Project for Strengthening AAWSA's Management Capacity of Non-Revenue Water Reduction
Implementing Agency: Addis Ababa Water and Sewerage Authority (AAWSA)
Target Group: AAWSA
Period of Project: 4 years
Project Site: Addis Ababa City (Service Area of AAWSA) Model Site: Planned Kirkos branch area
End Beneficiaries: Customers / Water Users in Addis Ababa City

Narrative Summary of the Project	Objectively Verifiable Indicators	Means for verification	Important Assumption	Achievement	Remarks
Overall Goal (target in 3 to 5 years after the completion)					
AAWSA's water supply business is efficiently conducted by the cost-benefits management of NRW reduction.	1. NRW ratio (%) decreases from the baseline. (1) 2. All AAWSA branches formulate NRW action plans utilizing the results of the project and implement the plans.	1. AAWSA NRW ratio baseline and target 2. NRW action plan and their status of implementation			
Project Purpose					
AAWSA's operation and management capacity of NRW reduction is strengthened.	1. Key Performance Indicators for the NRW management agreed and applied to all AAWSA branches. 2. NRW action plans for the target branches utilizing the project experiences are formulated and implemented.	1. Annual achievements of KPIs of all the branches 2. NRW action plans for target branches			
Project Interim Purpose					
Knowledge and techniques accumulated in the pilot branch office are ready to be transferred to another branch office. (2)	1. Capacity for NRW reduction activities is enhanced. 2. Cost-effectiveness indicators for reducing NRW are identified. 3. Creation of block water supply system and installation of monitoring system are implemented.	1. Project progress report 2. Project progress report 3. Project progress report			
Outputs					
1 NRW monitoring system is established at selected pilot branch.	1-1 Pilot branch can monitor NRW from the established monitoring system by the project.	1-1 Monitored NRW of Kirkos pilot branch			
2 Capacity to implement and manage NRW reduction measures is strengthened in the pilot block. (3)	2-1 Agreed pipe network renovation plan of pilot block is implemented. 2-2 NRW action plan of pilot block is implemented. 2-3 Commercial loss activities based on the customer survey results are implemented. 2-4 Available leakage detection skills and methods are increased.	2-1 Status of implementation of Pipe network renovation plan 2-2 Status of implementation of Action plan of NRW reduction activities 2-3 Conducted commercial losses activities and their results 2-4 Skills and methods used for leak detection in Pilot block.			
3 Capacity for cost-benefits analysis of NRW reduction measures by the pilot branch office is strengthened.	3-1 Cost-benefit performance indicators are selected. 3-2 Cost-benefit analysis of NRW is conducted in the pilot block.	3-1 Selected cost-benefit indicators 3-2 Results of cost-benefit analysis of pilot block			
4 Technical skills and business management capacity on NRW control is improved at AAWSA Head Office and branch offices.	4-1 All the trainings conducted by the experts are repeated by CPs. 4-2-AAWSA managements support for the NRW activities introduced by the project is enhanced.	4-1 Trainings conducted by the experts and CPs. 4-2 Evidence of supports of project by AAWSA management			

5	Knowledge and techniques accumulated in the pilot block are transferred to twinning blocks.	5-1 Agreed pipe network renovation plans of twinning blocks are implemented. 5-2 NRW action plans utilizing the result of project are implemented in three or more of twinning blocks 5-3 Commercial loss activities based on the customer survey results are implemented in three or more of twinning blocks 5-4 Available leakage detection skills and methods are increased in three or more of twinning blocks.	5-1 Implementation of renovation of pipe networks 5-2 Status of implementation of NRW action plan 5-3 Results of commercial losses activities 5-4 Skills and methods used for leak detection			
---	---	--	---	--	--	--

- 1) Target NRW ratio and the baseline ratio in Overall goal will be decided before the end of the project.
- 2) Pilot branch is Kirkos branch area which consists of 4 branches (Nifas Silk, Mekanisa, Megenagna, Akaki) Those four branches are referred as target branches
- 3) Pilot branch of Kirkos area is divided by 11 blocks. Agreement was made that K-1 block is pilot block and K-5, 7 and 11 are twinning blocks.

Activities	Inputs	Pre-condition
<u>For Output 1: NRW monitoring system is established at selected pilot branch office.</u> 1-1 To select one pilot branch office. 1-2 To review GIS mapping system and hydraulic analysis data of network. 1-3 To formulate isolation plan by conducting field survey to identify locations of flow meters and water pressure gauges. 1-4 To procure and install flow meters and water pressure gauges, and create a block water supply system. 1-5 To monitor NRW ratio in the created blocks and compile data in head office. 1-6 To review existing NRW Key Performance Indicators of annual plan and integrate KPIs reflecting the project activity. 1-7 To visualize and benchmark the key performance indicators of selected pilot branch office.	【 Inputs By Ethiopian Side 】 1 Counterpart Personnel for the Project activities - Project Director: General Manager of AAWSA - Project Manager: Deputy General Manager of Water Supply of AAWSA - Sub-Project Manager: Sub-Process Owner of NRW - Piot Branch Manager: Branch Manager of selected pilot and twinning branch office - Technical Counterpart (AAWSA Head office): NRW department, Commercial & Customer department, Water distribution & Control Department, Project Office, Finance & Planning, GIS case team, IT department, Human Resources development, Training Center - Branch Office: One (1) pilot and one (1) twinning branch office) 2 AAWSA's existing facilities and equipment for activities 3 Labor forces or technicians to install equipment procured by JICA 4 Office Space for JICA Experts	• AAWSA applies for budget necessary for project activities.
<u>For Output 2: Capacity to implement and manage NRW reduction measures is strengthened in the pilot branch office.</u> 2-1 To understand current situation of the pilot block by field survey and reviewing existing distribution network drawings and customer data. 2-2 To prepare information database (inventory of network, pipe repair record, etc.) necessary for 2-3 & 2-4 activities in the pilot block. 2-3 To formulate "pipe network renovation plan" based on Activity 2-2 result. 2-4 To replace a part of pipelines based on the "pipe network renovation plan" by Activity 2-3. 2-5 To formulate "action plan" of NRW reduction activities (leakage detection and repair, meter replacement, reduction of encoding error of meter reading, reduction of illegal connections, etc.) in the pilot block 2-6 To organize "action team" to implement the "action plan" formulated in Activity 2-4. 2-7 To conduct on-the-job training about physical loss reduction (leakage detection, pipe repair, service pipe and customer meter installation). 2-8 To conduct on-the-job training about commercial loss reduction. 2-9 To implement NRW reduction activities according to the "action plan" formulated in Activity 2-5. 2-10 To feedback the results to AAWSA management officials and share them among all AAWSA branch offices through seminars or workshops.	【 Inputs By Japanese Side】 1 JICA Experts - Chief Advisor / NRW Control 1 - Co-Chief Advisor / NRW Control 2 - Business Management - NRW Reduction Plan - Pipe Renovation Plan / Construction Supervision - Leakage Detection - Pipe Joining Technology - Tariff Collection / Commercial Loss - Procurement Plan 2 Budget & Administration of Counterparts' Training in Japan and/or third country	
<u>For Output 3: Capacity for cost-benefits analysis of NRW reduction measures by the pilot branch office is strengthened.</u> 3-1 To understand financial situation (income and expenditure) of the pilot branch office. 3-2 To select cost-benefit performance indicator regarding NRW reduction measures. 3-3 To monitor cost-benefit performance indicators regularly. 3-4 To reflect the result of Action 3-3 to "action plan" of pilot branch office. 3-5 To feedback the results to AAWSA management officials and share them among all AAWSA branch offices through seminars or workshops.		Issues and countermeasures Schedule is delayed especially for the following activities due to COVID-19 & conflicts in Ethiopia.
<u>For Output 4: Technical skills and business management capacity on NRW control is improved at AAWSA Head Office and branch offices.</u> 4-1 To conduct NRW management trainings to AAWSA technical staffs. 4-2 To report the progress and results of the project activities to AAWSA management officials regularly. 4-3 To conduct NRW management trainings to AAWSA management officials.		<u>Activity 1-4</u> It is expected that procurement including shipping takes time. AAWSA and JET discussed about this issue as follows in August 2022. Mechanical flow meters which are provided by AAWSA shall be installed until arrival of the procurement by JET. After arrival of the equipment, flow meters by AAWSA shall be replaced to flow meters procured by JET.
<u>For Output 5: Knowledge and techniques accumulated in the pilot block are transferred to twinning blocks.</u> 5-1 To select twinning blocks in the pilot branch office. 5-2 To understand current situation of the twinning blocks by field survey and reviewing existing distribution network drawings and customer data. 5-3 To prepare information database (inventory of network, pipe repair record, etc.) necessary for 5-4 & 5-5 activities in the twinning blocks. 5-4 To formulate "pipe network renovation plan" based on Activity 5-3 result. 5-5 To replace a part of pipelines based on the "pipe network renovation plan" by Activity 5-4. 5-6 To formulate "action plan" of NRW reduction activities (leakage detection and repair, meter replacement, reduction of encoding error of meter reading, reduction of illegal connections, etc.) in the twinning block	3 Equipment for NRW Control Works requested by AAWSA - Leakage survey equipment - Pipe maintenance equipment - Bulk flow meter - Customer Meters - Pipe and fitting - Vehicles - Pressure gauges - Pressure reducing valve	

5-7 To organize "action team" to implement the "action plan" formulated in Activity 5-6.

5-8 To conduct on-the-job training about physical loss reduction (leakage detection, pipe repair, service pipe and customer meter installation).

5-9 To conduct on-the-job training about commercial loss reduction.

5-10To implement NRW reduction activities according to the "action plan" formulated in Activity 5-4.

5-11To feedback the results to AAWSA management officials and share them among all AAWSA branch offices through seminars or workshops.

Annex 3 Changes in PDM V3 to V4 (proposed)

	PDM Version 3	PDM Version 4	Reason for change
Project period	Project period 3 to 4 years	Project period 4 years	Reflecting the changes of project duration
Overall Goal OVI	1. NRW ratio (<u>X%</u> decrease from the baseline) 2. <u>Cost-recovery ratio (X%)</u>	1. NRW ratio (%) decreases from the baseline. 2. <u>All AAWSA branches formulate NRW action plans utilizing the results of the project and implement the plans.</u>	1. Rephrased to clarify and subject (target) of OVI and achievement were added. 2. Indicator were added because it will be based on the achievement of project purpose.
Project Purpose OVI	Key performance indicators agreed and applied among all AAWSA	1. Key Performance Indicators for the NRW management agreed and applied to all AAWSA branches. <u>2. NRW action plans for the target branches utilizing the project experiences are formulated and implemented.</u>	Second OVI was added.
Output 1 OVI	1-1 Establishment of proper and accurate monitoring system.	1-1 Pilot branch (Kirkos area) can monitor NRW from the established monitoring system by the project.	Rephrased to clarify and subject (target) of OVI and achievement are added.
Output 2	Capacity to implement and manage NRW reduction measures is strengthened in the <u>pilot branch office</u>	Capacity to implement and manage NRW reduction measures is strengthened <u>in the pilot block</u>	Pilot branch office was changed to Pilot block
Output 2 OVI	2-1 Pipe network renovation plan 2-2 Action plan of NRW reduction activities 2-3 Results of OJT	2-1 <u>Agreed pipe network renovation plan of pilot block is implemented.</u> 2-2 NRW action plan of pilot block is implemented. 2-3 Commercial loss activities based on the customer survey results are implemented. 2-4 Available leakage detection skills and methods are increased.	2-1 and 2-2. Rephrased to clarify and subject and action are added. 2-3 and 2-4. To describe the achievements of OJT on Physical and Commercial losses reductions.
Output 3 OVI	3-1 Selected cost-benefit performance indicators 3-2 Cost-benefit monitoring report	3-1 Cost-benefit performance indicators <u>are selected.</u> 3-2 Cost-benefit analysis <u>of NRW is conducted in the pilot block.</u>	3-1 and 3-2. Rephrased to describe the achievement clearly.
Output 4 OVI	4-1 Results of training 4-2 Report of project activities to AAWSA management officials	4-1 All the trainings conducted by the experts are repeated by CPs. 4-2 AAWSA managements support for the NRW activities introduced by the project is enhanced.	4-1 and 4-2. Rephrased to describe the achievements clearly.
Output 5	Knowledge and techniques accumulated in the <u>pilot branch office</u> are transferred to <u>another branch office.</u>	Knowledge and techniques accumulated in the <u>pilot block</u> are transferred to <u>twinning blocks.</u>	Pilot branch office was changed to Pilot block as well as another branch was changed to twinning blocks
Output 5 OVI	5-1 Pipe network renovation plan in twinning branch office 5-2 Action plan of NRW reduction activities in twinning branch office 5-3 Results of OJT in twinning branch office	<u>5-1 Agreed pipe network renovation plans of twinning blocks are implemented.</u> <u>5-2 NRW action plans utilizing the result of project are implemented in three or more of twinning blocks</u> <u>5-3 Commercial loss activities based on the customer survey results are</u>	5-1 and 5-2. Rephrased to clarify and subject and action were added. 5-3 and 5-4. To describe the achievements of OJT on Physical and Commercial losses reductions.

	PDM Version 3	PDM Version 4	Reason for change
Project period	Project period 3 to 4 years	Project period 4 years	Reflecting the changes of project duration
Overall Goal OVI	1. NRW ratio (<u>X%</u> decrease from the baseline) 2. <u>Cost-recovery ratio (X%)</u>	1. NRW ratio (%) decreases from the baseline. 2. <u>All AAWSA branches formulate NRW action plans utilizing the results of the project and implement the plans.</u>	1. Rephrased to clarify and subject (target) of OVI and achievement were added. 2. Indicator were added because it will be based on the achievement of project purpose.
Project Purpose OVI	Key performance indicators agreed and applied among all AAWSA	1. Key Performance Indicators for the NRW management agreed and applied to all AAWSA branches. 2. <u>NRW action plans for the target branches utilizing the project experiences are formulated and implemented.</u>	Second OVI was added.
Output 1 OVI	1-1 Establishment of proper and accurate monitoring system.	1-1 Pilot branch (Kirkos area) can monitor NRW from the established monitoring system by the project.	Rephrased to clarify and subject (target) of OVI and achievement are added.
		<u>implemented in three or more of twinning blocks</u> <u>5-4 Available leakage detection skills and methods are increased in three or more of twinning blocks.</u>	
Output 1 Activity		1-6 To review existing NRW Key Performance Indicators of annual plan and integrate KPIs reflecting the project activity.	Added activity for the review of AAWAS's KPI and integration of project KPI.
Output 2 Activity	2-1 To understand current situation of the <u>pilot branch office</u> by field survey and reviewing existing distribution network drawings and customer data. 2-2 To prepare information database (inventory of network, pipe repair record, etc.) necessary for 2-3 & 2-4 activities in <u>the pilot branch office.</u> 2-5 To formulate "action plan" of NRW reduction activities (leakage detection and repair, meter replacement, reduction of encoding error of meter reading, reduction of illegal connections, etc.) <u>in the pilot branch office</u> 2-9 To implement NRW reduction activities according to the "action plan" formulated in Activity 2-4.	2-1 To understand current situation of <u>the pilot block</u> by field survey and reviewing existing distribution network drawings and customer data. 2-2 To prepare information database (inventory of network, pipe repair record, etc.) necessary for 2-3 & 2-4 activities in <u>the pilot block.</u> 2-5 To formulate "action plan" of NRW reduction activities (leakage detection and repair, meter replacement, reduction of encoding error of meter reading, reduction of illegal connections, etc.) <u>in the pilot block</u> 2-9 To implement NRW reduction activities according to the "action plan" formulated in Activity <u>2-5.</u>	2-1, 2-2, 2-5. Pilot branch office is changed to pilot block. 2-9. Corrected to the appropriate no of activity
Output 5 Activity	5-2 Trained staffs through the project activities share/transfer their knowledges and experiences to other staffs	5-2 To understand current situation of the twinning blocks by field survey and reviewing existing distribution network drawings and customer data.	Since activities of Output 5 are the replication of Output 2 in Twinning blocks. Output 2 activities were added.

	PDM Version 3	PDM Version 4	Reason for change
Project period	Project period 3 to 4 years	Project period 4 years	Reflecting the changes of project duration
Overall Goal OVI	1. NRW ratio (<u>X%</u> decrease from the baseline) 2. <u>Cost-recovery ratio (X%)</u>	1. NRW ratio (%) decreases from the baseline. 2. <u>All AAWSA branches formulate NRW action plans utilizing the results of the project and implement the plans.</u>	1. Rephrased to clarify and subject (target) of OVI and achievement were added. 2. Indicator were added because it will be based on the achievement of project purpose.
Project Purpose OVI	Key performance indicators agreed and applied among all AAWSA	1. Key Performance Indicators for the NRW management agreed and applied to all AAWSA branches. 2. <u>NRW action plans for the target branches utilizing the project experiences are formulated and implemented.</u>	Second OVI was added.
Output 1 OVI	1-1 Establishment of proper and accurate monitoring system.	1-1 Pilot branch (Kirkos area) can monitor NRW from the established monitoring system by the project.	Rephrased to clarify and subject (target) of OVI and achievement are added.
	through the activities in the twinning blocks.	5-3 To prepare information database (inventory of network, pipe repair record, etc.) necessary for 5-4 & 5-5 activities in the twinning blocks. 5-4 To formulate "pipe network renovation plan" based on Activity 5-3 result. 5-5 To replace a part of pipelines based on the "pipe network renovation plan" by Activity 5-4. 5-6 To formulate "action plan" of NRW reduction activities (leakage detection and repair, meter replacement, reduction of encoding error of meter reading, reduction of illegal connections, etc.) in the twinning block. 5-7 To organize "action team" to implement the "action plan" formulated in Activity 5-6. 5-8 To conduct on-the-job training about physical loss reduction (leakage detection, pipe repair, service pipe and customer meter installation). 5-9 To conduct on-the-job training about commercial loss reduction. 5-10 To implement NRW reduction activities according to the "action plan" formulated in Activity 5-6. 5-11 To feedback the results to AAWSA management officials and share them among all AAWSA branch offices through seminars or workshops.	
Note		1. Target NRW ratio and the baseline ratio in Overall goal will be decided before the end of the project.	Explanation was added about timing of target setting.

	PDM Version 3	PDM Version 4	Reason for change
Project period	Project period 3 to 4 years	Project period 4 years	Reflecting the changes of project duration
Overall Goal OVI	1. NRW ratio (<u>X</u> % decrease from the baseline) 2. <u>Cost-recovery ratio (X%)</u>	1. NRW ratio (%) decreases from the baseline. 2. <u>All AAWSA branches formulate NRW action plans utilizing the results of the project and implement the plans.</u>	1. Rephrased to clarify and subject (target) of OVI and achievement were added. 2. Indicator were added because it will be based on the achievement of project purpose.
Project Purpose OVI	Key performance indicators agreed and applied among all AAWSA	1. Key Performance Indicators for the NRW management agreed and applied to all AAWSA branches. 2. <u>NRW action plans for the target branches utilizing the project experiences are formulated and implemented.</u>	Second OVI was added.
Output 1 OVI	1-1 Establishment of proper and accurate monitoring system.	1-1 Pilot branch (Kirkos area) can monitor NRW from the established monitoring system by the project.	Rephrased to clarify and subject (target) of OVI and achievement are added.
		2. Pilot branch is Kirkos branch area which consists of 4 branches (Nifas Silk, Mekanisa, Megenagna, Akaki) Those four branches are referred as target branches	Explanation was added about pilot and target branches.
		3. Pilot branch of Kirkos area is divided by 11 blocks. Agreement was made that K-1 block is pilot block and K-5, 7 and 11 are twinning blocks.	Explanation was added about target and twinning blocks.