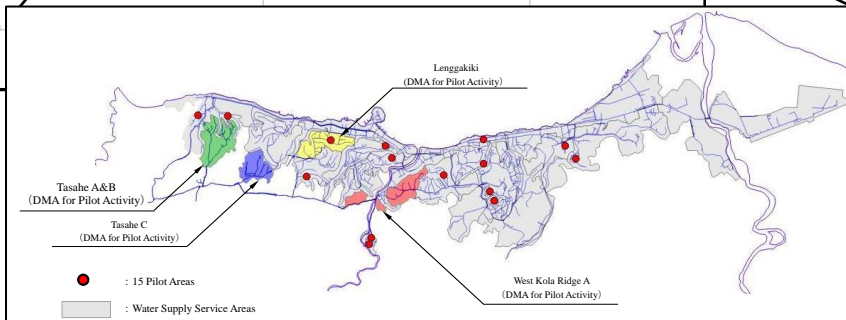
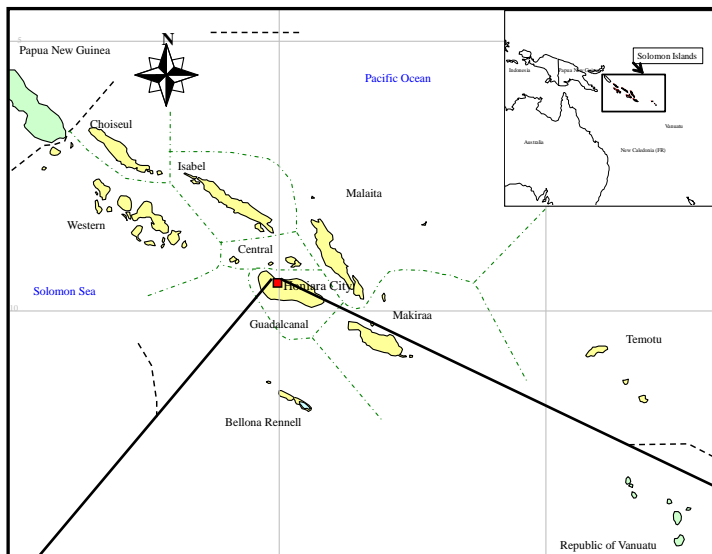


JICA PROJECT BRIEF NOTE

The Project for Improvement of Non-Revenue Water Reduction Capacity for SIWA in Solomon Islands

- Capacity Development towards sustainable promotion of NRW Reduction-

August 2016



1. Background of the Project and Problems

Water supply service in Honiara City, Solomon Islands (hereinafter referred to as “Solomon”) is implemented by Solomon Islands Water Authority (brand name: Solomon Water, hereinafter referred to as “SW”).

The following is basic information of SW water supply works in Honiara City (as of 2015).

- Service Population : About 72,000 (estimation)
- Water Supply Demand : About 34,000m³/day
- Connection : About 10,300 households
- Water Charge : SBD299 (in case 32m³/household/month) (JPY4,100)
- Pipe Length : About 220km (estimation)
- Pipe Type : PVC, Polyethylene, Ductile Cast Iron Pipe, etc.)

Water supply service coverage in Honiara City was about 72% before the Project started (as of 2011), further, in fact about two third of subscribers of SW were suffering from water supply rationing and actually only receive intermittent supply. As for management of water supply

service, the account deficit in 2010 was SBD5million (JPY59million) and operational revenue-to-expenditure ratio was about 84.7%, due to reasons such as a high Non-Revenue Water¹ (hereinafter referred to as “NRW”) ratio reaching 56% as of 2011, high electricity cost, etc.

SW was working on financial improvement through the financial support of AUD2.2millions (JPY170million) from Australian Department of Foreign Affairs and Trade (hereinafter referred to as “DFAT”) in October 2011. However, the NRW ratio, which contributed significantly to the financial situation, was still in high level.

The main reason for this being that, there was no systematized plan for NRW reduction, and SW was repairing surface leakage only if reported by dwellers without scheduled leak detection activities. In addition, high NRW was not only caused by leakage, but also non-installation of water meter, malfunctioning water meter, deficiency of meter reading and insufficient record of water consumption and finally illegal connection. To eliminate the illegal connection, a team to do detection of the illegal connection was established, but it was not settled as a routine work like leak detection, installation/replacement of water meters, etc.

From the aspect of the above background, SW recognized the need to reduce NRW and improve the financial standing, thus Solomon Islands Government requested a technical cooperation project to Japanese Government for the capacity development of SW on NRW reduction. In response to the request, The Project for Improvement of Non-Revenue Water Reduction Capacity for SIWA in Solomon Island (hereinafter referred to as “the Project”) whose purpose is improving NRW reduction capacity was commenced in October, 2012, and the Project was completed in June, 2016.

¹ NRW ratio is an indicator which shows percentage of amount of unbilled water to amount of water supply. It includes that water losses from leakages, illegal connections, and water meter inaccuracy.

2. Approaches to deal with Problems

NRW reduction was urgent issue, since high NRW ratio gave a negative effect to SW water supply service. SW had problems as shown in Table-1. Therefore, in order to solve various problems comprehensively, Output-1 to Output-4 were set as shown in Table-1 and NRW reduction activities to achieve the Outputs were carried out in the Project.

In the Project, in order to conduct solution of NRW reduction effectively, Japan International Cooperation Agency (hereinafter referred to as “JICA”) Expert Team attempted to approach not only at technical aspect (development of the basic capacity for NRW reduction through pilot activities and the capacity for promotion of NRW reduction activities) but also capacity development aspect which self-development was focused on.

2.1 Capacity Development which Self-Development is focused on

(1) Promotion to understand Significance of NRW Reduction Activities

In order to develop organizational frame-work for maintaining NRW measures by SW after the completion of the Project, the Project Team aimed at promotion to make stakeholders understand. SW counterparts

Table-1 List of problems, aims of activities, and achievement

Problems	Aims of activities	Outputs to be expected
1) Insufficient planning ability of NRW reduction activities	To enable to formulate plan of NRW reduction activities periodically	Output-1: Planning process of SW for NRW reduction is systemized.
2) -Insufficient experience of IWA Water balance analysis -Insufficient experience of field investigation and documentation for NRW cause analysis	To enable to self-analyze causes of NRW through training of NRW reduction activities	Output-2: The procedure for NRW reduction is established through the pilot project areas and LCZs.
3) -Insufficient technical skill for leak detection -Insufficient technical skill for maintaining NRW ratio at low level	To enable to monitor of NRW ratio and maintain activities based on work flow through training of practical leak detection	Output-3: NRW reduction is implemented in accordance with the procedure in pilot project areas and/or LCZs in the selected DMAs, and then improved NRW ratio is monitored and maintained.
4) Defective management system for water meter reading and billing process	To Establish management system systematically for water meter reading and billing	Output-4: Water meter reading and billing process management are improved.

(hereinafter referred to as “CP”) and JICA Expert Team performed promotion of understanding for supervisory ministries through workshop for NRW reduction activities to convey significance of NRW reduction activities. In addition, SW CP conducted awareness meetings for the residents (Photo-1) and public relations activities about the NRW reduction activities so as deeply to make customers understand NRW activities in the field and water supply service.

(2) Training and Instruction conducted by SW CP Positively

Some of staff members who were trained through



Photo-1 Awareness meetings for water charge system and illegal connection to the residents



Photo-2 Lecture by NRW Action Team for other Staff Members (confirmation of minimum flow rate during night)

this Project trained other staff members in SW headquarters (Photo-2 and Photo-3) and visited other Provinces to promote NRW reduction activities through On-the-Job Training (hereinafter referred to as “OJT”), which resulted in enhancement of SW’ capacity at the organizational levels.

(3) Planning and Implementation for Optimum Training in accordance with Capacity of SW CP Levels

In order to enable implementation for optimum and sustainable training, JICA Expert Team assessed the baseline of capacity at the organization and individual levels through the interviews and small examination, and formulated the capacity development plan. JICA Expert Team provided optimum training to meet each staff needs in the Project. Fig.-1 is the actual example of a particular staff who is in charge of the entire leak detection activities. According to capacity assessment, since staff’s skills to identify leak points were insufficient, JICA Expert Team focused on leak detection planning and leak detection method through OJT.

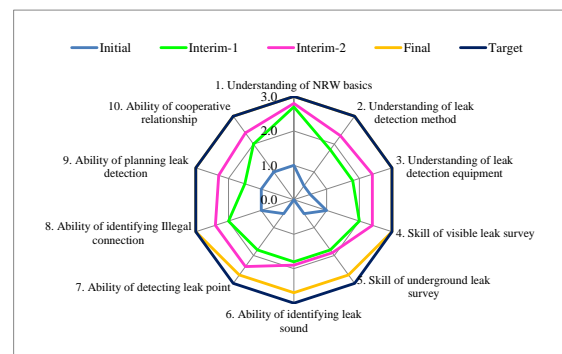


Fig.-1 Transition of progress of individual capacity

(4) Enhancement of Individual Awareness for Work by Introduction of individual Annual Action Plan

Based on capacity development plan, each SW CP formulated an annual action plan which is composed of output target, activity process, and verifiable indicator at the beginning of a fiscal year of the Project, to enhance

awareness of NRW reduction activities and to enable implementation of these activities positively and self-sustainably. SW CP self-evaluated their performance and achievement, based on this Individual Annual Action Plan (hereinafter referred to as “IAP”) at the end of fiscal year.

2.2 Development Basic Capacity for NRW Reduction through Pilot Activities

The basic capacity for NRW reduction was developed according to the following workflow (Fig.-2) through Preparation-Activities and pilot activities for NRW reduction.

The Project Team² carried out pilot activities in pilot activity area³ such as 15 pilot project areas and four Districts Metered Areas (herein after referred to as “DMAs”).

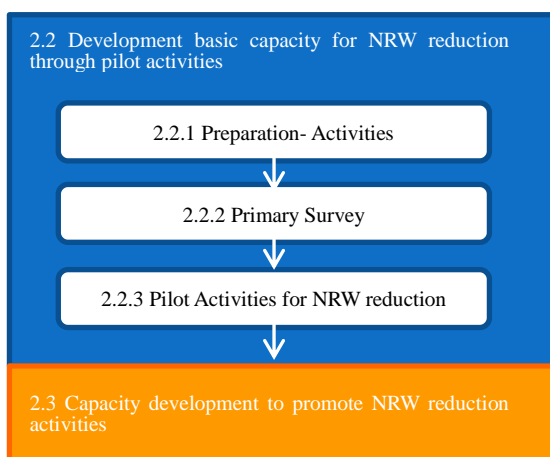


Fig.-2 Workflow of development of basic capacity for NRW reduction

2.2.1 Preparation-Activities

(1) Establishment of Implementation System to conduct Pilot Activities Smoothly

As for the Project Team, the following two teams were established as SW CP.

- NRW Management Team to formulate action plan and supervise NRW action team

- NRW Action Team to implement NRW reduction activities

In addition, since actual activity contents were classified into four categories; the entire NRW reduction activities, water meter reading & billing, GIS and leak detection, NRW action team was divided into following four sub-teams to report detailed progress of the pilot activities.

- Technical Sub-Team
- Customer service Sub-Team
- GIS sub Sub-Team
- Leak detection Sub-Team

To share and solve the issues verified by the pilot activities, weekly meeting regarding NRW reduction activities was carried out to report progress of activity by each sub-team.

(2) Acquisition of Know-How regarding Procurement of Bulk Flow Meters

In order to learn status-quo of distributed flow rate for the whole Honiara city, the Project installed bulk flow meters in each service reservoir. JICA Expert Team was in charge of procurement of bulk flow meters, while SW CP was in charge of BQ preparation of fittings required for examination and installation of flow meters. SW CP had little experiences of these works, because installation of flow meter and valves were not performed regularly.

Through procurement work of flow meters, in order to install flow meters and valves continuously by SW CP in future, which are necessary for NRW reduction activities, JICA Expert Team focused on its planning and design and instructed SW CP to enhance capacity on them.

² The Project Team consists of SW counterparts and JICA Expert Team.

³ 15 pilot project areas and four Districts Metered Areas are defined as “Pilot Activity Areas”.

(3) Database to be prioritized of Pipeline

Drawings of Pilot Activity Areas

It is essential to develop the existing drawings of pipelines so as to conduct NRW reduction activities. Therefore, SW CP utilized GIS software to create database of the existing pipelines.

Because development of database was an urgent issue to operate and maintain water supply facilities, data of pilot activities areas was developed preferentially.

2.2.2 Primary Survey

(1) Measurement and Estimation of NRW in Honiara City

At the commencement of the Project, bulk flow meter and water meter were not installed in some of areas. Therefore, distributed water flow rate was assumed based on water transmission flow (pump operation hours and pump specification) in case of non-installation of bulk flow meters. Metered rate and flat rate were applied for billing. As for flat rate, billing of standard water consumption (32m³/month/household) were imposed. As a result of that, average NRW ratio was about 58% as of 2012 in the whole Honiara City. SW CP learned tentative calculation of NRW ratio by this primary survey.

(2) Survey of the Existing Pipe Location and Confirmation of Valve Status

Before the commencement of the pilot activities, there are discrepancies between existing drawings of pipes and actual locations of pipes. Therefore, SW CP identified locations of valves and fire hydrants by using GPS and assumed location of pipes. In addition, it was indicated that the existing valves which were not used for long time had not been functioned well. SW CP surveyed whether replacement of valves was necessary or not. Consequently, SW CP learned the work required for

hydraulic management and area isolation.

2.2.3 Pilot Activities for NRW Reduction

(1) NRW Reduction Activities based on Annual Action Plan

At the beginning of each fiscal year, the Project Team formulated an annual action plan of NRW reduction in the pilot activity areas. The annual action plan was introduced by SW Project Director at the monthly-board meeting, and it was approved as an annual plan of NRW reduction activities. Based on the result of the primary survey, the annual action plan contained update of the distribution network, plan of installation of valves and flow meters, International Water Association (hereinafter referred to as "IWA") water balance analysis, installation of water meters (Photo-4), leak detection (Photo-5), pipe repair, annual cost to be incurred.

Simultaneously with formulation of this action plan, an individual annual action plan based on the annual action



Photo-4 Installation work of water

plan was formulated by each staff. At this time, the annual action plan was utilized as useful document to prepare the IAP which states role of staff members. Consequently, the annual action plan contributes to IAP.



Photo-5 Identification of leakage points by using leak detection equipment

(2) Selection of Two Types of Pilot Activities

In the Project, two types of pilot activity areas were selected for implementation of NRW reduction activities. One was pilot areas, and the other was DMA. The objective of selection is shown in Table-2⁴. At the beginning of the Project, the Project Team expected that NRW reduction activities would be implemented in the pilot areas. However, the Project Team added activities in DMAs to learn water pressure management and countermeasures of NRW utilizing DMA continuously since DMA was established by SW during the Project.

Table-2 Comparison with Two Types of Pilot Activity Areas

Areas	Nr. of Areas	Objectives
Pilot Area	15	<ul style="list-style-type: none"> - Training for primary NRW reduction activities (water leakage, illegal connection, and reduction of meter inaccuracy) - Collection of information and data necessary for Formulation of strategic implementation plan
DMA	4	<ul style="list-style-type: none"> - Training for primary NRW reduction activities (water leakage and illegal connection, reduction of meter inaccuracy, water pressure management) - Collection of information and data necessary for formulation of strategic implementation plan - Implementation of monitoring of NRW reduction and maintaining

⁴ “Strategic implementation plan” in the table is for implementation of NRW reduction activities in the future, based on pilot activates.

In regard to selection of areas, in order to implement the Project as estimated budget as scheduled, the Project Team added not only stability of water supply and service time but also efficiency of the work and beneficiaries.

(3) International Water Association (IWA) Water Balance Analysis

The Project Team figured out NRW from the differences between the 24-hour system input volume (SIV) and the metered consumption in the particular pilot area. IWA water balance analysis was conducted before and after-countermeasure to verify the effects of NRW reduction activities. SW CP learned identification of NRW volume in accordance with analysis form of NRW provided by IWA.

(4) Analysis of NRW Causes

Causes of NRW are mainly categorized into three; leaks including unknown water, illegal connections and water meter inaccuracy. Example of result of NRW reduction activities at pilot areas is shown in Table-3.

In regard to identification of water loss, even though it was limited to classify NRW causes accurately, NRW causes were sorted out by measured and estimated value as much as possible.

As the result of calculation, composition of NRW causes was leaks of about 83%, illegal connections of about 9% and water meter inaccuracy of about 8%.

Table-3 Examples of Result of Water Distribution Analysis

Items			Definitions in the Project (calculation method)	Before Countermeasure		After Countermeasure	
Revenue Water	Billed Authorized Consumption		1) Metered Consumption	Metered consumption [based on actual metering]	4.10%	13.50%	66.10%
			2) Unmetered Consumption	Flat rate consumption [based on estimated standard consumption]	9.50%		1.70%
Non-Revenue Water	Un billed Authorized Consumption		3) Metered Consumption	Arbitration water [not applied in the Project]	0.00%	86.50%	0.00%
			4) Unmetered Consumption	Exceeded consumption in the flat rate consumption [based on actual measurement in the particular period of	13.80%		0.00%
	Apparent Losses	Unauthorized Consumption	5) Unbilled Water (illegal connection) -1	-Water consumption by illegal connection with faucets [open faucets -Water consumption from household supplied water as flat rate [based on estimated consumption]	7.3%		0.00%
			6) Unbilled Water (illegal connection) -2	Water consumption by illegal connection without faucets [based on actual measurement in the particular period of	15.00%		0.00%
		Metering Error	7) Metering Inaccuracy	Error of water metering [based on actual measurement]	1.10%		1.40%
	Real Losses	Leakage, Others	8) Leakage, Others	Leakage and unknown water [inflow water -(3)~7]	49.20%		30.70%
System Input Volume (SIV)					100%	100%	100%

(5) Countermeasures

In order to reduce NRW indeed, the Project Team implemented countermeasure comprehensively considering mutual correlation between solutions shown in Table-4.

Table-4 Solutions to Issues

Issues	Solutions
Illegal connections	- Disconnection of illegal connections - Promotion of legalization - Awareness meeting to resident
Leakage	- Pipe repair - Replacement of pipelines - Water pressure management
Metering Inaccuracy	- Installation of water meters - Replacement of water meters
Deficiencies of meter reading and billing management	- Development of organizational frameworks of meter reading and billing work system - Education of staff for meter reading

1) Reducing Leaks

Countermeasure for leak reduction is key measures of NRW reduction. The countermeasure is divided into three; survey of leaks, identification of leak points and repair of pipelines. As result of filed survey in the pilot areas, many volume surface leaks were found, and

countermeasure of these leaks were conducted preferentially. Consequently, much effectiveness of NRW reduction was confirmed even though surface leaks were eliminated. In addition, the Project Team controlled water pressure by using pressure reducing valve in the highly water pressurized area.

2) Eliminating Illegal Connections

Elimination of illegal connections is prompt countermeasure which should be tackled by SW. In the Project, the Project Team conducted disconnection and promotion of legalization against illegal connections as immediate measures. However, it was observed that illegal connections recurred since the disconnection of illegal connections is not drastic countermeasure. Therefore, SW has been conducting PR and awareness meeting persistently to stop illegal connections.

3) Raising Awareness to Conduct Meter Reading in Accuracy

SW regulated the metered rate basically, but SW was not concerned with water tariff collection on flat rate. The Project Team installed water meters newly and

replaced the existing water meters with new ones in the areas, where water meters were not installed and water meter malfunctioning so that SW CP's awareness on meter reading was improved.

4) Improving Water Meter Reading and Billing Process

An accurate water meter reading, billing management, and these data processing are significantly important works to ensure reliable record of revenue water. As a countermeasure of NRW reduction, to conduct water meter reading accurately, the Project Team made an effort to improve accuracy of water meter reading as follows (Photo-6).

- Establishment of organizational system based on meter reading work schedule to implement monthly meter reading

- Training for prevention of meter misreading

- Verification of reading records by photography (Photo-6), especially, the photography contributed to reduction of number of complaints from customers.



Photo-6 Verification between reading record and photography

(6) Importance of Analysis of Cost Effectiveness for NRW Reduction Activities

The Project Team analyzed cost effectiveness with the balance between cost incurred for NRW reduction activities and revenue increased by revenue water. As a result of the analysis of cost effectiveness, the followings

were expected.

- SW CP fully understands effectiveness of NRW reduction activities

- SW CP raises awareness of NRW reduction activities

- Contribution to annual budgetary arrangement

2.3 Capacity Development to promote NRW Reduction Activities

After development of basic capacity regarding NRW reduction activities, the Project Team focused on promotion of NRW reduction activities. Based on strategic implementation plan which the Project Team formulated considering lessons learned from the pilot activities, the Project Team commenced practical NRW reduction activities in the DMAs. Capacity development process is shown in Fig.-3.

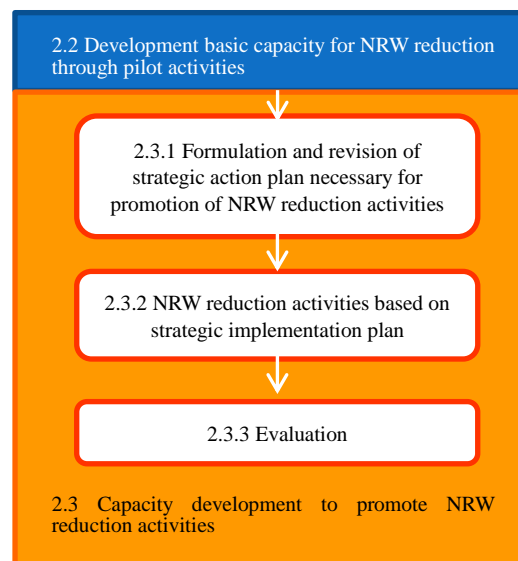


Fig.-3 Workflow of capacity development to promote NRW reduction activities

2.3.1 Formulation of Strategic Implementation Plan necessary to promote NRW Reduction Activities

In consideration of the results and the lessons learned from pilot projects, SW CP prepared strategic implementation plan for NRW reduction in the whole Honiara city to achieve 25% NRW ratio as of 2025 in

cooperation with JICA Expert Team. According to the result from pilot activities, the Project Team analyzed characteristics of pilot activity areas and effective countermeasure to conduct NRW reduction activities efficiently.

The following are contained in the strategic implementation plan.

- Medium-Term goal for NRW reduction activities
- Correlation between characteristics of pilot activity areas and causes of NRW
- Implementation system for NRW reduction activities
- Detailed NRW reduction activities
- Workflow of implementation of NRW reduction activities
- Priority level in DMA activities
- Budgetary planning
- Implementation schedule

As for priority level in DMA activities, 28 DMAs in Honiara City were prioritized with rating in accordance with criteria as shown in Table-5.

Table-5 Criteria for prioritized Level of DMA

Criteria	Contents
Seriousness of NRW	<ul style="list-style-type: none"> ● A large number of illegal connections ● A large number of leakages ● Frequent bursts
Water Supply System Condition	<ul style="list-style-type: none"> ● A large number of bulk flow meter installed ● A small number of the pilot projects including the past projects which were done. ● A small number of cascading
Effect on SW's Finance	<ul style="list-style-type: none"> ● Large amounts of revenue in Sep. '14 (SBD/mon.) ● A large number of domestic user
Number of Beneficiaries	<ul style="list-style-type: none"> ● A large number of domestic user ● A large number of commercial & Institutes
Easiness of Isolation	<ul style="list-style-type: none"> ● A small number of the places to be Isolated
Feature of Distribution Network	<ul style="list-style-type: none"> ● A large number of more simple network ● A large number of dendritic network ● A large number of raising capacity

2.3.2 NRW Reduction Activities Based on Countermeasures Strategic Implementation Plan

Based on strategic implementation plan for NRW reduction in the whole Honiara city, NRW reduction activities such as leak detection and repair, disconnection or legalization of illegal water user, installation or

replacement of customer meters and so forth were taken in four DMAs out of 28 DMAs created in Honiara city. These activities are same as the activities which were taken in the pilot project, however, improved low NRW ratio was necessary to maintain as an additional issue. To maintain improved NRW ratio at low level, it is necessary to ensure monitoring of NRW ratio and maintenance activities. The Project Team set frequency of monitoring (monthly, weekly and daily) depending on measured NRW ratio, to enhance work efficiency (Table-6). In case NRW ratio was higher than criterion, an appropriate countermeasure was undertaken.

Table-6 Frequency of Monitoring in each measured NRW Ratio

NRW ratio (criterion)	Frequency of monitoring
20% or less (low)	Monthly
25% or less (mid)	Weekly
More than 25% (high)	Daily

2.3.3 Evaluation

The Project Team reviews the issues learned through the annual activities, and reflects their results to improve the strategic implementation plan according to current condition.

3. Results of Approaches

3.1 Significant Reduction of NRW Ratio

NRW ratio before and after NRW reduction and its reduction points in 15 pilot project areas and four DMAs are shown in Fig.-4. NRW ratio was decreased from 56% to 18%, which was reduction of 38 points on an average. Daily NRW per connection was decreased from 1.9m³/household/day to 0.4m³/household/day, however, according to the indicator which is shown in “The International Non-Revenue Water Assessment Matrix, The Issues and Challenges of Reducing Non-Revenue Water ADB (2010)”, daily NRW per connection after countermeasures should be further improved.

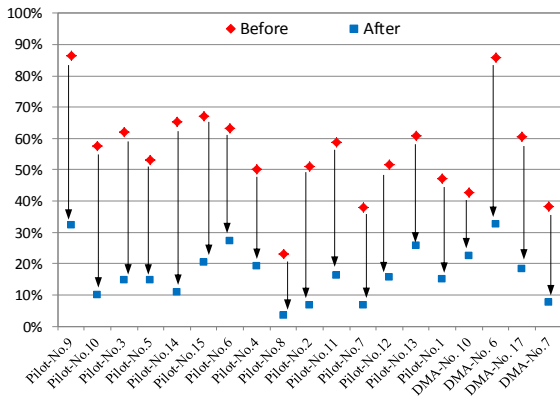


Fig.-4 Reduced NRW Ratio



Photo-7 Over 60 years old pipes after installation

3.2 Correlation between Characteristics of Pilot Areas and NRW Ratio

Main Causes of NRW are leaks, illegal connections and water meter inaccuracy. The Project Team reviewed that there was a high correlation between above mentioned causes and characteristics of pilot areas as shown in Table-7.

To develop NRW reduction activities in future, importance of the activities considering characteristics of areas was stated in Strategic Implementation Plan.

Table-7 Correlation between Characteristics of Pilot Areas and NRW Ratio

Correlation between characteristics of pilot areas and NRW ratio	Reasons of correlation
a) Many illegal connections in the areas relatively which is away from SW office	In case residents are away from SW office, it is likely to connect illegally due to low frequency of monitoring.
b) Many leaks in the areas where distribution pipelines are laid in non-public road	In the area where it is impossible to access by car, it takes time to access on foot, therefore, it is likely that leak were not found frequently.
c) Many leaks in the areas where deteriorated water pipes exist	Leaks were detected in the order of year of installation (Photo-7), therefore, it is likely that their pipes are deteriorated.

3.3 Leaks accounted for Main Cause of NRW

As mentioned above, leaks account for 80% of NRW causes. Leakage points, pipe types, and pipe condition are shown in Table-8. Most of leaks were detected at fitting of polyethylene pipes and valve joint. Besides, breakage of valves was found. Therefore, the Project Team focused on countermeasures on the fitting of polyethylene pipes and valve joint.

Table-8 Main Cause of NRW

Classification	Causes of Leakage	Ratio(%)
Pipe types	Polyethylene pipes (mainly water service pipes)	74
Leakage point	Pipes and valves	65
Pipe condition	Looseness of joint	56
Others	Vandalism and defective valves	65

3.4 Water Pressure Control for NRW Countermeasures

The Project Team had pressure control (12m pressure reducing) as one of the NRW reduction activities in a certain DMA. NRW ratio was decreased from 86% to 45% after countermeasures prior to pressure control and NRW ratio was decreased to 33% with pressure control which resulted in 12 points reduction. Pressure control is one of the effective NRW reduction activities.

3.5 Cost-Effectiveness of NRW Reduction

The Project calculated the total cost for NRW reduction for three years in consideration of initial cost of NRW reduction and recurring cost to maintain⁵ NRW ratio at low level for a certain period. Meanwhile, the Project estimated the total increased revenue by multiplying billed water for three years by unit water supply price. As a result, benefits of NRW reduction were estimated at SBD 23 million (JPY 320 million) in 15 pilot project areas and SBD 24 million (JPY 340 million) in four DMAs (Table-9).

In addition, through NRW reduction activities, it was found that income was increased by about 50-95% of current income with water tariff.

Table-9 Benefit by NRW reduction

Area	Nr. of Households	Increased Revenue Water m ³ for three years	Increased Revenue (1)	Primary Cost and Proactive Cost for Recurrent NRW (2)	Benefit for three years (3)=(1)-(2)
15 Pilot Areas	1,464	1,538,784	27.1 million	4.5 million	22.6 million (JPY320 million)
4 DMAs	829	1,598,184	28.1 million	4.0 million	24.1 million (JPY340 million)

3.6 Monitoring and Maintenance of NRW Ratio

Figure-5 shows monitoring results as follows.

- Monthly results of NRW ratio during period from January, 2015 to July, 2015 as primary activities
- Monthly monitoring result of NRW ratio from August, 2015 to March, 2016 after primary activities

As monitoring results, recurrence and reduction in NRW are repeated during the whole period (a reason of high NRW ratio on November, 2015 is breakage of water distribution pipelines).

According to the monitoring results, SW CP has been conducting countermeasures properly to maintain the improved NRW ratio.

⁵ Even if NRW reduction activities are performed, NRW is increased again due to various factors. Therefore, countermeasures with monitoring should be conducted as necessary to maintain low NRW ratio.

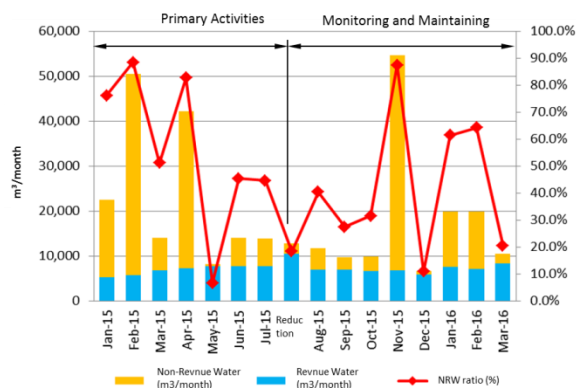


Fig-5 Monitoring result of monthly balance at DMA West Kola Ridge A

4. Efforts and Lessons Learned in Project Operation

4.1 Technical Effort for NRW Reduction

(1) Thorough Detection of Surface Leakage by utilizing Meter Readers

Because of high ratio of NRW in Honiara city, detection of surface leakage and its repair were effective measures against NRW until the ratio decreases to about 30%. Actually, repair of surface leakage was a main measure in most of 15 pilot project areas. The Project got meter readers as well as technical staff in charge of leakage detection to find out surface leakage effectively.

(2) Surveillance of Illegal Connections by utilizing Meter Readers

Apparent loss by illegal connections accounts for a little less than 10% of the total NRW, this means a large number of illegal connections exist in Honiara city. SW has a dedicated section for surveilling illegal connections, but their situations change continuously. So, meter readers surveilled illegal connections as well as detected surface leakage during meter reading, and then this led to quick response against illegal connections by making it obligatory for meter readers to report to Billing Team.

(3) Effective Searching of Error on Billed Amount of Water (Water Meter Error?)

It is a common method to search abnormal value in monthly billed amount of water by comparison with the past one in Japan. The Project employed the same method to find out water meters suspicious for malfunctioning and included the activity to make a judgment on necessity of replacement of the water meters. This approach made replacement by SW more effective.

(4) Importance of Leakage Control

Physical loss by unknown/unidentified water including leakage accounts for about 80% of the total NRW. Leakage tends to occur often along distribution pipelines located in outside of roads and deteriorated pipelines, and also at servicing points. So, strategic implementation plan focuses on leakage control in future NRW reduction in the whole Honiara city.

(5) Effective Measures against Illegal Connections

Illegal connections tend to be located in the areas away from SW's office, where may hardly be surveilled by SW staff. To deal with illegal connections effectively, strategic implementation plan introduced patrol to surveil illegal connections, disconnection or legalization particularly in such remote areas. However, the Project found out that a certain number of disconnected households recidivate. One reason is that some areas have no alternative to get potable water, so SW tried to encourage those households to register immediately.

4.2 Effort for promoting NRW Reduction to the Whole Honiara City

(1) Preparation of Strategic Implementation Plan and Manuals, and its Revision

On the basis of knowledge gained in pilot projects, strategic implementation plan was prepared by Counterparts with support from JICA Expert Team to sustain NRW reduction autonomously and effectively. In

addition, a series of capacity development conducted in the Project was made out as manuals, which are supposed to be revised by SW for improving user-friendliness in accordance with results of future NRW reduction.

(2) Information Sharing and Initiatives of Counterpart through Weekly Meetings

The Project held weekly meetings for NRW Action Team to share progress, present issues and discuss solutions. Even if ill-attended, the regular meetings encouraged the initiative of the Counterpart for continuous activities and enhanced understanding of importance of NRW reduction. This understanding brought in continuance of the meeting and then positive growth cycle. Counterparts recognized its usefulness which enables them to understand issues of other departments or sections, learn from others and then cooperate to conduct NRW reduction activity.

(3) Importance of Cost-Effectiveness of NRW Reduction

The Project compared the total cost for NRW reduction and the total increased revenue by multiplying billed water by unit water supply price. Significant increase in revenue by NRW reduction led to awareness rising of Counterpart about importance of NRW reduction.

4.3 Effort for enhancing Motivation

(1) Taking Advantage of Competitive Consciousness

SW has kept on NRW reduction activities by six groups in DMAs excluding four DMAs targeted by the Project. Each group has a leader and has charge of a DMA, and NRW reduction activities in DMAs have been conducted simultaneously. This arrangement has led to awareness of impact and promptness, then enhancing motivation by competitive consciousness among groups.

(2) Target-Setting in Annual Action Plan and Self-Evaluation by Each Staff

SW Counterparts set the target and indicators in individual annual action plan and evaluate achievement by themselves at the end of each year. Human Resources Manager of SW got involved in planning and self-evaluation, and also gave advices and evaluations.

This process encouraged SW staff to perform their own tasks with a sense of tension and responsibility, then led to enhancing their motivation and improving attitude toward works.

(3) Initiative of Counterparts in JCC Meetings and Workshops

In JCC meetings and workshops on suitable occasions, Counterparts made presentations actively of progress and results of NRW reduction activities. The presentations and discussions with SW management, board members, regulating ministries and development partners empowered them.

(4) Award to SW Counterparts

As a part of capacity development, the Project carried out examinations. The members of NRW Management Team and NRW Action Team, who scored high in the examinations or contributed highly to activities, were recognized in weekly meetings particularly in which SW management including General Manager participated. This kind of recognition does not lead directly to promotion but seemed to keep up their morale because their contributions are presented to SW management.

4.4 Lessons Learned in Project Implementation

(1) Importance of Monitoring and Maintenance after Initial NRW Reduction Activities

Initial NRW reduction activities in pilot project areas

such as water balance analysis, minimum night flow measurement, leak detection, measures against illegal connections, water meter error test, etc. were conducted smoothly. However, toward the end of pilot project, the Project clarified lack of know-how in SW for maintaining the reduced NRW ratio at the low level. In addition to assistance for initial NRW reduction activities, assistance for monitoring and maintenance of NRW ratio is useful in capacity development on NRW reduction.

(2) Effect of Water Tariff on NRW

In case of Honiara city, expense for water accounted for about 15%⁶ of monthly household income on the ground, this high proportion caused illegal connections. Therefore, not only technical approaches such as leakage control but also impact of water tariff on NRW ratio should be considered in NRW reduction. To eliminate illegal connections and arrears, the Project Team suggested that SW revise water tariff to be more affordable based upon socio-economic survey.

(3) Timely Procurement of Equipment and Materials

Water supply services and NRW reduction are subject to procurement of equipment and materials. Because of no suppliers of major equipment and materials necessary for water supply services in Honiara city, SW has to procure and import them directly from Australia and New Zealand, that is, SW takes much time to procure them. Discrepancy in order between SW and suppliers sometimes causes extra time. To avoid delay in future NRW reduction, SW should procure them smoothly and timely through close coordination with suppliers.

(Project Period: October 2012 to June 2016)

⁶ As an example, the expense is SBD299 (JPY4,100) at 32m³/month for flat-rate domestic customer as of Sep. 2015, while household income is SBD2,000 (JPY27,000) per month.