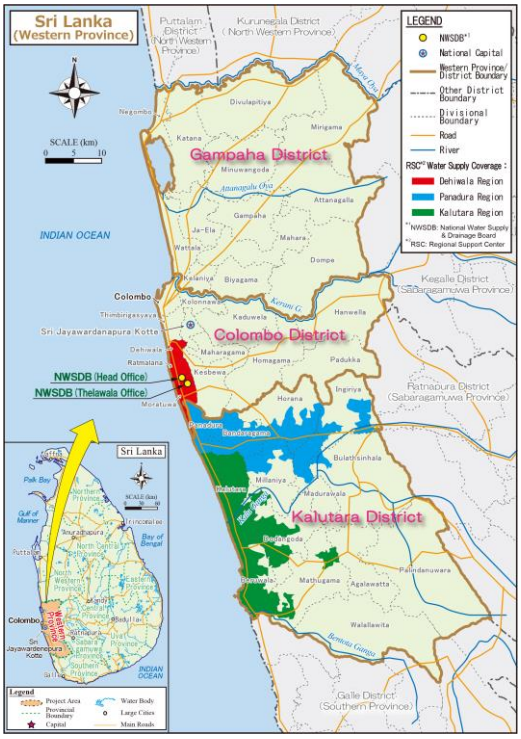
JICA PROJECT BRIEF NOTE

The Project for Enhancement of Operational Efficiency and Asset Management Capacity of Regional Support Center-Western South of NWSDB in Sri Lanka

October 2021

Japan International Cooperation Agency

National Water Supply and Drainage Board



1. Background and Issues

National Water Supply and Drainage Board (NWSDB) has been providing water services in Sri Lanka since its establishment in 1975. According to the latest corporate plan of NWSDB (Corporate Plan 2020 -2025), although coverage of the water supply system of densely populated Colombo District has reached 92.1%, overall coverage in the country is still 40.0%. Therefore, NWSDB will continue to enhance water supply capacity and improve the quality of services.

To proceed this business, NWSDB has been considering the introduction of asset management to (1) improve their business operation by effective distribution of O&M and investment fund and (2) formulate a business plan based on prioritized renewal of aging assets.

Also, leakage control work in NWSDB was mainly taking reactive measures in response to leakages which are identifiable on the ground, and there was less awareness for measures against subsurface leakage. In addition, there were problems regarding the quality of pipe installation and technical skill of fitters and supervisors, such that fitters did not pay attention to appropriate procedure of pipe jointing and installation, and supervisors did not take care of the adequacy of construction procedure enough.

Considering the above situation, Sri Lankan Government requested the following technical cooperation in capacity development of NWSDB to Japan in July 2016.

- Enhancement of efficiency of NWSDB's business operation by introduction of asset management
- Improvement of NRW ratio by strengthening countermeasures for water leakage.
- Improvement of water leakage control and construction quality by improving the training programmes.

2. Approach

(1) Outline of the Project

The following is the Project outline agreed with NWSDB about implementing "The Project for Enhancement of Operational Efficiency and Asset Management Capacity of Regional Support Center-Western South of NWSDB in Sri Lanka" (the Project).

[Overall goal]
The enhanced works of pipelines management are expanded in NWSDB.
[Project Purpose]
Pipelines management works of NWSDB are enhanced.
[Outputs]
1) Asset management of pipelines is introduced to NWSDB
2) Capacity for leakage control is enhanced in the pilot activity site
3) Capacity for implementation of training programmes on leakage control is enhanced

(2) Project implementation structure

The Project was implemented with the support of 2 water utilities in Japan: Kobe city waterworks bureau and Nagoya city water and sewerage bureau participated with their knowledge and experience of practicing good water supply services. JICA made an agreement about cooperation to the Project with both water utilities. Both water utilities dispatched experts, conduct training in Japan, and support the Project from Japan as an administrative office.

Project implementation structure is shown in Figure 1.

The work team, which mainly consists of Manpower Development & Training Division (MD&TD) of NWSDB, Regional Support center (Western-South) (RSC(W-S)) and Regional Support center (Western-Central) (RSC(W-C)), was organized for each Output. Sri Lankan and Japanese leaders of each work team managed the progress and found out solutions to problems.

Also, Additional General Manager (Addl GM) of NWSDB and Assistant General Manager (AGM) of RSC(W-S) were assigned as Project Director and Project Manager respectively and managed the whole project. Joint Coordinating Committee meeting with the participation of the Ministry of Water Supply (MWS), JICA and all project stakeholders was held regularly to monitor the progress and make decisions during the Project.

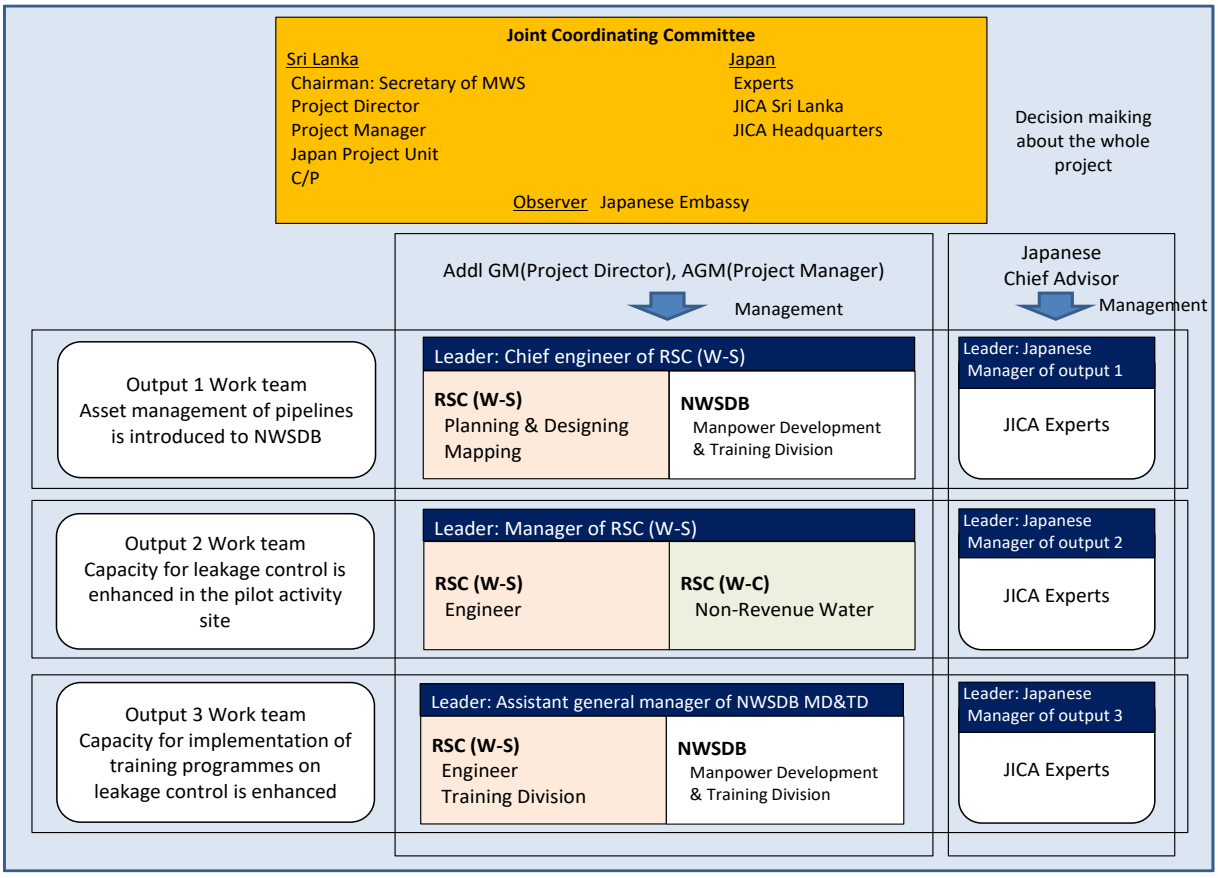


Figure 1 Project implementation structure

(3) Concept of the Project

The Project is aiming to enhance pipeline management in NWSDB and encourage sustainable activities for the enhancement of efficiency of business operation.

The Project contributes to the realization of the corporate philosophy of NWSDB "Serve the nation by providing sustainable water & sanitation solutions ensuring total user satisfaction" and achievement of SDGs. The relationship between Outputs, corporate philosophy of NWSDB and contribution to SDGs are shown in Figure 2.

(4) Procedure of Project Implementation

1) Output 1: Asset management of pipelines is introduced to NWSDB

Although activities of Output 1 were changed during the Project considering the implementation structure of NWSDB and NWSDB's requests, eventually Japanese experts and NWSDB agreed on discontinuing Output 1 in the middle of the Project. Therefore, the history of change of scope and summary of Output 1 activities are shown in "3. Results"

✧ Conduct seminar/workshop on asset management of pipelines

Seminar/workshop are conducted for the explanation of outline of asset management and confirmation of NWSDB's issues. There was no department responsible for asset management at NWSDB Head Office in the beginning of the Project. In addition, responsibilities for asset management of each department were unclear since they were not defined in the division of work. Also, the necessary information of pipelines such as installation year of pipelines were not registered properly. Therefore, the seminar and workshop are to clarify the responsibility of each department, introduce the asset management for a long-term planning, consider the installation year of pipelines and so on.

✧ Develop a draft of guideline for asset management

Japanese experts and NWSDB develop a draft of guideline for asset management so that NWSDB will be able to continue the proper asset management.

✧ Conduct Top Management Meeting (TMM) for formulation of asset management

In order to enhance the asset management in NWSDB, decision-making at the management level is important. Therefore, TMM is conducted regularly to make decisions about asset management of pipelines associated with the Project.

✧ Collect necessary data of pipelines for the trial calculation of renewal demand in the pilot site

There is a lack of information in the current database of NWSDB (installation year, pipe type, diameter, record of leakage and repair). Therefore, Japanese experts and NWSDB collect information to calculate renewal demand of pipelines. The collected data is to be included in the current database.

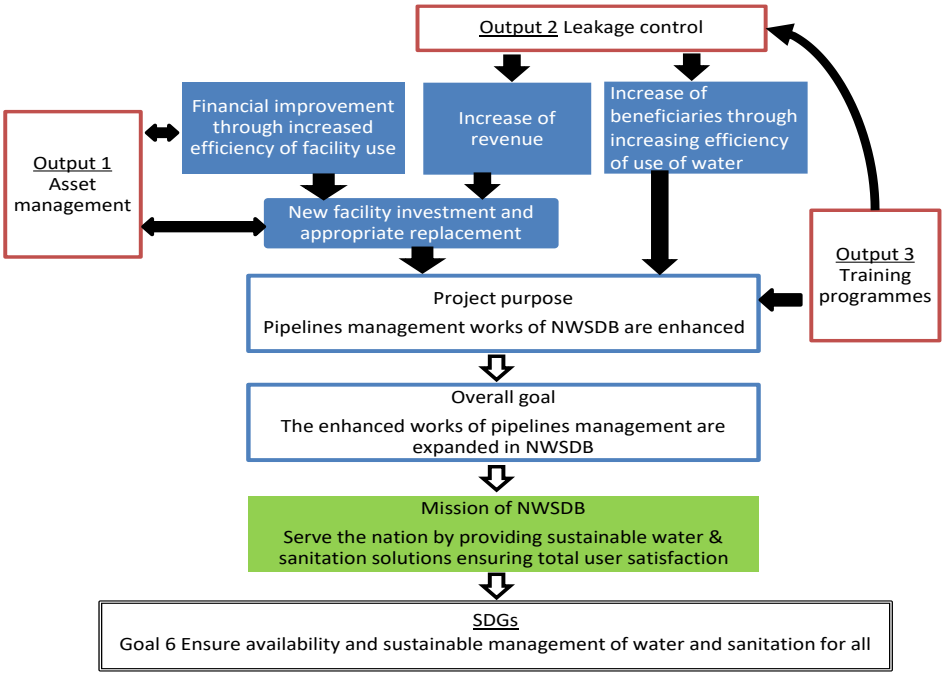


Figure 2 Concept of the Project

2) Output 2: Capacity for leakage control is enhanced in the pilot activity site

✧Develop a work plan for enhancement of the existing leakage control works

The conventional countermeasures for water leakage implemented in RSC(W-S) have been limited to "passive ground leak countermeasures" based on reports from residents and irregular reports from field staff. Therefore, NWSDB pointed out that it is necessary to promote more aggressive water leakage reduction activities. In creating the work plan, Japanese experts emphasize the practice of "active countermeasures for underground water leakage" and aims to improve the efficiency of countermeasures, identify and establish effective activities through practical work in On-the-Job Training (OJT) style.

✧Implement OJT for leakage control works

Japanese experts conduct OJT based on the formulated work plan. Figure 3 shows the general procedures of leakage control applied in Japan. Table 1 shows the methods of technical guidance in the Project.

Regarding the implementation of OJT, it is important to consider the following:

- [Purpose of OJT]

  RSC(W-S) staff learns the techniques required for District Metered Area (DMA) management, leak detection, operation and maintenance of equipment, leak repair, measurement of leak reduction, cost-effectiveness analysis of activities, and leak monitoring so that they will be able to efficiently implement measures against underground leaks.

- [Target person of OJT]

  Mainly, target person of OJT are office in charge Panadura staff and RSC(W-S) engineers who have the responsibility of the pilot site. However, by encouraging participation from other office in charges, Japanese experts aim to disseminate the technology of Output 2 to the whole of NWSDB.

- [Expected impact of OJT]

  Strengthen the collaboration between RSC(W-S) and MD&TD and improve the quality of practical training at training yard.

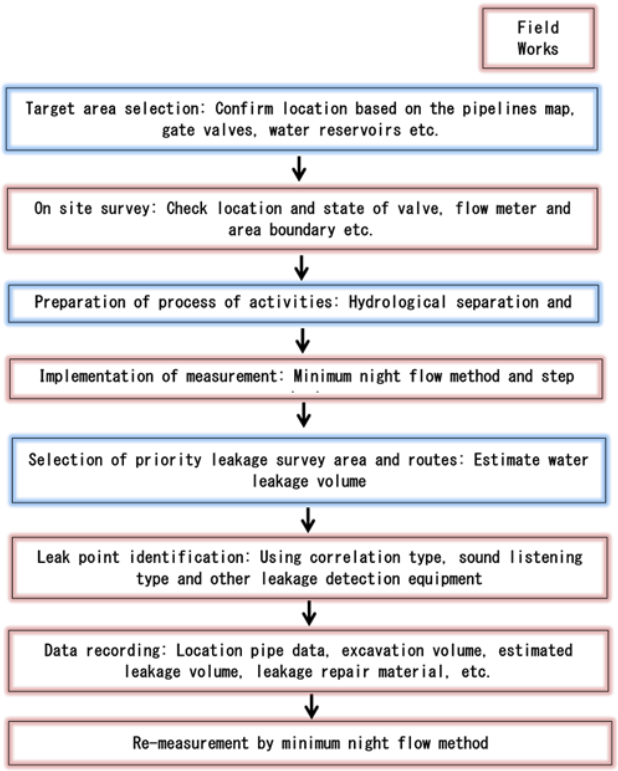


Figure 3 General procedure of leakage control

Table 1 Method of technical guidance in the Project

Item	Method
Implementation system / planning for survey	Formation of survey team, efficient survey schedule, planning survey area etc.
Pipeline drawing, As-built drawing	Based on existing piping drawing and as-built drawing, conduct actual field investigation, check valve position, branch, boundary etc.
Operation of leakage survey equipment	Instruct operation of various types of leak detectors with the actual operations
Feedback of leakage prevention measure	Summarize existing leakage record and identify frequent water leakage area and pipeline
Making a Record, reflection to pipe asset management	Instruct recording method of leakage data
GPS, mapping	Instruct how to record the information with digital tools
Implementation system / planning for repair	Formation of repair team, planning repair work
Excavation Repair work	Instruct proper implementation method of excavation work and repair work at the site.
Excavation tool Leak repair equipment	Preparation of excavation and repair tools and equipment, and instruction on appropriate usage.
Estimation of leakage volume, cutting off water and filling water	Instruct how to measure water leakage volume by visual inspection or simple measuring equipment. Instruct how to cut off water and fill water using valve and fire hydrant
Securing work quality and safety management	Instruct how to secure work quality and safety measures, and instruct the method on customer service

✧ Accumulate collected data during leakage control works to the existing database

Japanese experts support NWSDB to accumulate specifications and information about pipes, customer information, etc. obtained through OJT for leakage control and reflect the data in the existing GIS database.

✧ Create a procedure manual for leakage control

Japanese experts and NWSDB create a procedure manual about underground leakage control, pipe installation, connection of service pipe and data collection. The procedures of this activity are shown below.

- Review the existing documents related to leakage control
- Create a draft of the procedure manual
- Discuss with Planning and Design Procedure Manual Review Committee about the draft of the procedure manual
- Update the procedure manual based on the result of pilot activity
- Finalize the procedure manual based on the comment of NWSDB managers

3) Output 3: Capacity for implementation of training programmes on leakage control is enhanced

✧Review status of the current training programmes on leakage control conducted at the training center and RSCs

Japanese experts study the existing training programmes such as leakage control, pipe laying and jointing and pipe maintenance, and identify the issues of NWSDB's training.

✧Plan practical training programmes on leakage control

Based on the results of the above review, Japanese experts develop practical training programmes on leakage control. Practical training is conducted in the training yard which is set up by the Project.

✧Set up a training yard

Training yard is set up to conduct practical training. The outline of training yard is shown in Table 2. Training yard mainly consists of facilities for leakage detection and service pipe installation, and it has a roof and facility to collect leaking water.

✧ Select candidates for trainer of practical training

Japanese experts and NWSDB select the trainer of practical training in training yard.

Table 2 Outline of training yard

Target of training
Training to detect underground (invisible) leakage and connect service pipe
Outline of training yard
・ Location: NWSDB, Thelawala Premises ・ Required construction area：Approx. 400m^2 (including drain trench around yard)) ・ Roof for pipe connection yard is constructed so that training can be conducted on a rainy day or under intense sunlight. ・ Facilities to drain leaked water and drain trench around yard are constructed. [Survey of underground leakage] ・ Training of pinpointing the leaking points from distribution pipe (ND80mm or ND100mm) and service pipe (ND20mm) ・ Training of pinpointing leaking points under different water pressure by valve control ・ Listening training of leaking tone from asphalt and concrete surface materials laid on in the field ・ Listening training of leaking tone from pipe materials such as Ductile Iron (DI) and Polyethylene (PE) laid in the field [Pipe connection] ・ Distribution pipe: DI pipe, PVC pipe and Polyethylene pipe (PE) by heat fusion connection ・ Service connection: PE pipe etc.

✧Conduct TOT for trainer of practical training

Japanese experts conduct Training of Trainer (TOT) to trainer of practical training. Trainer of practical training can learn the way to conduct training in this TOT and the trained trainer can conduct TOT to the candidate of next trainer in future. This will generate a flow to succeed in the technical skills in NWSDB.

The scheme of selecting trainer in MD&TD was to select candidates of trainer from the experienced staff in each division and register the staff as trainer. MD&TD didn't have the criteria and systematic scheme to select the trainer. MD&TD was selecting the suitable person for trainer by discussing with other divisions each time. Therefore, Japanese experts and NWSDB create a system to select the trainer with clear criteria.

✧Implement the practical training programmes

Trainer of practical training who has understood the implementation procedures of training conducts the practical training with trainees.

3. Results

(1) Output 1

1) History of change of scope

Japanese experts conducted seminars and workshops to share the image of asset management, and introduced the ISO 55000 series, which is the international standards of asset management, and the practices of asset management in Japan based on the "Asset Management Guidelines for Waterworks, 2009" published by the Ministry of Health, Labour and Welfare of Japan.

Based on the mutual understanding that strong participation of top management is necessary to establish a systematic asset management system, it was decided that TMM is held regularly. Also, in the original plan, the OJT was to be conducted for the calculation of pipe replacement demand, however, NWSDB requested the practice of prioritization of pipe replacement as well. Therefore, the activity of prioritization was added to the OJT item.

However, a gap between the asset management required by NWSDB and that the Japanese expert team was introducing has become clearer through the Project activities. To respond to the situation above, a mission team was dispatched from JICA headquarters to adjust the differences in requirements. Japanese side and NWSDB held several discussions and eventually, both sides reached a conclusion that the experience of JICA experts in Japanese context was different to Sri Lankan context and it was comprehended that, NWSDB requirement on asset management could not be served within the experiences in Japanese condition. Therefore, both sides agreed on discontinuing Output 1 activities in 1st term.

In the following, the implemented contents of Output 1 activities are described.

2) Conduct seminar/workshop on asset management of pipelines

Japanese experts conducted seminars and workshops to share the image of asset management 2 times respectively from October 2018 to January 2019. In seminars and workshops, PDCA cycle, necessary pipe information and issues to introduce asset management to NWSDB were discussed. NWSDB understood the Japanese asset management and importance of long-term budget plan.

Photo 1 Question and answer session in seminar

3) Develop a draft of guideline for asset management

The development of guideline for asset management was canceled due to the discontinuation of Output 1.

4) Conduct Top Management Meeting (TMM) for formulation of asset management

The 1st TMM was held on 26th November 2019. NWSDB presented the concept of asset management and Japanese experts presented the proposal for asset management introduction into NWSDB. There were discussions about creation of specialized budget for asset management and inclusion of asset management into corporate plan. However, the NWSDB's presentation included requests for introduction of software and renewal demand forecasting needed for planning short-term pipe replacement programmes for asset management. This showed a divergence from the long-term asset management proposed by the Japanese-side. Each RSC plans and implements the works including pipeline repair/replacement within the budget allocated for a year. What RSC needs is a list of existing assets with an urgency ranking of repair/replacement to take measures when the budget becomes available.

5) Collect necessary data of pipelines for the trial calculation of renewal demand in the pilot site

Japanese experts and NWSDB discussed about the necessary information. Since the importance of pipe installation year was understood by NWSDB, NWSDB is now collecting the information of installation year in the responsible area of RSC(W-S) after the Project.

6) Summary of Output 1 activities

At the stage of preparation of the Project, NWSDB and JICA agreed that JICA would support introduction of asset management of pipelines into

NWSDB. However, the discrepancies between NWSDB requirement and the Project assistance were revealed during Output 1 activities.

The Output 1 activities ended with the completion of sharing the policy and implementing method of asset management in Japan which were generated by the experience and achievement. The Project concentrated on the activities of Output 2 and Output 3, and the following results connected to asset management have been obtained.

i. The technical transfer has been done for the viewpoints of evaluation of the vulnerability of pipelines, cost/benefit analysis of pipeline repair, and data collection that will be necessary for asset management in the future

ii. Above considerations were introduced into the new training module and the Output 2 members became the trainer of the new training module. The knowledge obtained at the site will be transferred to the other NWSDB staff members.

(2) Output 2

1) Develop a work plan for enhancement of the existing leakage control works

In formulating the work plan for water leakage control, the following 3 basic policies were established.

- Show the steps necessary for NWSDB to understand the relation between water leakage countermeasures and non-revenue water reduction, and to compare the effects of water leakage countermeasures with quantitative indicators.
- Organize the process for improving the management of water leakage control based on the PDCA cycle.
- Clarify the methods related to water leakage countermeasures in the flowchart.

Table 3 Contents of work plan

1. Introduction
2. Planning for water leakage reduction measures (Plan)
3. Practice of leakage control measures (Do)
4. Evaluation of Pilot activities (Check)
5. Improvement of pilot activities (Action)

Work plan shows the details of the pilot site and procedures of leakage control activities. Regarding the pilot site, the area called Zone 1 under the control of the office in charge Panadura was selected considering the ease of moving to the site, the effect of leak reduction activity and hydraulic separation of the distribution pipe. Also, District Metered Area (DMA) was adopted to carry out the leak investigation efficiently and effectively. DMA is a method to create an area in which the water amount can be managed so that it helps to identify leakage points, measure the effect of leak reduction activity and narrow down the area of water suspension.

The location of the pilot site and DMA division are shown in Figure 4. pilot site was divided into 6 DMAs.

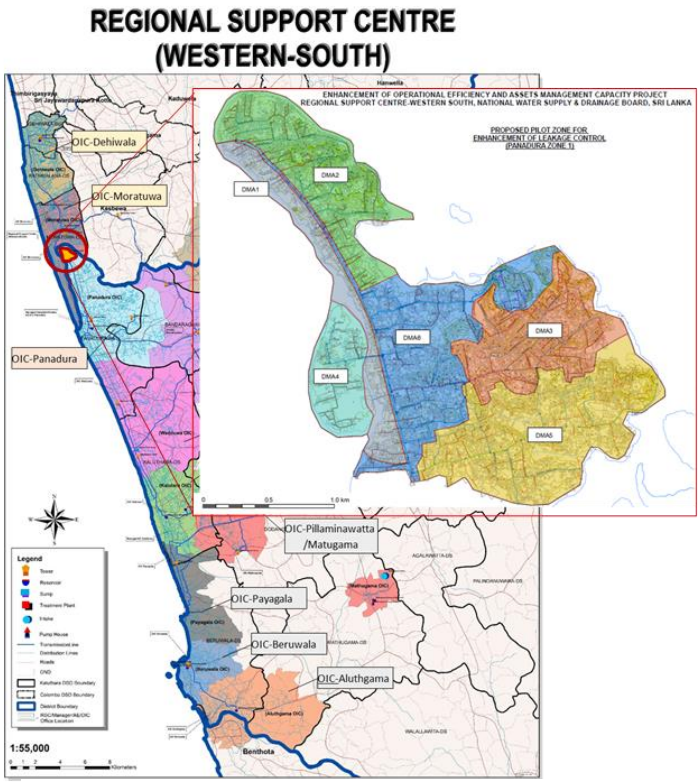


Figure 4 Location of pilot site and division of DMA

2) Implement OJT for leakage control works

OJT includes DMA management, leakage detection and repair, Cost-Benefit analysis and leakage monitoring. The procedure of OJT is shown in Figure 5.

OJT started in September 2018 and local activities of Japanese experts were completed in June 2021. NWSDB is continuing the subsequent work such as leak detection and repair, and evaluation of DMA based on quantitative indicators. Regarding the result of capacity assessment, it was confirmed that capacity of NWSDB staff related to the knowledge on NRW, planning on NRW countermeasures and procedures of DMA method were improved. The result of a capacity assessment of Output 2 is shown in Figure 6.

Regarding the Cost-Benefit analysis, assuming a period of 3 years for the reduced leak to return to its

original level, the benefit-cost ratio was positive in all cases. Therefore, it was confirmed that the active leakage control was beneficial in the study area.

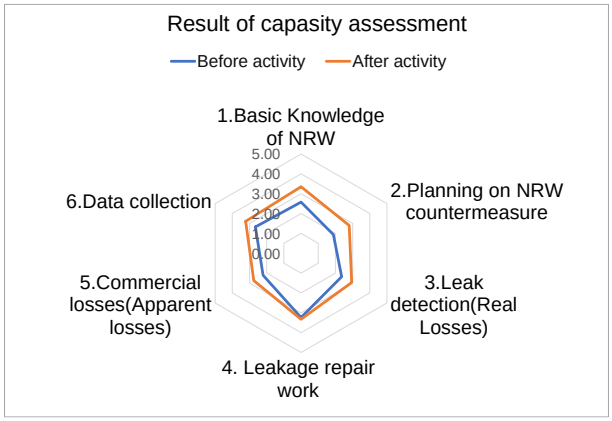


Figure 6 Result of Output 2 capacity assessment

In the 2nd term of the Project, Japanese experts introduced a system that can remotely monitor the water flow and pressure of DMA. Since this is a cloud-based monitoring system that utilizes a Web server, NWSDB can check the DMA status remotely and confirm the effect of leak repairs in a timely and quantitative manner. This was effective under the curfew caused by COVID-19 and contributed to motivating NWSDB staff. The remote monitoring system and monitored water flow and pressure are shown in Figure 7.

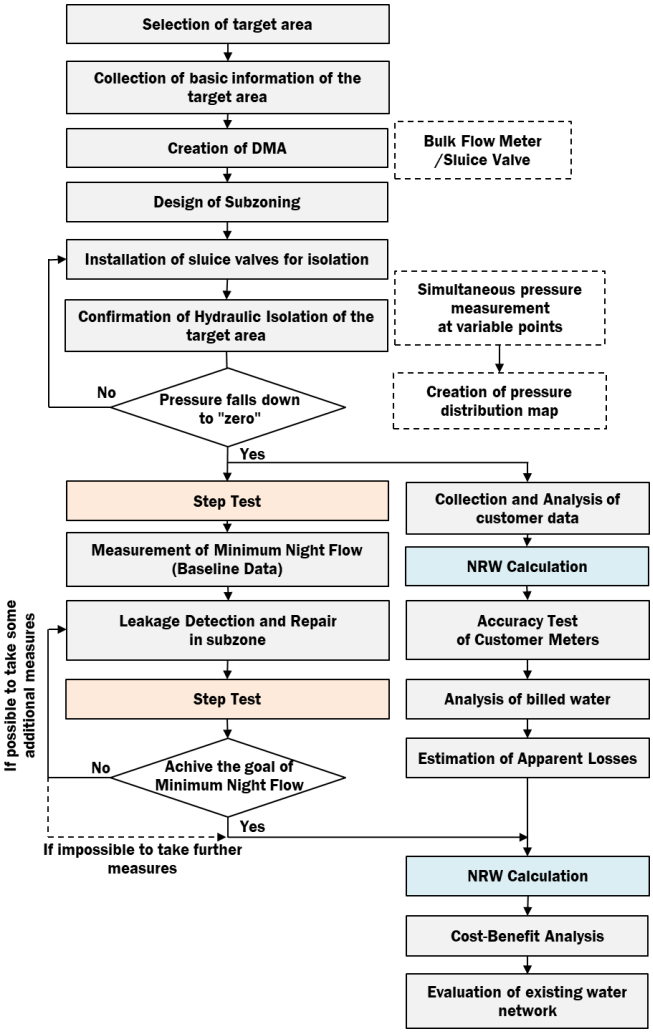


Figure 5 Procedures of OJT

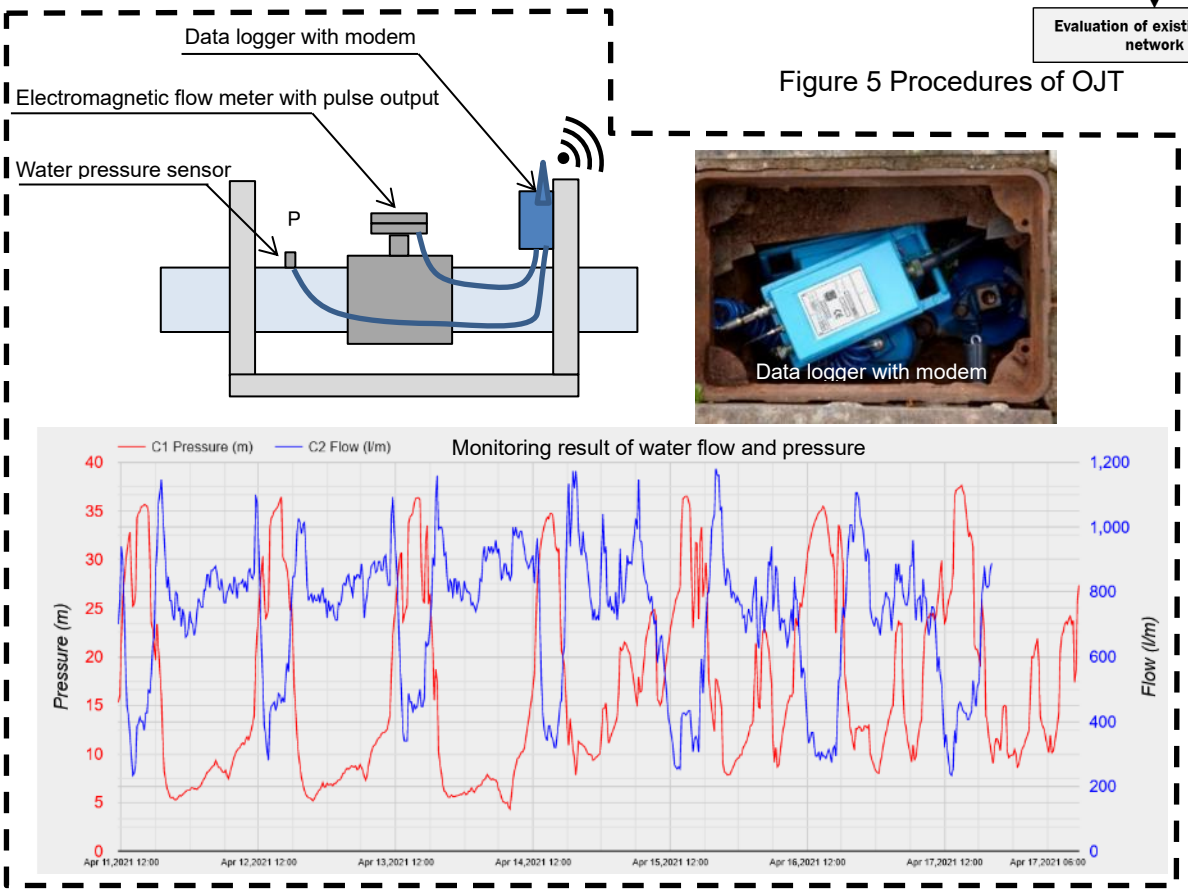


Figure 7 remote monitoring system and monitored water flow and pressure

Moreover, the Output 2 activity was incorporated into the Output 3 activity as one of the training modules so that the contents of Output 2 activity can be shared in NWSDB.

3) Accumulate collected data during leakage control works to the existing database

Japanese experts and NWSDB accumulated the collected data from pilot activity such as pipe information and leakage repair and reflected them into the existing GIS database.

Since the record of leakage repair in the pilot site is important, Japanese experts and NWSDB improved the existing leakage repair record sheet and added the information on the location of leakage, customer number, material for repair and leakage amount.

The leakage repair record sheet is created on site by workers, and the information is reflected into a ledger and Google Earth Pro. The leakage repair record sheet is shown in Figure 8.

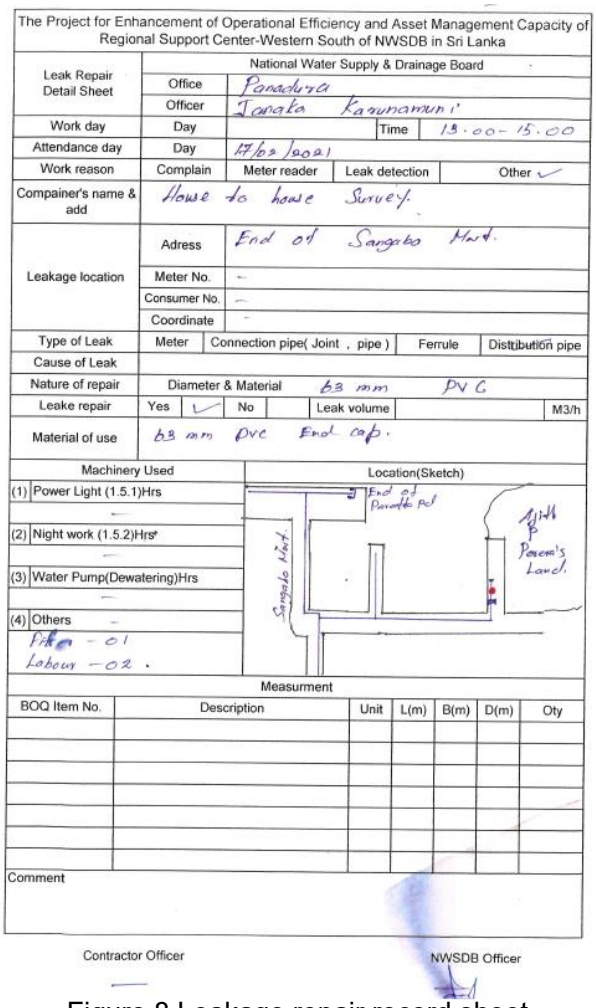
4) Create a procedure manual for leakage control

Although NWSDB has some manuals related to leakage control, the contents are limited to general theory and there is no concrete method at the site. Therefore, Japanese experts and NWSDB created a concrete and practical procedure manual for leakage control based on the pilot activity. Also, this manual includes the Cost-Benefit analysis and evaluation method of distribution pipe so that it can contribute to the evaluation of effectiveness and planning of leakage control activity. The contents of the procedure manual are shown in Table 4. Japanese experts and NWSDB enhanced the contents of the procedure manual by making some attachments such as the detailed information of pilot activity so that NWSDB staff can refer to this procedure manual for future similar activity.

Table 4 Contents of procedure manual

1. Outline of the manual
2. Assessment of current position
3. Practice of active leakage control
4. Management of pipe network map and database
5. Leakage control plan for RSC-WS
[Appendix]
1. Case study
2. Calculation sheet for leakage survey cost
3. Introduction of Remote Monitoring System
4. Mechanism of Ultrasonic Flow Meter
5. Data Collection and Management
6. Manuals of Instruments
7. Backfilling Instatement
8. Theft Prevention Strategy

Procedure manual is submitted to NWSDB to certify it as official document of NWSDB, and it was approved on 11th August 2021.


The Project for Enhancement of Operational Efficiency and Asset Management Capacity of Regional Support Center-Western South of NWSDB in Sri Lanka

Leak Repair Detail Sheet — National Water Supply & Drainage Board

Office: Panadura

Officer: Janaka Karunamuni

Work day: Day — Time: 13.00 - 15.00

Attendance day: Day: 17/02/2021

Work reason: Complain | Meter reader | Leak detection | Other ✓

Compainer's name & add: House to house Survey

Leakage location: Adress: End of Sangaba Mw.; Meter No.: -; Consumer No.: -; Coordinate: -

Type of Leak: Meter | Connection pipe(Joint , pipe) | Ferrule | Distribution pipe

Cause of Leak:

Nature of repair: Diameter & Material: 63 mm PVC

Leake repair: Yes ✓ | No | Leak volume | M3/h

Material of use: 63 mm PVC End cap.

Machinery Used

(1) Power Light (1.5.1)Hrs: -

(2) Night work (1.5.2)Hrs: -

(3) Water Pump(Dewatering)Hrs: -

(4) Others: Pipe - 01, Labour - 02.

Location(Sketch)

Measurement

BOQ Item No.	Description	Unit	L(m)	B(m)	D(m)	Qty

Comment

Contractor Officer — NWSDB Officer

Figure 8 Leakage repair record sheet

5) Summary of Output 2 activities

To reduce the NRW ratio more, active leakage reduction activities were necessary for NWSDB. In Output 2 activities, Japanese experts assisted NWSDB to plan the active leakage reduction activities and conducted them. Since the Output 2 activities contributed to reducing the NRW ratio, NWSDB could conduct the activities more positively. Eventually, NWSDB recognized the existence of a certain level of underground leakage and understood the importance of active leakage reduction. Moreover, NWSDB learned the way to conduct the efficient leakage reduction activities through the method of narrowing down the survey area according to the vulnerability analysis of the pipe network. NWSDB conducted an economic analysis of Output 2 activities also and learned the basic knowledge to judge the proper countermeasures against leaked pipe such as repair or replacement.

(3) Output 3

1) Review status of the current training programmes on leakage control conducted at the training center and RSCs

The NWSDB's training sessions were systematically implemented not only with classroom lectures but also with programs that include demonstrations and practical experience. Trainers have high capability, and they give lectures that attracted the participant's interest. On the other hand, in a drilling operation of construction site, an accurate and clean hole can be made by using a correct instrument. However, they sometimes use a hand drill for convenience, which causes problems such as improper drilling and generation of burrs (rough edges which are generated as a result of the improper cutting process). It is said that the training method is not used fully at the site. One of the reasons is the difficulty to understand and realize the procedures by classroom lecture because trainees don't have enough opportunities to practice the use of equipment. Therefore, practical training can be effective for skill improvement.

Photo 2 Drilled hole with burr

2) Plan practical training programmes on leakage control

Planned practical training programmes based on the review of current training and construction are shown in Table 5. The training of the Project covers not only training of installation and jointing of service pipe where typical leakage tends to occur but also tapping of service pipe which requires proper works. And the training No.7 "How to use the data obtained from pilot activity" was established to expand the knowledge and experience of Output 2 pilot activity.

Based on the above practical training, training guidelines were prepared, and Japanese experts revised the training guidelines with trainer of practical training in consideration of the result of TOT and practical training.

Table 5 Practical trainings

Subject Area	Training Title
1. Leak Detection	a. Underground Leakage Survey b. Valve, Metal Pipe and Non-Metal Pipe Locating
2. Distribution Pipe Installation	a. HDPE Distribution Pipe Installation
	b. PVC Distribution Pipe Installation
	c. Ductile iron Distribution Pipe Installation
3. Service Pipe Installation	a. HDPE Service Pipe Installation
	b. PVC Service Pipe Installation
4. Leak Repair	a. HDPE Distribution & Service Pipe Repair
	b. PVC Distribution & Service Pipe Repair
	c. Ductile iron Distribution Pipe Repair
	d. Valve and Accessory Repair
5. Measurement	a. Water Meter
	b. Flow Measurement
	c. Pressure Measurement
6. DMA	DMA Creation & Step Test
7. How to use the data obtained from pilot activity	How to use the data obtained from pilot activity

3) Set up a training yard

Training yard is divided into 3 parts based on the training modules and equipped pump house, elevated water tank and storage. The construction of the training yard was completed in January 2020.

Table 6 3 Divisions of training yard

Pipe Connection Area	Training on connecting distribution pipes and service pipes for Ductile iron and resin pipes.
Leakage Survey Area	Training on how to use equipment of leakage detection on the buried pipes with artificially leaked holes. Buried pipe are Ductile iron and resin pipes with 2 types of pavements to represent the actual situation at the site.
Flow Measurement Area	Practice of flow measurement and step test using exposed pipe

Photo 3 Whole picture of training yard

4) Select candidates for trainer of practical training

Japanese experts collected information about NWSDB staff who has experience in practical training and selected total 17 trainers with NWSDB. Also, Japanese experts assigned multiple people to training since it was assumed that trainer sometimes can't conduct the training due to their regular work. In addition, 11 Assistant trainers, 1 Fitter and 2 Helpers were selected, and assigned to each training programmes to assist the trainer.

5) Conduct TOT for trainer of practical training

TOT was conducted in January 2020. The outline is shown below.

- Date: After completion of training yard (January 2020)
- Participant: Trainer, Japanese experts
- Contents: Total 17 programmes. Japanese experts instructed the way to conduct the training in the training yard. Training guideline was revised after TOT based on the results.

Photo 4 TOT at training yard

Almost all scheduled practical training sessions were conducted in TOT. Trainer acquired methods for conducting practical training in training yard. On the other hand, Japanese experts couldn't conduct some of TOT due to the shortage of time caused by lack of experience of participants about the practical training, delay of delivery from a contractor of training yard construction and so on. Japanese experts, therefore, conducted supplementary training after TOT. Since it was difficult to conduct supplementary TOT in person due to the COVID-19 pandemic, Japanese experts created training videos and instructed the procedures of training through web meetings.

Photo 5 Training video

After the TOT or supplemental TOT is completed, rehearsal was conducted to confirm the procedures of training and the capacity of trainers. Japanese experts, NWSDB and trainer conducted the review meeting through a web meeting after the rehearsal and confirmed the results and issues.

Japanese experts and NWSDB created a trainer certification system to select the trainer of practical training with clear criteria. Trainer certification system consists of document screening for recommended candidates from NWSDB department, implementation of TOT if necessary and evaluation of competence by MD&TD panel. The candidate of trainer is rated with evaluation points based on the experience and capacity to conduct training, and eventually, certified based on 4 grades of trainer or assistant trainer based on the acquired points. After the trainer certification, MD&TD panel continues to evaluate the trainer by the number of conducted training sessions as a trainer and improvement of capacity, and the trainer who acquires high score can get promoted to a higher grade. It is expected that this system will motivate the trainers.

6) Implement the practical training programmes

The practical training has been conducted by MD&TD since August 2020. Although the training which people gather in training yard was prohibited due to the COVID-19 pandemic from the beginning of 2020, MD&TD utilized the timing of lockdown removal and web meeting tool, and conducted total 9 practical programmes such as leakage detection and HDPE installation. Total 200 trainees such as assistant engineers of NWSDB were trained.

Photo 6 Practical training (HDPE pipe installation)

As a result of a review of conducted practical training, the trainer's capacity to conduct the actual training was high and the satisfaction level of participants was also high. Therefore, it was confirmed that trainer has high capacity to conduct actual training. Also, regarding the result of a capacity assessment of Output 3, it was confirmed that capacity of trainer of implementing practical training was improved. The result of Output 3 capacity assessment is shown in Figure 9.

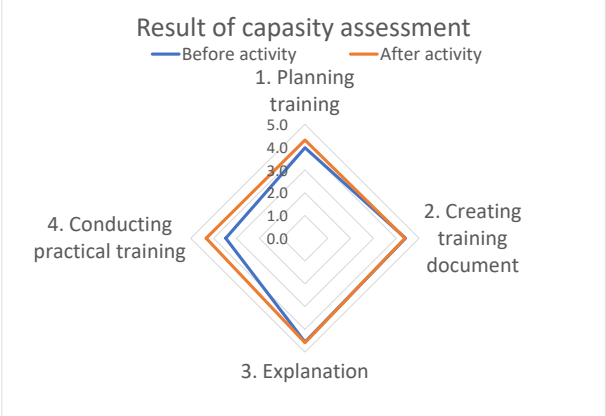


Figure 9 Result of Output 3 capacity assessment

Also, the training of leakage detection and pipe installation which were developed in the project were included in MD&TD's annual training plan of 2021. It means the budget for those training modules has been assigned already and the training must be conducted in future.

MD&TD is ready to conduct training more actively by themselves by the result of the Project and has the plan to be the main training organization in Sri Lanka as "Center of Excellence for Water", which is financially independent. As of 2021, Sri Lanka government focuses on the policy called "Water for all" and securing engineers for expanding the water supply system is an urgent matter. Under the encouragement of this trend, MD&TD is planning to conduct not only the improvement of training quality but the training for plumbers of private companies. Also, MD&TD is willing to accept the trainees from other countries as a main training center of South Asia and it is expected that MD&TD will make further development in future.

7) Summary of Output 3 activities

Although NWSDB had tried to conduct systematic training and enhance the training quality so far, practical training had been limited to the trial use of equipment and trainees could not recognize the importance of proper procedures enough. Therefore, the Project focused on capacity improvement by the practical training, determined the proper and effective training contents by the series of discussions with NWSDB, and set up the training yard for the determined training contents. Moreover, Japanese experts conducted TOT to teach how to conduct practical training in the training yard, and eventually, the trainer who participated in the TOT conducted practical training to trainees. In this practical training, all participants can conduct the actual works and learn how to use the equipment in detail. Since there were no similar training facilities in Sri Lanka, the satisfaction level of participants of practical training was very high. The developed training modules by the Project is incorporated into the MD&TD's annual training programmes. MD&TD has started the plan to develop their training organization and it is expected that the training programmes and training yard prepared by the Project will be fully utilized at their new stages.

4. Lessons Learned

(1) Improvement of motivation by collaboration works and achievements

Japanese experts and NWSDB staff discussed in detail and revised the activities, if necessary, in consideration of requests of NWSDB staff. Those detailed activities contributed to the achievements of the Project and motivated NWSDB staff. Moreover, the improvement of motivation of NWSDB staff made NWSDB managers change their awareness of the Project and the outcomes of the Project were reflected in the future plan of NWSDB.

(2) Introduction of incentive mechanism

Japanese experts and MD&TD considered the system to motivate the trainer to conduct the training and the trainee to participate in practical training. Regarding the trainer, the trainer certification system was developed, and the trainer can be promoted based on the number of conducted

training sessions and improved capacity for practical skills. Regarding the trainee, issuance of certification, announce of trainees on the NWSDB website, and encouragements system to participate training by NWSDB managers were considered in the Project, and part of them has been implemented and the others are planned to be implemented in future.

(3) Distance assistance

Japanese experts were unable to travel for about a year due to the COVID-19 pandemic, and during that time the distance assistance was conducted. The measures which worked successfully in this project are shown below.

- Preparation of visual teaching material:

  Video recording on the handling of equipment was effectively introduced. It was shared on YouTube so that anyone who shared the link can see it from anywhere.

- Video recording of work:

  The local staff of the Project shot the video at the site work and training and shared it with Japanese experts. The video materials made it possible for Japanese experts who could not go to the site to understand the issues better and give accurate instructions.

(4) Participation of Japanese water utilities

Kobe city and Nagoya city participated in the Project, dispatched experts and conducted Japan training. Also, both water utilities supported the Project from Japan as an administrative office. Regarding the training in Japan, experienced experts who recognized necessary training contents made an effort to consider the training programmes and the trained NWSDB staff utilized the knowledge and experience of the training in Japan for the Project activities.

(5) Importance of needs assessment

The approach and the scope of the project should have been discussed from the outset with a clear understanding of the difference in financial and budgeting system, as well as the infrastructure development stages (e.g., developing, maintenance, replacing stages) between Japan and the partner country when forming a technical cooperation project of a new subject, or which is about a long-term planning, such as asset management. The Japanese asset management was difficult to apply directly to the NWSDB. The identification process of needs and differences between both countries in the preparatory stage of the project or early stage of the project implementation should have been practiced.

(6) Design and construction of training yard

In this project, NWSDB and Japanese expert team took a long time to agree on the scope/ works of the training yard. It was mainly because the two parties had different images and expectations to the training yard and there was no description of the intended scope of training and works of the training yard in the Record of Discussions (R/D) nor the minutes of meeting signed at project formation. If there is a plan to provide a facility/equipment which required certain amount of input in a technical cooperation project, it is important that JICA and the partner organization to fully discuss about the purpose of use, size and beneficiaries of the facility/equipment, and to agree on them in a minute of meeting or other official documents in order to ensure timely provision.

[Project period]

September 2018 – August 2021