

Kathmandu Upatyaka
Khanepani Limited (KUKL)
Nepal

The Project on Capacity Development of KUKL to Improve Overall Water Supply Service in Kathmandu Valley

Progress Report (Term-2)

January 2024

CTI Engineering International Co., Ltd.
TEC International Co., Ltd.
Nihon Suido Consultants Co., Ltd.
Tokyo Water Co., Ltd.

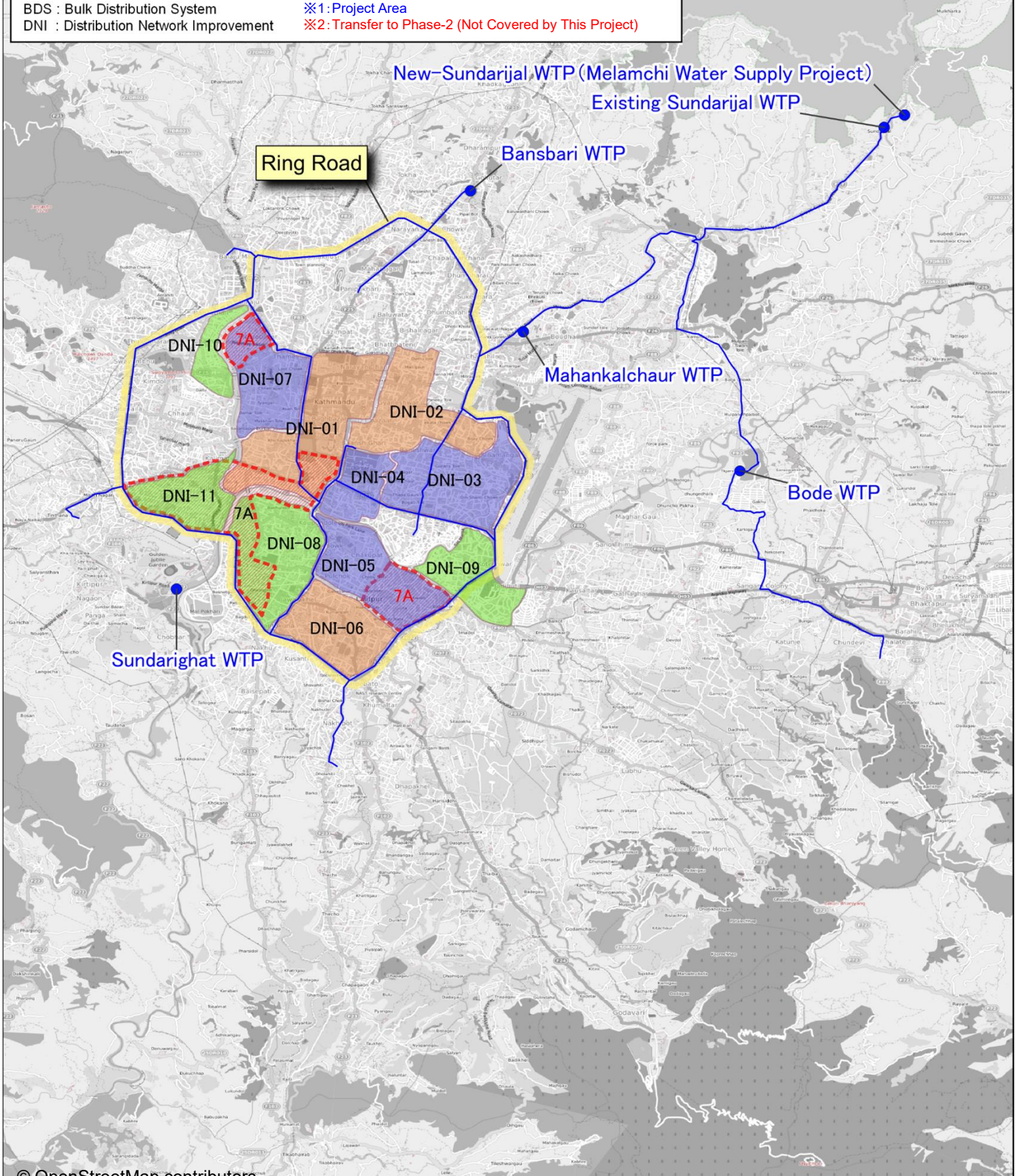
Kathmandu Valley

Legend

- Ring Road
- BDS route
- WTP candidate for OJT
- Package Area for DNI
- Package 1
- Package 2
- Package 3
- Package 4
- ⋯ Phase-1^{※1}
- ⋯ Phase-2^{※2}

BDS : Bulk Distribution System
 DNI : Distribution Network Improvement

※1: Project Area
 ※2: Transfer to Phase-2 (Not Covered by This Project)



Abbreviaciones and Acronyms

ADB	Asian Development Bank
BCP	Business Continuity Plan
BDS	Bulk Distribution System
C/P	Counterpart
CBAAS	Computerized Billing and Accounting System
CEO	Chief Executive Officer
CTII	CTI Engineering International Co. Ltd.
DMA	District Metered Area
DNI	Distribution Network Improvement
DWSSM	Department of Water Supply and Sewerage Management
GIS	Geographic Information System
GPS	Global Positioning System
JCC	Joint Coordination Committee
JET	Japanese Expert Team
JICA	Japan International Cooperation Agency
JV	Joint Venture
KUKL	Kathmandu Upatyaka Khanepani Limited
KVWSMB	Kathmandu Valley Water Supply Management Board
MLD	Million Liters per Day
MoWS	Ministry of Water Supply
MWSDB	Melamchi Water Supply Development Board
NRW	Non-Revenue Water
NSC	Nihon Suido Consultants Co., Ltd.
NWSC	Nepal Water Supply Corporation
NWSDB	National Water Supply and Drainage Board
O&M	Operation and Maintenance
OJT	On the Job Training
PC	Personal Computer
PDCA	Plan-Do-Check-Act
PDM	Project Design Matrix
PID	Project Implementation Directorate
PMU	Project Management Unit
PO	Plan of Operation
R/D	Record of Discussion
SATREPS	Science and Technology Research Partnership for Sustainable Development
SCADA	Supervisory Control And Data Acquisition
SDGs	Sustainable Development Goals
SOP	Standard Operating Procedure
TECI	TEC International Co., Ltd.
TFC	Tariff Fixation Committee
TOT	Training of Trainers
TW	Tokyo Water Co., Ltd.
UPS	Uninterruptible Power Supply
WASMIP	Water Supply Management Improvement Project
WTP	Water Treatment Plant

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[Supplementary volume]

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Chapter 1: Progress of the overall project and related projects

Chapter 1: Progress of the overall project and related projects

1.1 Background of the Project

In the Kathmandu Valley of Nepal, Kathmandu Valley Water Supply Management Board (KVWSMB) owns the water supply facility and Kathmandu Upatyaka Khanepani Limited (KUKL) operates and maintains the water supply service under the lease agreement with the granted license.

Against an estimated water demand of 370MLD for 2.7 million of population in the Kathmandu Valley, the drinking water provided by KUKL is only 126 MLD on average per year, and taking into account an estimated 26% leakage rate, the effective water supply is estimated to be 81 MLD. As a result, water services are unevenly distributed, and many customers do not get water despite having a contract or are forced to have a service every few days or under limited water supply hours.

Under these circumstances, water service customers are forced to use alternative water sources, such as using water tankers for additional payment or using groundwater of poor quality, which does not ensure fairness in water service.

KUKL is not fully fulfilling its role as a water utility in terms of water quality management, water treatment plant operation and maintenance, water supply pressure control, non-revenue water management, and customer service, and is lagging behind in establishing an internal human resource development system.

Until now, water quality management has not been given a high priority in improving water quality, as the top priority for KUKL has been to alleviate absolute water shortages. However, after the completion of the Melamchi Water Supply Project, which is described below, it is expected that the level of water quality requirements of customers will increase, and it will be necessary to enhance technical capabilities for appropriate water quality management and to establish appropriate operation and maintenance techniques for the water treatment plant.

In addition, equitable distribution of drinking water with well-controlled water quality within the valley is essential to improve customer service, and proper water distribution management must be realized. For this purpose, water distribution management utilizing GIS data of the water distribution network currently under construction will be important, but neither the specific method of utilizing GIS data nor its organizational structure has been determined.

Regarding non-revenue water management, as part of KUKL's organizational reform, a Non-Revenue Water Section has been established under the Planning and Monitoring Division. However, its personnel and organizational structure are weak, and it is necessary to enhance the system and improve technical capabilities to maintain a low non-revenue water rate.

In addition to these, a system of continuous development of internal human resources is considered necessary to transform KUKL's business operations into a more sustainable form in the future.

In order to improve the situation, the "Melamchi Water Supply Project" with a water supply capacity of 170 MLD is underway (Japanese ODA Loan, co-financed with the Asian Development Bank (hereinafter referred to as "ADB")). After the completion of this Melamchi project, the water supply volume of KUKL will be approximately doubled by the water conducted from the Melamchi River, and the water supply infrastructure in the Kathmandu Valley is expected to be drastically improved through synergy effects with the ADB-supported Distribution Network Improvement (DNI) project, etc.

In the above DNI project, the water distribution network including installation of distribution pipes and meters is being implemented in three phases. The water distribution network inside the ring road surrounding Kathmandu and Lalitpur will be developed through DNI Phase 1 and Phase 2.

Meanwhile, KUKL's new organizational structure was announced in July 2016, and implementation systems within KUKL are being developed, with the hiring of new staff beginning thereafter.

Following these trends, the framework for cooperation and implementation policies for the present Project were agreed upon during two detailed planning studies conducted by JICA in May and August 2017, and a Record of Discussions (R/D) was signed in February 2018; however, the start of this Project was also delayed significantly due to the suspension of the water conduction following the accident at the Melamchi Diversion Tunnel.

Subsequently, after the repair of the water diversion tunnel was completed and the trial operation using the New Sundarijal Water Treatment Plant was resumed in March 2021, JICA decided to start this technical cooperation project in March 2021.

1.2 Outline of the Project

1.2.1 Challenges of Water Supply Service in the Kathmandu Valley

The challenges facing the Kathmandu Valley can be summarized in eight main tasks. To overcome these challenges, Melamchi Water Supply Project has been carried out with the support of JICA and ADB, and this technical cooperation project was planned to maximize the results of these projects. As indicated in the Project Design Matrix (PDM), the Project has set 5 outputs to achieve the project purpose and specified the activities to achieve the results in PDM.

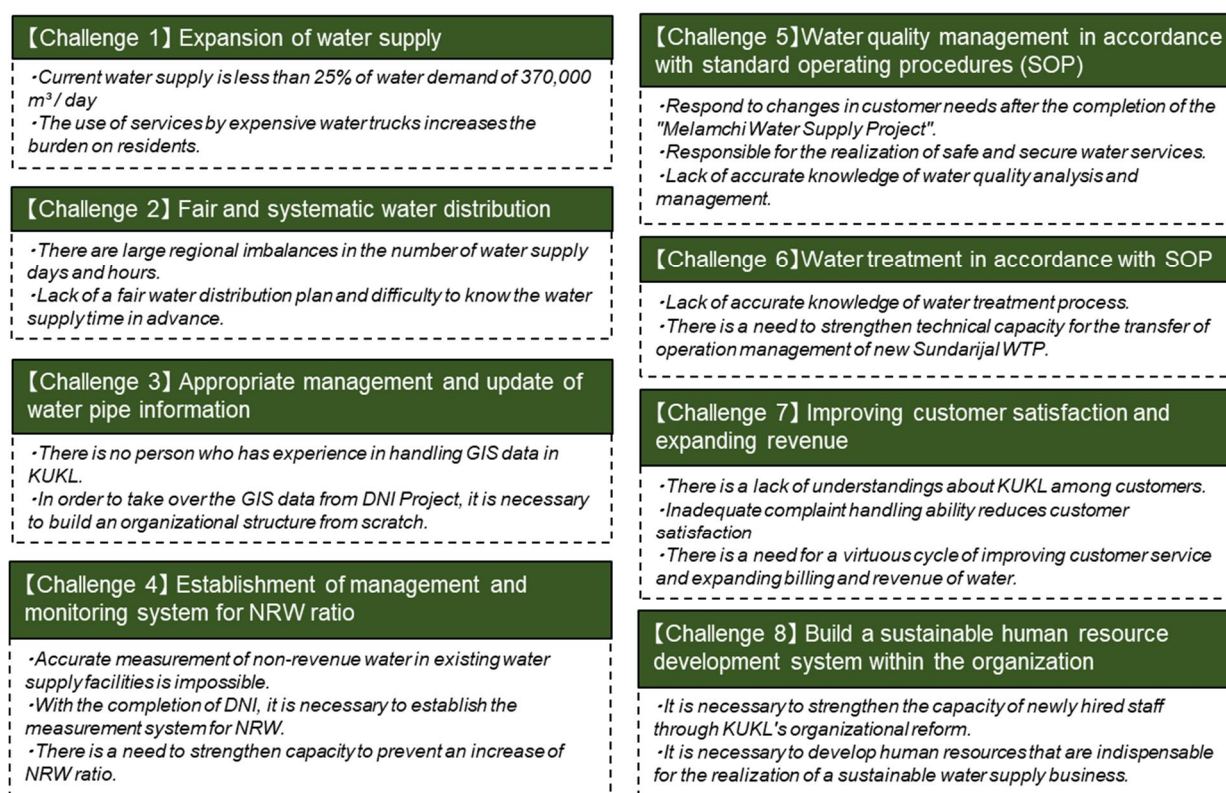


Figure 1.2.1 Challenges faced by KUKL and related supports for solution

1.2.2 Concept of the Project

To overcome above mentioned challenges faced by KUKL, the JICA Experts Team (JET) and KUKL staff will collaborate to carry out the activities indicated in R/D. As a consequence, the Project aims to realize continuous improvement of the water supply business through improvement of water supply service level and enhancement of the KUKL's internal training.

The concept of this project is to establish a virtuous circle in which each phase of "improvement of water service by KUKL," "improvement of tariff collection," "improvement of financial capacity," "improvement of water supply facilities," and "further improvement of water service" continues like a spiral through continuous implementation of activities to improve each issue facing KUKL.

Table 1.2.1 Approach for overcoming the challenges

Challenges	Approach
Challenge 1	After the completion of Phase 1 of the Melamchi Water Supply Project, it will be possible to supply 170MLD of water, and the water supply situation is expected to improve significantly. This project will support the realization of appropriate water distribution management by effectively utilizing the increasing amount of treated water.
Challenge 2 / Challenge 3	It is necessary to formulate a water distribution plan by utilizing GIS data and analyzing the water distribution network considering the actual water usage situation. These are carried out through the activities of Output 1. In order to overcome these challenges, it is premised that the facilities shall be constructed by the Melamchi Water Supply Project, BDS and DNI projects, which are implemented with the support of ADB and JICA.
Challenge 4	It is important to create an organizational system promoting competitive atmosphere among different branches, raising motivation for non-revenue water reduction measures, and clarifying the roles and responsibilities among head office and branches. These are carried out through the activities of Output 2.
Challenge 5 / Challenge 6	It is necessary for KUKL to clarify the roles and responsibilities among the head office, branches and laboratories in order to utilize limited water resources effectively and supply safe water. In addition, it is necessary to operate and update the SOP by KUKL itself. These are carried out through the activities of Output 3.
Challenge 7	It is important for KUKL to recognize customer satisfaction and importance of customer service by analyzing the content of complaints, and to spread KUKL's improved service for the customers through public relations and enlightenment activities. These are carried out through the activities of Output 4.
Challenge 8	It is important to establish an internal training system so that the training can be done continuously without being affected by the retirement, transfer of staff. These are carried out through the activities of Output 5.

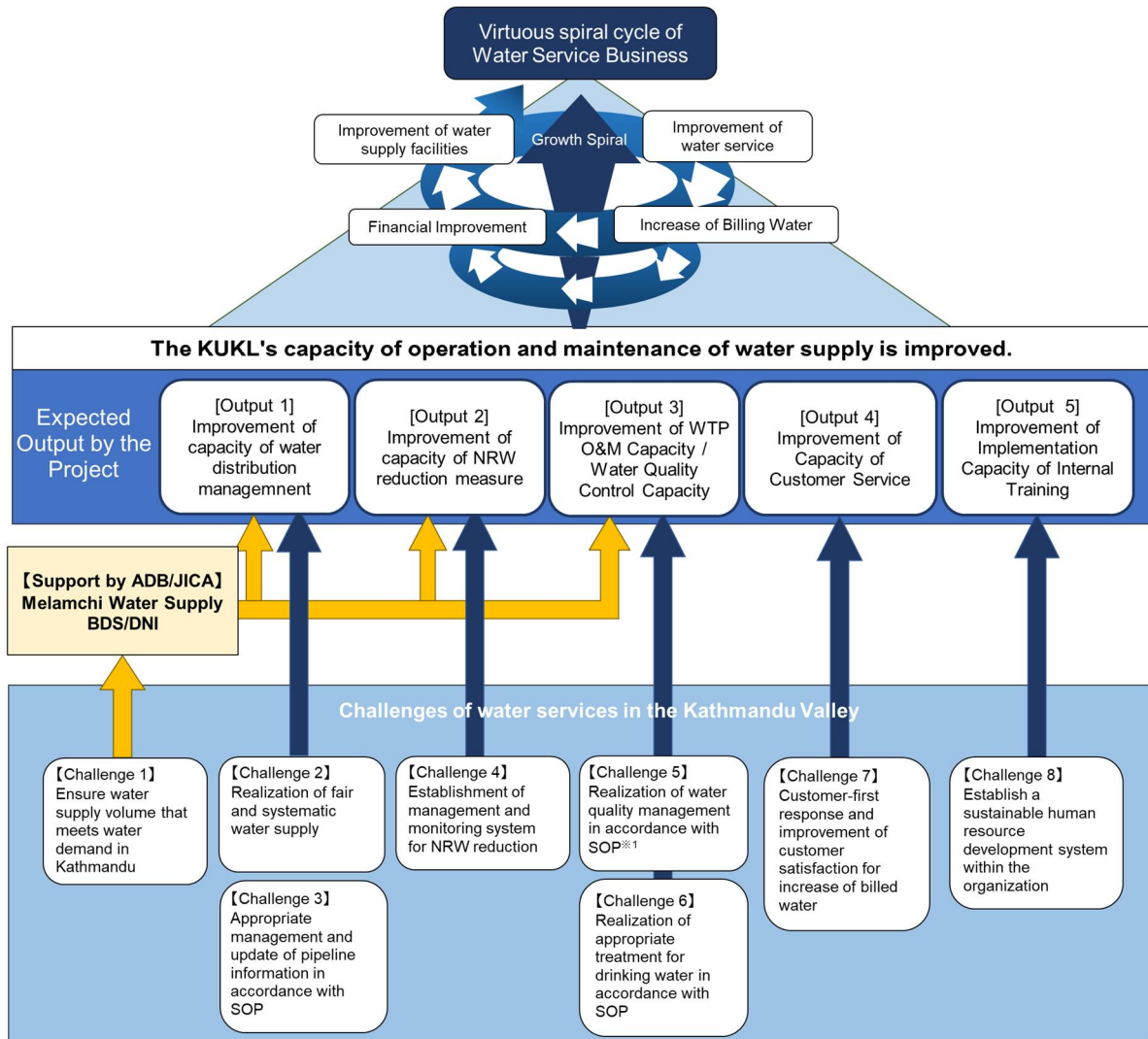


Figure 1.2.2 Overview and concept of the Project

1.2.3 Outline of the Project

An outline of the Project is shown below. This is based on the content agreed by the Joint Coordinating Committee (JCC) on 14 February 2022 (PDM Ver. 2.0).

Table 1.2.2 Outline of the Project

Item	Contents	
Overall Goal	The quality of KUKL's water supply services is improved	
	[Indicator 1]	Water pressure is properly maintained above 0.05MPa during the water supply time in the areas within the ring road where the water distribution networks will be improved by DNI project.
	[Indicator 2]	Water supply hours are fair in the areas within the ring road where the water distribution networks will be improved by DNI project.
	[Indicator 3]	The water quality (Turbidity and Residual Chlorine) at the taps in the water supply areas by the target WTPs* ¹ is improved.
	[Indicator 4]	Customer satisfaction of KUKL's water supply service is improved.
Project Purpose	The KUKL's capacity of operation and maintenance of water supply is improved.	
	[Indicator 1]	Water pressure is properly maintained above 0.05MPa during the water supply time in the areas within the ring road where the DNI project has been completed.
	[Indicator 2]	Water supply hours are fair in the areas within the ring road where the DNI project has been completed.
	[Indicator 3]	The rate of turbidity value which satisfies 5 NTU at the clear water reservoirs of the target WTPs* ¹ reaches more than 95%.
	[Indicator 4]	The rate of residual chlorine value which satisfies the required value specified in the SOPs at the clear water reservoir of the target WTPs* ¹ reaches more than 95%.
	[Indicator 5]	The result of customer satisfaction survey is reported in the KUKL's annual reports.
Expected Outputs	[Output 1]	The capacity of water distribution management utilizing GIS is enhanced.
	[Output 2]	The capacity of NRW reduction is enhanced.
	[Output 3]	The capacity of operation and maintenance of WTPs and water quality control is enhanced.
	[Output 4]	The capacity of customer service management is enhanced.
	[Output 5]	The capacity of managing KUKL's internal training is improved.
Project Site	Kathmandu Valley	
Target areas for project activities	[Output 1]	Water service areas covered by DNI Project Phase 1
	[Output 2]	Water service areas covered by DNI Project Phase 1
	[Output 3]	Mahankalchaur WTP, Bode WTP, Bansbari WTP and New Sundarijal WTP
	[Output 4]	Water service areas covered by DNI Project Phase 1
	[Output 5]	Kathmandu Valley
Concerned organizations	Ministry in charge	Ministry of Water Supply (MoWS)
	Implementation agency	Kathmandu Upatyaka Khanepani Limited (KUKL) <ul style="list-style-type: none"> • Head Office • Mahankalchaur Branch • Maharajgunj Branch • Baneshwor Branch (*²) • Chhetrapati Branch (In the future, Chjhetrapati will be merged into Maharajgunj and Tripureshwor branches.) • Tripureshwor Branch • Lalitpur Branch

*1: Target WTPs are Mahankalchaur, Bode, Bansbari and New Sundarijal.

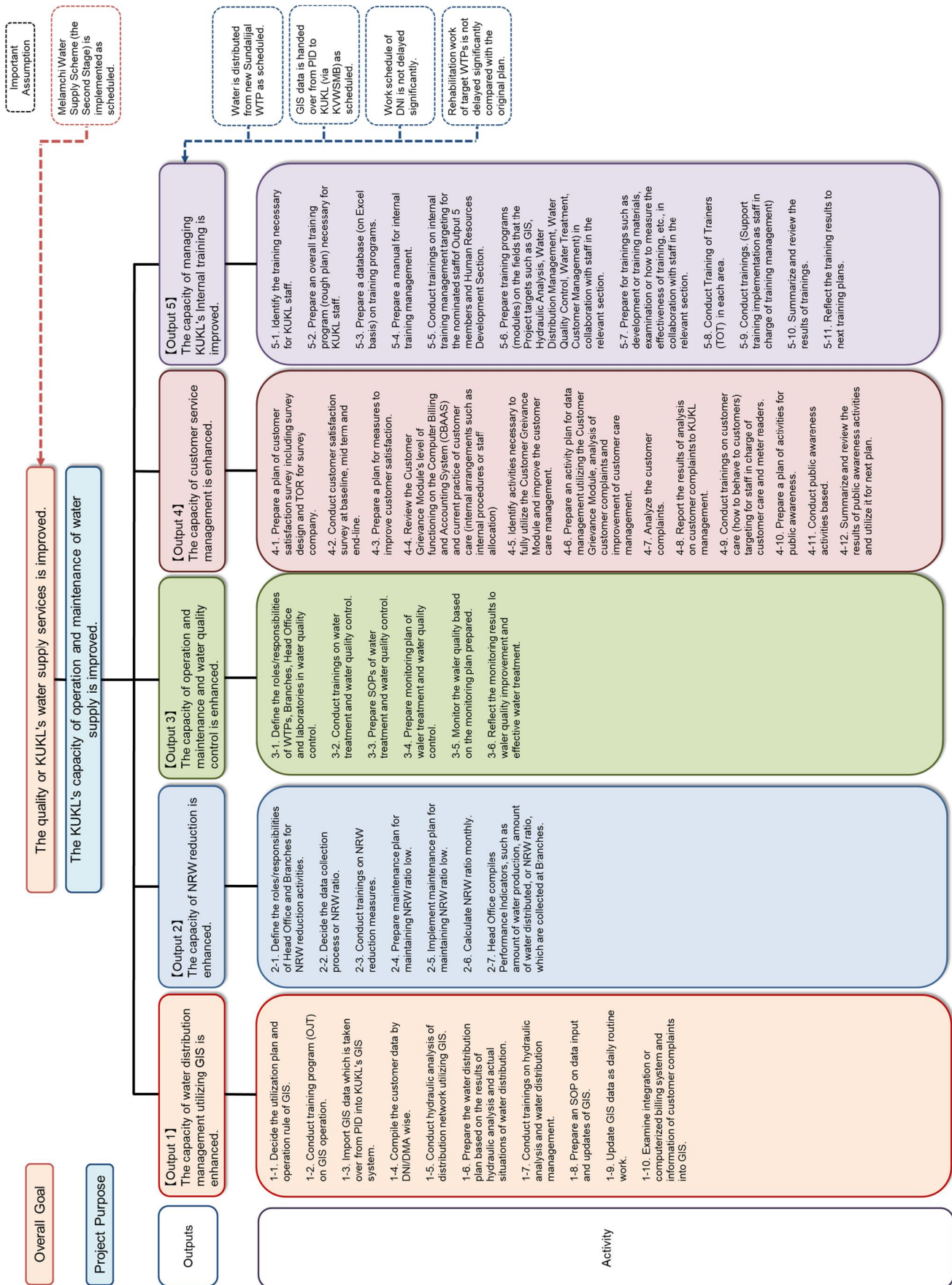


Figure 1.2.3 Work Breakdown Structure of PDM

1.2.4 Objectively verifiable indicators of each output

The indicators and their baseline values for each output are as follows:

Table 1.2.3 Objectively verifiable indicators for each output

No	Objectively verifiable indicators	Baseline status
[Output 1] The capacity of water distribution management utilizing GIS is enhanced		
1-1	GIS data is updated according to SOP in the areas within the ring road where the DNI project has been completed.	There are no SOPs for GIS at the start of the project.
1-2	GIS data is shared between Head Office and Branches according to SOP in the areas within the ring road where the DNI project has been completed.	There are no SOPs for GIS at the start of the project.
1-3	The water distribution plan for maintaining proper water pressure is prepared for the areas within the ring road where the DNI project has been completed.	At the start of the project, there is no water distribution plan to ensure adequate water pressure.
[Output 2] The capacity of NRW reduction is enhanced.		
2-1	The data of water inflow and water consumption in the areas within the ring road where the DNI project has been completed is monthly reported from Branches to Head Office	At the start of the project, the precise data required for the calculation of the non-revenue water rate was not reported.
2-2	The NRW rate in the areas within the ring road where the DNI project has been completed is monthly calculated at Head Office.	At the start of the project, non-revenue water rates were not calculated on monthly basis.
2-3	The number of training participants on NRW reduction measures (Basic training, TOT and Internal Training by KUKL) is more than 120 persons.	At the start of the project, the number of participants is zero.
2-4	The NRW rate in the areas within the ring road where the DNI project has been completed does not exceed 15 %.	The baseline value cannot be calculated at the start of the project due to delay of handing over of DNI completed area.
[Output 3] The capacity of operation and maintenance of WTPs and water quality control is enhanced.		
3-1	Water is treated according to the SOPs in the target WTPs.	There are no SOPs for water treatment plants.
3-2	The water quality is measured according to SOPs.	SOPs for water quality analysis exist but do not match the actual equipment or environment.
3-3	The monitoring activities are carried out at all target WTPs* ¹ according to the water quality control plan.	Water quality monitoring is carried out at three water treatment plants, Mahankalchaur, Bode and Bansbari, but water quality management plans are not fully developed
3-4	The water quality is regularly measured at the taps.	Water quality at the tap has not been measured regularly.
[Output 4] The capacity of customer service management is enhanced.		
4-1	The future plan of customer services management is prepared.	There are no relevant plans at the start of the project.
4-2	Customer satisfaction about KUKL's customer care is improved.	Satisfaction with customer care as identified by the first customer satisfaction survey. Percentage of customers who said they were "A little satisfied" or "Much satisfied" (%) "Telephone support": 30.1% "In-person support in KUKL office": 54.8%
4-3	The results of customer complaints' analysis and how KUKL responds to their complaints are regularly reported to KUKL's management.	At the start of the project there was no analysis of complaint information.
4-4	Public awareness activities are planned and developed by KUKL and implemented annually from 2022.	At the start of the project, no public awareness activities had been carried out.
[Output 5] The capacity of managing KUKL's internal training is improved.		
5-1	An overall structure of training (rough structure) for KUKL staff is developed.	It has not been created at the start of the project.
5-2	The number of training programs that KUKL plans and implement by itself (without JICA experts	There are no training courses at the start of the project.

No	Objectively verifiable indicators	Baseline status
	support) is more than 10 courses.	
5-3	No need to be modified. The target value should be mentioned at the bottom of the PDM in accordance with the final consensus by KUKL.	At the start of the project, no trainers have been trained.

*1: Target WTPs are Mahankalchaur, Bode, Bansbari and New Sundarijal.

*2: The target value of trainer is shown in Table 1.2.4.

Table 1.2.4 Target number of internal training courses and trainers

No	Technical Field	Training Course (Draft)	Number of trainers to be created (Minimum)	Number of candidate trainer as of the end of Term-2
1	Water Distribution Management	GIS Operation	2	3
		GIS Mobile App	-	3
		Hydraulic Analysis	2	2
		Water Distribution Control	1	2
2	NRW Management	Anti-illegal connections	1	6
		Meter accuracy control	2	3
		Commercial Losses (Basics of NRW)	2	5
		Customer data input/check	-	4
3	Water Quality Management	Water quality control	3	2
		Water treatment	3	6
4	Customer Management	Customer care	1	3
		Meter reading	2	3
		Total	19	42

1.3 Summary of progress of each activity

A summary of the progress of the activities to date is provided below, with details of each activity described in Chapter 3.

Table 1.3.1 Summary of progress of activities related to Output 1

No	Activities	Progress	Summary
[Output 1] The capacity of water distribution management utilizing GIS is enhanced.			
1-1	Decide the utilization plan and operation rule of GIS.	Partially completed (Continued in Term-3)	<p>Plans through Term-2 were achieved.</p> <p>The contents of the necessary GIS equipment were reviewed and agreed upon based on KUKL's IT environment and future organizational structure.</p> <p>All GIS data will be stored on a GIS server located at the Head Office for centralized data management.</p> <p>The GIS staff at each branch office downloads the data to the operation PC at the branch office when necessary. The data updated at each branch office will be stored on the GIS server at the Head Office.</p> <p>The GIS staff who belongs to the Head Office will conduct data quality inspections, and if errors are found, each branch office will be responsible for correcting them.</p> <p>The final data will be archived on the GIS server.</p> <p>The concept of utilization and operational plans, roles among divisions/departments, measures for applying GIS data and KUKL's burdens have already been agreed upon.</p> <p>Currently, guidelines are being developed to show how these operations should be carried out.</p>
1-2	Conduct training program (OJT) on GIS operation.	In progress (Continued in Term-3)	<p>This activity was originally planned for implementation in Term-2, but was initiated in the second half of the Term-1.</p> <p>Basic training required for GIS operations was conducted in Term-1 of the project, utilizing GIS data of "DMA No. 4" provided informally by PID.</p> <p>In Term-2, KUKL staff received on-the-job training with the goal of becoming able to operate GIS application software and GIS data correctly in their daily work.</p> <p>In technical transfer for GIS, RTK-GNSS, mobile GIS, etc., more practical training was provided in the form of face-to-face group training and visits to each branch office to provide guidance on how to solve various problems in data update operations that occur on a case-by-case basis.</p> <p>In addition, GIS technology has been introduced not only for GIS staff but also for collecting local information by supervisors at each branch office, and on-the-job training is being provided on an ongoing basis.</p> <p>[Trainings conducted until Dec 2023] OJT: 36 times, TOT: 0 times, Internal Training: 1 time, Online-seminar: 3 times</p>
1-3	Import GIS data which is taken over from PID into KUKL's GIS system.	In progress (Continued in Term-3)	<p>Of the DMAs in the ring road, the construction of DMA2.4, DMA3.5, and DMA9.1 were completed, and the inspection documents and GIS data were handed over from PID to KUKL. (See Chapter 3 for details.)</p> <p>DMA 4.1 and DMA 4.2 are not yet completed, but water has been supplied through the new distribution pipe, and GIS data is informally available.</p> <p>These GIS data were analyzed and converted to Geopackage database with a preliminary checking of the database structure and attribute information., then imported as provisional data to the server and PCs at the branch offices.</p> <p>By understanding the contents of the GIS data in advance, KUKL staff and JICA Expert are preparing for a smooth transition to daily data updating operations after data inspection and conversion when the GIS data is officially provided by PID.</p>

No	Activities	Progress	Summary
[Output 1] The capacity of water distribution management utilizing GIS is enhanced.			
1-4	Compile the customer data by DNI/DMA wise.	Before start	-
1-5	Conduct hydraulic analysis of distribution network utilizing GIS.	Before start	-
1-6	Prepare the water distribution plan based on the results of hydraulic analysis and actual situations of water distribution.	Before start	-
1-7	Conduct trainings on hydraulic analysis and water distribution management.	In progress (Continued in Term-3)	<p>Plans through Term-2 were achieved.</p> <p>Basic training in hydraulic analysis and water distribution management was conducted in Term-1 of the project in order to identify the basic skills of KUKL staff and reflect them in the OJT implementation plan during the project period.</p> <p>In addition, a combination of in-room and hands-on training was conducted to familiarize the participants with the mechanism and importance of water distribution volume measurement using an ultrasonic flow meter.</p> <p>The need for these basic training programs was confirmed through the study of KUKL's capacity assessment, and they were planned and implemented by the JICA Expert Team based on strong requests from KUKL, which also helped to confirm basic skills for a smooth start of on-the-job training in the future.</p> <p>Since it still takes time to hand over the GIS data, practical guidance on hydraulic analysis and water distribution planning will be provided in Term-3.</p> <p>[Trainings conducted until Dec 2023] <Water Distribution Management> OJT: 5 times, TOT: 0 times. <Hydraulic Analysis> OJT: 7 times, TOT: 0 times, Online-seminar: 2 times</p>
1-8	Prepare an SOP on data input and updates of GIS.	In progress (Continued in Term-3)	<p>On-the-job training began in earnest in Term-2, and operating procedures manuals for individual equipment such as GIS, RTK-GNSS, and mobile GIS are being updated as needed to match KUKL's daily operations.</p> <p>The JICA Expert Team is currently preparing an operational guideline for GIS technology that describes how to utilize and operate GIS, and will eventually compile an SOP that integrates it with equipment operating procedures.</p>
1-9	Update GIS data as daily routine work.	In progress (Continued in Term-3)	<p>The GIS data officially provided by PID in Term-2 were for DMA2.4, DMA3.5, and DMA9.1. However, errors and missing information in the data were identified, and the data was not in a condition to be used for daily operations, so KUKL and the JICA Expert Team requested PID to correct the data.</p> <p>On the other hand, to make effective use of equipment that has already been procured and to enable staff to quickly learn to manage the water distribution network using GIS data, existing water distribution pipe data was converted to content equivalent to PID's GIS data structure and made available as practical data to establish GIS data update work as a routine task.</p>
1-10	Examine integration or computerized billing system and information of customer complaints into GIS.	Before start	-

Table 1.3.2 Summary of progress of activities related to Output 2

No	Activities	Progress	Summary
[Output 2] The capacity of NRW reduction is enhanced.			
2-1	Define the roles/responsibilities of Head Office and Branches for NRW reduction activities.	Partially completed (Continued in Term-3)	In Term-1, a draft was prepared in consultation with the Action Team of Output 2, which enumerated the tasks of the Head Office and branch offices related to non-revenue water management and the division of roles between the Head Office and branch offices. The original plan was to implement actual non-revenue water (commercial loss) measures through on-the-job training, while reflecting the findings in the proposed role assignment. However, by the end of Term-2, only three DMAs had been handed over to KUKL and water supply through the new distribution network has not yet started, so conditions for OJT are not in place. Therefore, the finalization of the division of roles is scheduled to be conducted in Term-3.
2-2	Decide the data collection process of NRW ratio.	Partially started (Continued in Term-3)	Due to delays in the completion of the DMA, it was not possible to begin calculating the actual non-revenue water ratio on a per DMA basis. However, in DMA 4.1.2, the bulk meter is ready for measurement and water supply has started from the newly installed distribution pipes. Therefore, although the DMA has not yet been handed over to KUKL, the calculation of the non-revenue water ratio has begun on a trial basis. Non-revenue water calculation work will continue and the most efficient and realistic process will be determined in Term-3.
2-3	Conduct trainings on NRW reduction measures.	Partially completed (Continued in Term-3)	By the end of Term-2, the training of trainers (TOT) was completed in five modules. In Term-3, the Japanese Expert Team will support KUKL to conduct internal training in the same five modules as TOT. Of the five courses, internal training in the areas of meter accuracy testing skills and the basics of non-revenue water has already been conducted in August 2023 and December of the same year respectively.
2-4	Prepare maintenance plan for maintaining NRW ratio low.	In progress (Continued in Term-3)	By the end of Term-2, the JICA Expert Team prepared a draft of the maintenance and management plan and discussed the framework with the action team. No objections were raised by the members of Action Team, but it was agreed that the framework would be fleshed out and revised as necessary to reflect the knowledge gained through the OJT trials. The first version of the maintenance plan was distributed to the members of Action Team in December 2023.
2-5	Implement maintenance plan (prepared by Activity 2-4) for maintaining NRW ratio low.	Before start	The switchover to the new distribution network in the DMA did not progress at the end of Term-2, and OJT using the maintenance plan was not initiated. Therefore, this activity is scheduled to be implemented in Term-3.
2-6	Calculate NRW ratio monthly.	Partially started (Continued in Term-3)	Although the new distribution network of DMA 4.1.2 has not been handed over to KUKL, bulk meter reading is available, so the calculation of the non-revenue water ratio was started on a trial basis. In DMA 4.1.2, the water supply continues to be provided by the old distribution pipes, and the old and new water meter readings are mixed. If the old distribution pipe is taken out of service, the water supply in the adjacent area will also be affected, so it is not possible to switch only this DMA to the new distribution network. The NRW calculation work will be continued in Term-3, and the knowledge gained will be applied to other DMAs that will be handed over to KUKL in the future.
2-7	Head Office compiles Performance Indicators, such as amount of water production, amount of water distributed, or NRW ratio, which are collected at Branches.	Before start	The collection of operational indicators at the branch offices was partially started in the second half of Term-2. This activity is scheduled to be implemented in Term-3 when the calculation of non-revenue water ratio at the branch offices will start in full swing.

Table 1.3.3 Summary of progress of activities related to Output 3

No	Activities	Progress	Summary
[Output 3] The capacity of operation and maintenance of WTPs and water quality control is enhanced.			
3-1	Define the roles/responsibilities of WTPs, Branches, Head Office and laboratories in water quality control.	In progress (Continued in Term-3)	<p>This activity was originally planned for Term-1, but was continued in Term-2 due to the need to discuss the division of roles after each training session was conducted ahead of time.</p> <p>Through the capacity assessment, it was confirmed that there is a significant difference in the skill level of the water quality laboratory staff and the staff engaged in water treatment plant operation, thus confirming the need to enhance the basic skills of the staff ahead of time before clearly defining the division of work.</p> <p>Through the basic training until Term-2 and the training in Japan in December 2022, the need for water quality control and the importance of cooperation with each department were better understood among KUKL staff, and the staff themselves deeply understood the reasons why the division of work should be clarified. Implementation of water quality management have begun based on the SOPs developed in Term-2, and work assignments will be defined in a manner that is consistent with the current status of KUKL while the SOPs are in operation.</p> <p>After that, the appropriateness of the division of roles and the need for changes will be clarified through monitoring as necessary.</p>
3-2	Conduct trainings on water treatment and water quality control.	In progress (Continued in Term-3)	<p>Plans through Term-2 were almost achieved.</p> <p>In Term-3, training will be planned and implemented according to needs in order to further establish the technology.</p> <p>The facilities targeted for training on water treatment are the three existing WTPs and the New Sundarikal WTP, and for training on water quality control, the Central Water Quality Laboratory.</p> <p>[Trainings conducted until Dec 2023]</p> <p><O&M of WTP> OJT: 9 times, TOT: 8 times, Online-seminar: 7 times <Water Quality Management> OJT: 8 times, TOT: 0 times, Online-seminar: 14 times</p>
3-3	Prepare SOPs of water treatment and water quality control.	In progress (Continued in Term-3)	<p>Plans through Term-2 were almost achieved.</p> <p>The work of updating SOPs should continue in Term-3.</p> <p>Regarding water treatment, simplified SOPs (in English and Nepali) and SOPs for operators (in English and Nepali) were prepared for each of the 3 existing WTPs and the New Sundarikal WTP.</p> <p>The JICA Expert Team will proceed to prepare an integrated version of SOPs (in English) for the 4 WTPs.</p> <p>Regarding water treatment, the preparation of integrated SOPs (in English) for the four water treatment plants has been completed. In the future, these SOPs will be reviewed and revised based on the results of improvement work at each facility.</p> <p>Regarding water quality control, the SOPs (1st version) considered necessary for the time being have been completed through the activities of Term-1.</p> <p>In Term-2, these SOPs will be operated on a trial basis through on-the-job training (OJT) to identify areas for improvement, and the content will be revised in about one year.</p>
3-4	Prepare monitoring plan of water treatment and water quality control.	In progress (Continued in Term-3)	<p>Monthly meetings are held to report monitoring results for raw water, settled water, treated water, and operating conditions at the 4 WTPs. Water quality monitoring items will be updated as necessary.</p> <p>The development of the monitoring plan, including a review of water sampling points, will continue in Term-3.</p>
3-5	Monitor the water quality based on the monitoring plan prepared in Activity 3-4.	In progress (Continued in Term-3)	<p>Monitoring of raw and treated water at 4 WTPs is underway on a daily basis, and water quality at several points in the distribution network is being monitored at given intervals.</p> <p>This activity is scheduled to continue in Term-3.</p>
3-6	Reflect the monitoring results to water quality improvement and effective water treatment.	In progress (Continued in Term-3)	<p>Through the above monitoring, water quality control issues will be identified and countermeasures will be implemented.</p> <p>This activity is scheduled to continue in Term-3.</p>

Table 1.3.4 Summary of progress of activities related to Output 4

No	Activities	Progress	Summary
[Output 4] The capacity of customer service management is enhanced.			
4-1	Prepare a plan of customer satisfaction survey including survey design and TOR for survey company.	Completed	<p>This activity was completed in Term-1.</p> <p>Through remote meeting, KUKL action team members and the JICA Expert Team discussed and agreed on the objectives of the customer satisfaction survey, the scope of the survey, the number of samples, how to analyze the survey results, and how to utilize the results in future KUKL operations.</p> <p>The questionnaire was developed collaboratively by JICA experts and KUKL, and then finalized with comments by the CEO, reflecting the initiative of KUKL to a large extent.</p> <p>At this time, the second survey has been completed at the midpoint of the project and a third survey will be conducted before the end of the project.</p>
4-2	Conduct customer satisfaction survey at baseline, mid-term and end-line.	Partially completed (Continued in Term-3)	<p>Plans through Term-2 were achieved.</p> <p>The first survey was conducted in October-November 2021 during the first phase of the project.</p> <p>In Term-2, KUKL staff analyzed the results of this survey as on-the-job training and discussed areas for improvement until the time of the second survey, and then started Activity 4-3.</p> <p>The second survey was conducted in May-June 2023 during the second phase of the project, and the survey report was completed by the end of September 2023. Analysis of the results is underway as on-the-job training for KUKL staff.</p> <p>The third survey will be conducted in mid-2025.</p>
4-3	Prepare a plan for measures to improve customer satisfaction.	In progress (Continued in Term-3)	<p>In Activity 4-2, an analysis was conducted based on the results of the first customer satisfaction survey, and a first draft of an action plan was developed based on the results.</p> <p>The Action Plan is being implemented on an ongoing basis through activities 4-9 and will be conducted in Term-3.</p>
4-4	Review the Customer Grievance Module's level of functioning on the Computer Billing and Accounting System (CBAAS) and current practice of customer care (internal arrangements such as internal procedures or staff allocation)	In progress (Continued in Term-3)	<p>The plan for Term-1 was achieved and this activity continued in Term-2.</p> <p>On the customer grievance handling system associated with CBAAS, customer grievances are entered into the system and the information is available on PCs at each branch office in a timely manner.</p> <p>In addition, the status of customer billing can be viewed online on the branch manager's PC, which greatly aids in the collection of non-revenue water data.</p> <p>Although the number of users increased as a result of the "Web Page access promotion" implemented from 2022 as an Output 4 activity, this trend was only temporary, and measures need to be considered in Term-3 onward.</p>
4-5	Identify activities necessary to fully utilize the Customer Grievance Module and improve the customer care management.	In progress (Continued in Term-3)	<p>The plan for Term-1 was achieved and this activity continued in Term-2.</p> <p>The results of Activity 4-4 and the current state of customer management and service were presented at the Action Team's regular meetings, and opinions were exchanged on how to resolve the issues faced.</p> <p>During the discussion, the JICA Expert Team proposed the items of activities to be implemented in the future and a policy for staffing, which were organized as "Customer Service Management Improvement Activities" and a total of 11 activities were listed.</p> <p>Among these items, "Public Relations Activities to Promote the Online Grievance Handling System to Customers" and "Improvement of the System Interface" were initiated in Term-1. Other activities were initiated in Term-2 and will be conducted in Term-3.</p>
4-6	Prepare an activity plan for data management utilizing the Customer Grievance Module,	In progress (Continued in Term-3)	<p>While access to the grievance handling module (online system) is not active and data accumulation is low, digitization of traditional complaint receipt information was initiated in Term-2 and is ongoing (effective use of PCs provided by the JICA Expert Team).</p>

No	Activities	Progress	Summary
[Output 4] The capacity of customer service management is enhanced.			
	analysis of customer complaints and improvement of customer care management.		Applying the training content of the customer satisfaction survey database, a database of grievance information has also been established, and an activity plan has been developed and is being updated on an ongoing basis.
4-7	Analyze the customer complaints.	In progress (Continued in Term-3)	Underway as part of activities 4-6.
4-8	Report the results of analysis on customer complaints to KUKL management.	In progress (Continued in Term-3)	A "Reporting System," which had not been created within the organization, was established in Term-2 and is now being implemented. On the other hand, it has not yet been formally institutionalized within the organization, and discussions are underway to institutionalize the system.
4-9	Conduct trainings on customer care (how to behave to customers) targeting for staff in charge or customer care and meter readers.	In progress (Continued in Term-3)	Training was conducted in Term-2 and will continue in Term-3. [Trainings conducted until Dec 2023] Online Grievance System: 9 times Database and Statistical Processing: 24 times Customer Care: 2 times Analysis of Customer Satisfaction: 1 time Statistical Processing of Customer Satisfaction Survey Data: 1 time
4-10	Prepare a plan of activities for public awareness.	In progress (Continued in Term-3)	First draft is drafted in Term-2 and is being updated as needed.
4-11	Conduct public awareness activities based on Activity 4-10.	In progress (Continued in Term-3)	This activity started in Term-2 and is underway.
4-12	Summarize and review the results of public awareness activities and utilize it for next plan.	Before start	-

Table 1.3.5 Summary of progress of activities related to Output 5

No	Activities	Progress	Summary
[Output 5] The capacity of managing KUKL's internal training is improved.			
5-1	Identify the training necessary for KUKL staff.	Completed	Completed in Term-1. Baseline surveys and capacity assessments were conducted by each Output Action Team, and training needs were identified based on analysis of the results. In Term-2, the baseline survey report was shared with the entire Output 5 Action Team, who reviewed the findings for each output.
5-2	Prepare an overall training program (rough plan) necessary for KUKL staff.	Completed	Completed in Term-1. Based on the draft OJT and TOT plans planned by the Action Teams for each output, a systematic diagram of the overall training program was developed. The activities planned in the first phase were completed. Although the systematic diagram has been finalized, the timing of each training program is subject to change after the start of Term-2. This is due to a number of uncertainties at the start of the project, including the progress of the DNI project, provision of GIS data, and the timing of the start of operation of the New Sundarjial WTP.
5-3	Prepare a database (on Excel basis) on training programs.	Completed	Completed in Term-1. A training database was created by the Outcome 5 Action Team. The training database was created in Excel, which KUKL staff is familiar with, and consists of a cover page, a results aggregation section, and a response input sheet. In addition, the training database was designed to be linked to the feedback survey to be conducted after the training. To increase the response rate to the feedback survey, the descriptive responses were minimized and most of the questions were in the form of multiple-choice questions.
5-4	Prepare a manual for internal training management.	Completed	Completed in Term-1. An Internal Training Supervision Manual was developed by the Action Team for Output 5. The Internal Training Supervision Manual is positioned in the same manner as the SOPs for the other results, and its contents are designed to enable new staff to continue internal training by following this manual even when the person in charge of training is replaced due to personnel changes or other reasons.
5-5	Conduct trainings on internal training management targeting for the nominated staffs of Output 5 members and Human Resources Development Section.	In progress (Continued in Term-3)	In Term-1, the basic training on training supervision was provided to those in charge of supervising the internal training for each achievement, and they were divided into groups for four days each. In Term-2, two persons in charge of internal training was assigned to the Training & Research Section, and training on internal training was provided to this person as well. After that, other two persons were reassigned due to personnel transfer, so training was conducted for the two newly appointed staff members in the second half of Term-2. In addition, the "Output 5 Training Support Team" was reorganized to include a new person in charge of each output, and KUKL staff members were newly assigned to each of these areas, and training in training supervision was also provided to these new members. In both cases, to ensure KUKL's autonomy and the sustainability of future training, the main instructor for this training is the person in charge of the internal training management manual, assisted by the JICA Expert Team.
5-6	Prepare training programs (modules) on the fields that the Project targets such as GIS, Hydraulic Analysis, Water Distribution Management, Water Quality Control, Water Treatment, Customer Management) in	In progress (Continued in Term-3)	At the beginning of Term-2, a tentative training plan was developed with the cooperation of KUKL staff in charge of each field and the JICA Expert Team. Currently, OJT and TOT are being conducted in each field, and the final training modules will be developed in Term-3.

No	Activities	Progress	Summary
[Output 5] The capacity of managing KUKL's internal training is improved.			
	collaboration with staff in the relevant section.		
5-7	Prepare for trainings such as development of training materials, examination of how to measure the effectiveness of training, etc., in collaboration with staff in the relevant section.	In progress (Continued in Term-3)	As described in Activity 5-5, a new staff member was assigned to the Output 5 Training Support Team. Some KUKL staff members who are highly relevant to each output work has been selected as new members of the team, with an eye to collaboration with each output area. Two members assigned to the Training and Research Section in the second half of Term-2 are working with the members of Output 5. Since OJT and TOT are currently in progress, KUKL still owes much of the preparation of teaching materials to JICA experts in each field, but KUKL is now able to efficiently conduct all other aspects of training preparation, including feedback surveys of the training.
5-8	Conduct training of trainers (TOT) in each area.	In progress (Continued in Term-3)	Training of Trainers (TOT) was conducted in each field in Term-2 and will continue in Term-3. The Output 5 Training Support Team and the Training & Research Section are providing lateral support based on the training manual developed in Term-1.
5-9	Conduct trainings. (Support training implementation as staff in charge of training management)	In progress (Continued in Term-3)	Similar to Activity 5-8, in conjunction with the implementation of training in each field, the Output 5 Training Support Team and the Training & Research Section provide support in three phases (preparation, implementation, and evaluation) in accordance with the Training Manual.
5-10	Summarize and review the results of trainings.	In progress (Continued in Term-3)	The Output 5 Training Support Team and the Training & Research Section conduct a feedback survey on the overall training on the last day of each training session, and the results are shared with KUKL staff and the JICA Expert Team in each field. The results of the survey were also input into the training database created in Term-1.
5-11	Reflect the training results to next training plans.	In progress (Continued in Term-3)	As described in Activity 5-10, the results of the feedback survey are shared with Output 5 Training Support Team, Training & Research Section, and the training groups in each output. The results of the survey are then analyzed for each of the training programs for which they were in charge, with particular attention paid to the points that received high and low evaluations from trainees, and reflected in the content of the next term's training.

1.4 Progress against project purpose

The duration of the project is approximately 60 months, from March 2021 to March 2026.

	Term1 (Mar/2021 - Mar/2022)	Term2 (Apr/2022 - Jan/2024)	Term3 (Feb/2024 - Mar/2026)
	Baseline Survey - Building a project implementation system	Planning and Implementation of OJT and TOT	Implementation of internal training - Establishment of skills
General	<ul style="list-style-type: none"> •Collection of basic information •Relationship-building with C/P 	<ul style="list-style-type: none"> •Improvement of the capacity of KUKL staff through training 	<ul style="list-style-type: none"> •Establishment of PDCA cycle and KUKL's organizational system after the project completion
Output1	<ul style="list-style-type: none"> •Activity: 1-1 •Implementation of basic training •Preparation of SOPs of GIS 	<ul style="list-style-type: none"> •Activity: from 1-2 to 1-10 •Implementation of OJT and TOT •Preparation/utilizing of SOPs of GIS 	<ul style="list-style-type: none"> •Activity: from 1-5 to 1-9 •Implementation of internal training •Utilization and update of GIS data
Output2	<ul style="list-style-type: none"> •Activity: 2-1 & 2-2 •Clarification of roles and data collection about NRW 	<ul style="list-style-type: none"> •Activity: from 2-2 to 2-7 •Formulation of maintenance plan for NRW reduction •Implementation of training 	<ul style="list-style-type: none"> •Activity: from 2-3 to 2-7 •Implementation of maintenance plan for NRW reduction •Implementation of training
Output3	<ul style="list-style-type: none"> •Activity: 3-1, 3-2 & 3-3 •Implementation of basic training •Prepare SOPs related to water treatment and water quality control 	<ul style="list-style-type: none"> •Activity: from 3-2 to 3-5 •Implementation of OJT and TOT •Formulation and implementation of monitoring plan 	<ul style="list-style-type: none"> •Activity: 3-2, from 3-4 to 3-6 •Implementation of internal training •Implementation of monitoring
Output4	<ul style="list-style-type: none"> •Activity: 4-1, 4-2, 4-4 & 4-5 •Conducting customer satisfaction •Review of complaint handling module 	<ul style="list-style-type: none"> •Activity: 4-2, 4-3, from 4-6 to 4-12 •Making an action plan for improving customer service •Prepare a plan of activities for public awareness and implementation of TOT 	<ul style="list-style-type: none"> •Activity: 4-2, 4-3, from 4-6 to 4-9, 4-11, 4-12 •Revised action plan for improving customer service •Review the results of public awareness activities, Implementation of internal training
Output5	<ul style="list-style-type: none"> •Activity: from 5-1 to 5-7 •Identify the training necessary for KUKL staff/ Prepare an overall training program, Prepare a manual for internal training management 	<ul style="list-style-type: none"> •Activity: from 5-8 to 5-11 •Implementation of TOT •Analysis and feedback of training 	<ul style="list-style-type: none"> •Activity: from 5-8 to 5-11 •Implementation of internal training •Analysis and feedback of training

Figure 1.4.1 Main activities in each term

Term-1 corresponded to the project's start-up phase, and laid the foundation for efficient capacity building for each of different outputs scheduled in Term-2. The JICA Expert Team identified the direction and training needs of the project through the baseline survey and capacity assessment of KUKL staff.

On the other hand, the KUKL side deepened its understanding of the relationship between project purposes and the expected outputs of each activity and various evaluation indicators through action team meetings for each output, and worked to acquire the basic knowledge necessary to start OJT.

In Term-2, in collaboration with KUKL staff, activities were developed in accordance with the technical themes addressed by each output, and training was effectively promoted to enhance the capacity of KUKL staff.

The training programs planned and implemented by the JICA Expert Team have all met the expectations of the KUKL side, and have contributed to the enhancement of staff motivation.

In addition, awareness has been fostered within the counter parts (C/P) to achieve the project purpose of translating the increased water supply from the Melamchi Water Supply Project into improved customer service and improving KUKL's own operations and maintenance capacity.

Meanwhile, the DNI project, a sub-project of the Melamchi Water Supply Project, has been delayed significantly from its original schedule due to flood damage to the Melamchi River and the closure of the diversion tunnel in rainy season.

Only three District Metered Areas (DMAs) have been handed over to KUKL for operation and maintenance after the completion of the construction of the new distribution network. Even in the DMAs

that have been handed over to KUKL, the switchover to the new distribution network has not progressed, and most of the water produced at the New Sundarijal WTP is supplied through the old distribution network.

Under these circumstances, for Indicators 1 and 2 of the project purpose, progress in switching to the new distribution network will largely determine the extent to which the indicators are achieved.

Table 1.4.1 Achievement of project purpose

No	Objectively Verifiable Indicators	Prospect
[Project Purpose]	The KUKL's capacity of operation and maintenance of water supply is improved.	
Indicator 1	Water pressure (*1) is properly maintained above 0.05MPa during the water supply time in the areas within the ring road where the DNI project has been completed.	Only 3 DMAs have been handed over to KUKL by the end of Term-2, but several more DMAs are planned for completion and handover by early 2024. A significant increase in water supply is assured during the dry season when the Melamchi water diversion tunnel will resume. This indicator will be achievable, although the timing and areas where water supply stabilizes will be limited.
Indicator 2	Water supply hours are fair in the areas within the ring road where the DNI project has been completed.	Only 3 DMAs have been handed over to KUKL by the end of Term-2, but several more DMAs are planned for completion and handover by early 2024. A significant increase in water supply is assured during the dry season when the Melamchi water diversion tunnel will resume. This indicator will be achievable, although the timing and areas where water supply stabilizes will be limited.
Indicator 3	The rate of turbidity value which satisfies 5NTU at the treated water reservoirs of the target WTPs reaches more than 95 % (*1).	Through the activities up to Term-2, turbidity control at each water treatment plant has improved more than before, and the turbidity value is generally below 5 NTU except during sudden increases in raw water turbidity. The amount of PAC injected was determined through jar tests, control targets were indicated in the prepared SOPs, and installation of the PAC injection volume measurement equipment (Rotameter) has completed in Mahankalchaur WTP. If improvements to the chemical dosing facilities at each WTP are completed and the capacity enhancement of C/P continues through Term-3, this indicator will be achieved.
Indicator 4	The rate of residual chlorine value which satisfies the required value specified in the SOPs at the treated water reservoirs of the target WTPs reaches more than 95 % (*1).	Through the activities up to Term-2, items to be improved in residual chlorine control have been identified, and facilities for measuring chlorine dosage have been installed in Mahankalchaur WTP. In Term-3, the required value to be specified in the SOP will be determined in consideration of the retention time at the clear water reservoirs and service reservoirs. After the chemical dosing measurement facilities (Rotameter) are installed and function at the remaining existing WTPs, and the capacity enhancement of C/P continues through Term-3, this indicator will be achieved.
Indicator 5	The result of customer satisfaction survey is reported in the KUKL's annual reports.	The results of the second customer satisfaction survey were analyzed and evaluated by KUKL staff throughout the activities in Term-2. The results will be published in the next KUKL Annual Report (first half of 2024). The results of the third survey to be conducted in Term-3 will be analyzed and evaluated by KUKL staff in the same way. This indicator is achievable by the end of the project.

1.5 Degree of improvement of KUKL organization during project implementation

Although there is no department within KUKL that collects and monitors Performance Indicators, the following information is shown in the Annual Report that is published in Falgun of every year, the time of KUKL's anniversary.

- Shareholders structure of KUKL
- List of directors of KUKL Board and CEO
- Organizational structure of human resource status
- KUKL service area for water supply
- Water production and distribution details
- Activities of service improvement (Maintenance and pipeline works)
- Pipeline installation for distribution improvement
- Consumer water connections
- Annual new connections
- Other activities (JICA Project Information, Water quality sampling etc.)

In technical cooperation projects, it is desirable to evaluate the results of implemented activities not only by using indicators shown in PDM, but also by linking capacity development activities to KUKL's Key Performance Indicators (KPIs).

While not all output activities will directly contribute to the improvement of KPIs, changes in indicators that can contribute to improvement through the project are shown below.

Table 1.5.1 Comparison between the outputs and KPIs

KPI	Baseline (2020/2021)	Actual (2023)	Source
General information			
Number of staff	Total: 977 Permanent: 750 Non-permanent: 227 (Feb/Mar 2021)	Total: 933 Permanent: 648 Non-permanent: 285 (Feb/Mar 2023)	KUKL Annual Report
Served population	2,300,000	2,300,000	JICA Institutional Capacity Assessment of KUKL (Feb 2016)
Number of staff per 1000 connections	4.3	3.9	
[Output 1] The capacity of water distribution management utilizing GIS is enhanced.			
Total number of connection	228,808	239,396	
Number of stand post	652	600	
Number of metered connection	220,659	230,160	
Metered connection ratio	96.4%	96.1%	
Number of new connection	7,719/year	10,275/year	
[Output 2] The capacity of NRW reduction is enhanced.			
Total operating cost (Annual expenses for O&M only) *1	NRs 804,250,957	NRs 799,713,043	KUKL Financial Statement
Annual total billing (Net Billing Amount)	NRs 858,146,648	NRs 936,975,412	KUKL Financial Statement
Total operating income*2	NRs 1,005,119,402	NRs 1,135,095,863	KUKL Financial Statement
Operating ratio*3	0.94	0.85	Total operating cost /Annual total billing
Operating balance ratio*4	1.25	1.42	Total operating income /Total operating cost
Collection ratio (Collected amount / Billing amount)	0.96	0.98	Historical Average
Average monthly billing	NRs 313/con • month	NRs,327/con • month	
Production cost	NRs.19.3/m ³	NRs.17.3/m ³	
Average daily production	114,000 m ³ /day	126,550 m ³ /day	KUKL Annual Report
Average daily production per	49.6 L/day • capita	55.0 L/day • capita	

KPI	Baseline (2020/2021)	Actual (2023)	Source
capita	(Target 2,300,000)	(Target: 2,300,000)	
Percentage exceeding standard values 5 NTU of turbidity in water samples of treated water at WTPs	Mahankalchaur: 32.4% Bode: 2.7% Bansbari: 0.5%	Mahankalchaur: 11.2% Bode: 0.1% Bansbari: 0.1% New Sundarijal: 4.1%	Data provided by the central laboratory
[Output 4] The capacity of customer service management is enhanced.			
Customers satisfied with overall service of KUKL (%)	388/1000 = 38.8% A little satisfied: 335 Very satisfied: 53	691/1000 = 69.1% A little satisfied: 443 Very satisfied: 248	Customer Satisfaction Survey Report
Customers satisfied with telephone attention by KUKL (%)	34/113 = 30.0% A little satisfied: 31 Very satisfied: 3	33/48 = 68.8% A little satisfied: 21 Very satisfied: 12	Customer Satisfaction Survey Report
Customers satisfied with on-site attention by KUKL (%)	17/37 = 45.9% A little satisfied: 15 Very satisfied: 2	144/172 = 83.7% A little satisfied: 81 Very satisfied: 63	Customer Satisfaction Survey Report
Customers whose domestic demand is fully covered by KUKL water supply (%)	[100% of Sufficiency] 141/1000 = 14.1%	[100% of Sufficiency] 385/992 = 38.8%	Customer Satisfaction Survey Report

*1: Annual operating expenses excluding license and lease fee and TFC payment

*2: Total operating income = Revenue + Other income

*3: Operating ratio = Annual O&M cost / Annual billing

*4: Operating balance ratio = Total operating income / Total operating cost

[Operating Ratio]

The operating expense ratio was previously used in the MoWS's WATER SERVICE PROVIDERS Capacity Assessment and Benchmarking 2071-72 (2014-15) and is defined as follows:

Annual operational cost / Annual sales revenue (Billing)

O&M expenses decreased 0.5%, while billings increased 9%, and the ratio of O&M expenses to billing decreased from 0.94 to 0.85. These O&M expenses do not include license/lease fees to KVWSMB and contributions to TFC, but are calculated as pure operating expenses.

[Operating Balance Ratio]

The operation balance ratio (operating income / operating cost) is an indicator of the percentage of operating expenses covered by operating revenues. The higher this ratio is, the better the operating profit is, and less than 100% means an operating loss. The operation balance ratio increased from 1.25 at the baseline to 1.42, indicating an improvement in the operating income/expenses ratio.

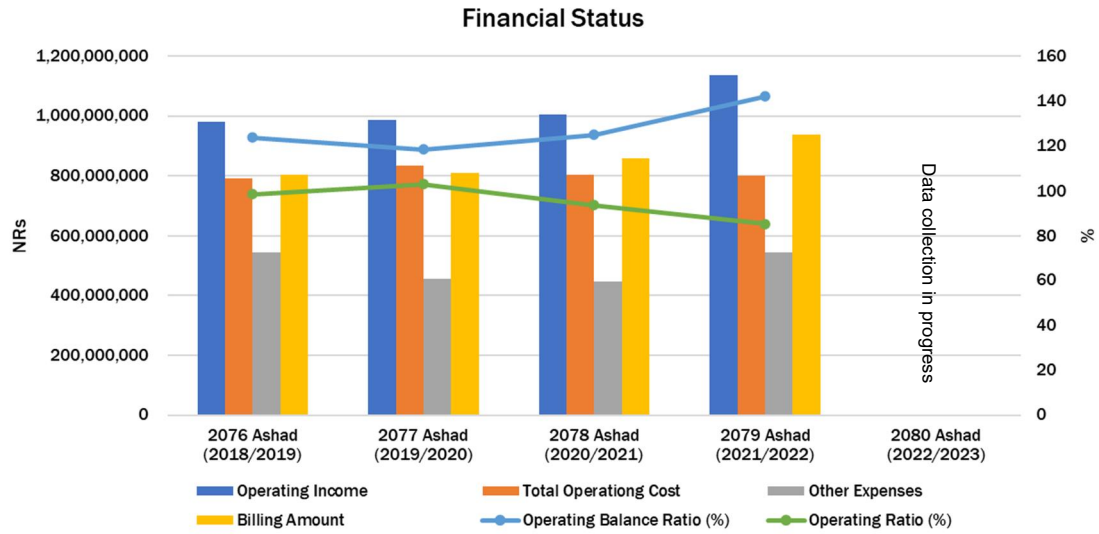


Figure 1.5.1 Operating Ratio and Operating Balance Ratio

[Collection Ratio]

The ratio of the collected amount to the billing amount, which shows improvement from previous years.

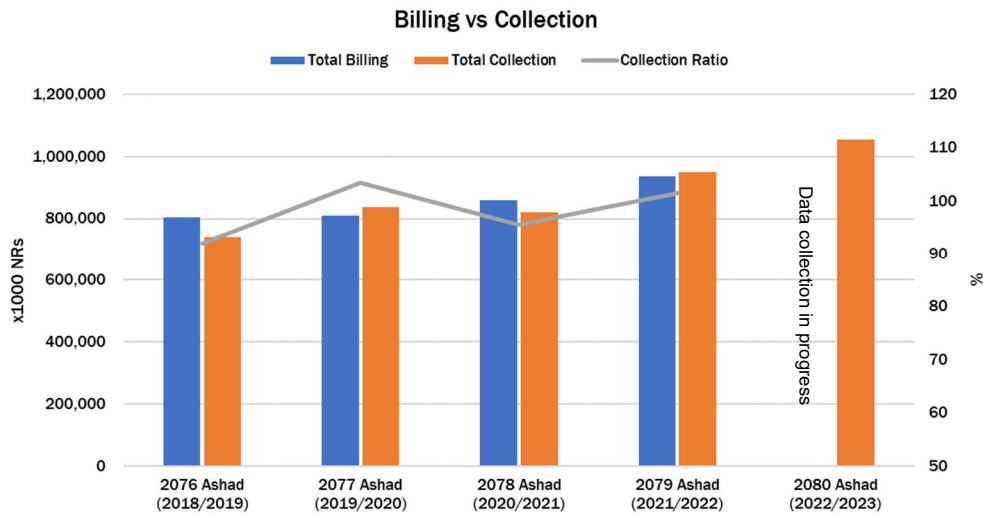


Figure 1.5.2 Billing and Collection

[Percentage of samples exceeding standard values 5 NTU of turbidity in treated water at WTPs]
Control of treated water turbidity at the water treatment plant is improving. In the Mahankalchaur WTP, there is still room for improvement in treatment and turbidity management when raw water turbidity suddenly increases.

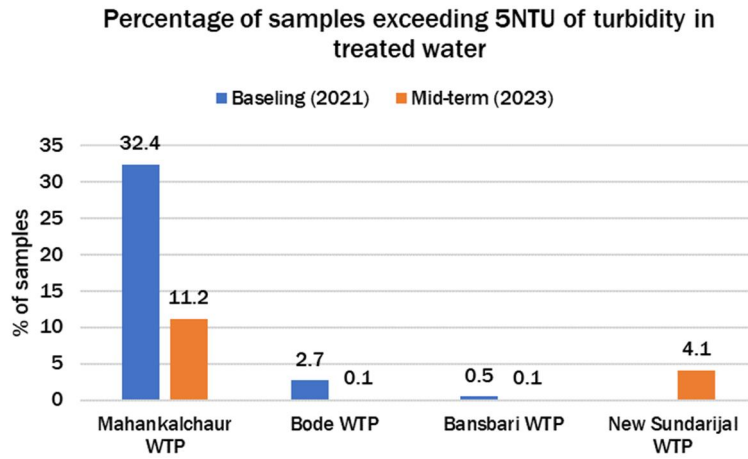


Figure 1.5.3 Change of turbidity control status in WTPs

1.6 Progress of related projects

To improve the water supply in the Kathmandu Valley, the following three projects are underway, ranging from water source development to construction of water transmission and distribution networks and installation of water meters for each household, utilizing co-financing from Japan and the ADB.

- Melamchi Water Supply Project
 - Construction of diversion tunnel and water treatment plant
 - Facilities supported by JICA: WTP1
 - Facilities supported by ADB: WTP2
- Construction of Bulk Distribution System (BDS)
- Distribution Network Improvement (DNI)

1.6.1 Melamchi Water Supply Project

(1) Water Diversion Tunnel

The Melamchi Water Diversion Tunnel and intake gate, originally expected to be completed by the end of 2018, had to be suspended due to contractor issues.

The water diversion tunnel was then completed in July 2020 after re-contracting with the contractor, but its operation was suspended due to a major accident during a water conduit test from the Melamchi River, requiring repair work in the tunnel.

Water conduction testing resumed on February 22, 2021, and operational testing of the tunnel proceeded with a gradual increase in water flow, which was completed by mid-March 2021.

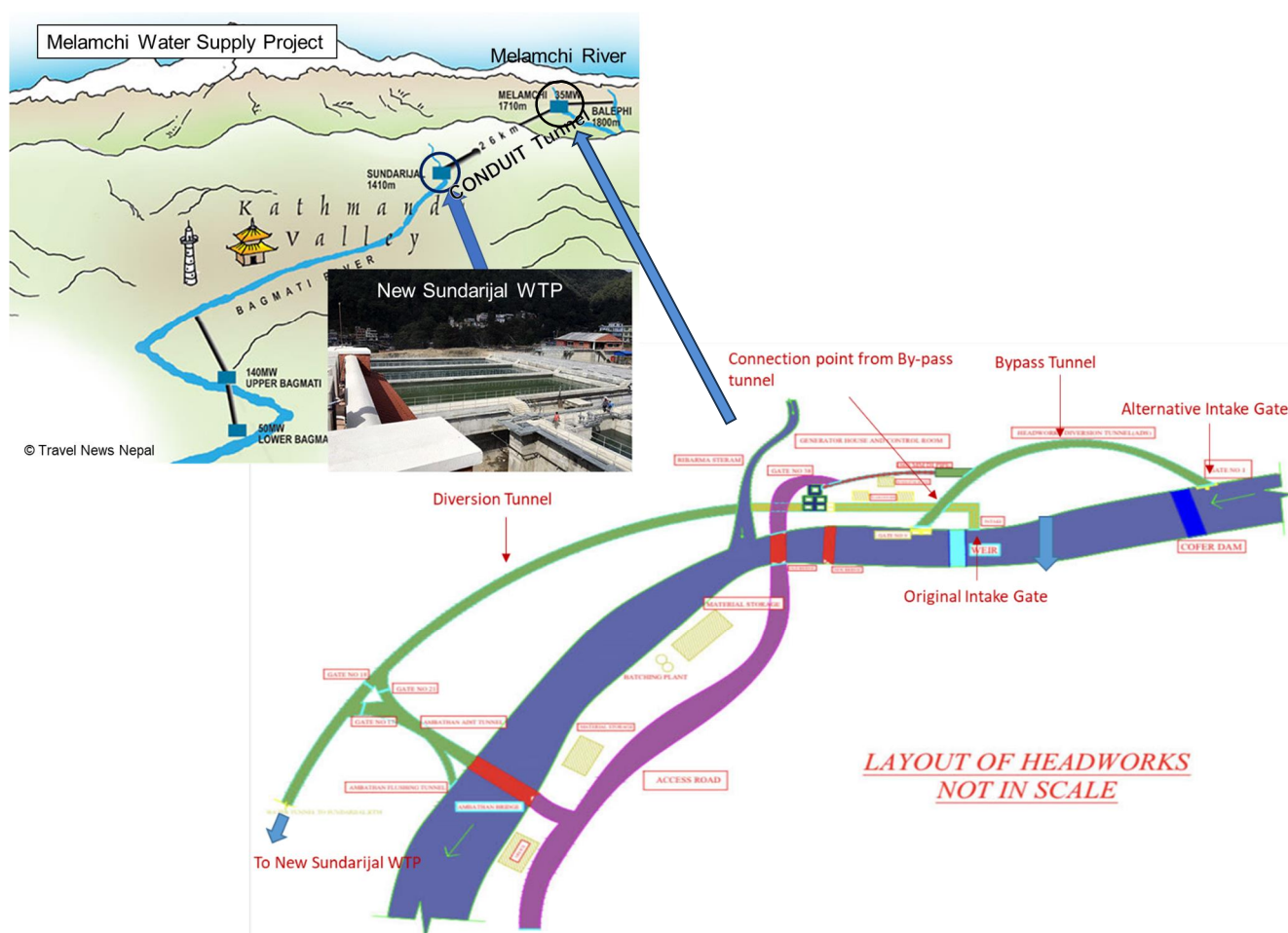


Figure 1.6.1 Overview of the Melamchi Diversion Tunnel

Although the BDS and DNI projects have not yet been completed, the high demand for early improvement of the water supply situation in the Kathmandu Valley has led to the start of test water distribution using the partially completed pipelines and service reservoirs constructed by BDS project, as well as existing reservoirs and distribution pipe networks.

However, the full operation of the water diversion tunnel was further delayed when the intake facilities were covered by mudslides caused by flooding on June 15, 2021.

Subsequently, as a result of emergency restoration works around the intake facility, water supply to the tunnel was resumed through a bypass route several hundred meters upstream from the original intake point about one and a half years after the flooding. After the contractor provided guidance on facility operation from late January 2023, responsibility for operation and management of the water treatment plant was handed over to KUKL on March 7 of the same year.

The water diversion tunnel continues to be operated by the Melamchi Water Supply Development Board (MWSDB). Water intake facilities remain difficult to rehabilitate, and the intake points along the current bypass route are likely to again be subject to flooding and mudslides during the rainy season.

It has been decided to stop water conduction from the Melamchi River for a certain period of time during the rainy season because the inflow of raw water with high turbidity and sediment into the tunnel would cause significant damage to the facilities.

Under these circumstances, ADB is considering new support for long-term solutions, one of which is a proposed dam approximately 800 m upstream from the current bypass intake point to mitigate flood damage during the rainy season.

In addition, a plan to abandon the restoration of the original intake facility and build a new intake facility upstream of the Melamchi River has been proposed, and the Nepalese government is currently considering the pros and cons of this plan.

(2) New Sundarijal Water Treatment Plant

An agreement was signed by four Nepalese government agencies for the transfer of the operation and management of the water treatment plant to KUKL. The signing date was March 7, 2023, and the agreement became effective on March 10, 2023.

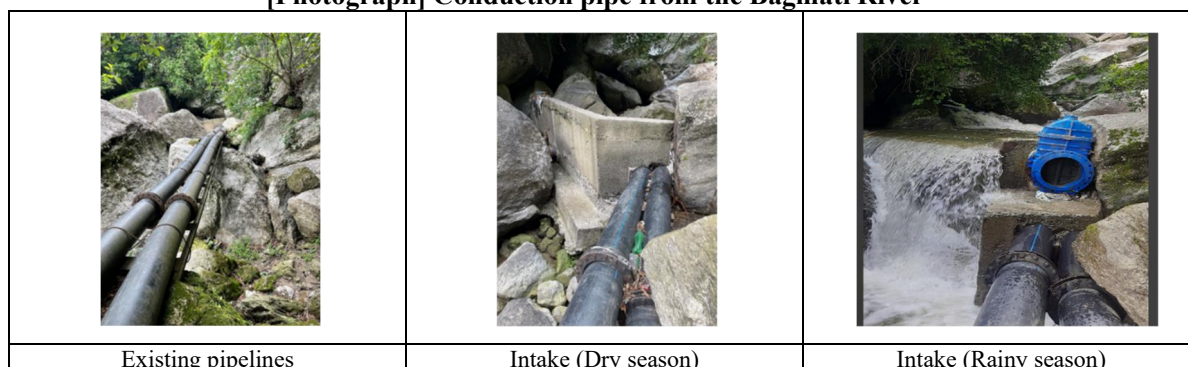
Table 1.6.1 Agreement for the handover of the New Sundarijal Water Treatment Plant

Organization	Roles and Responsibilities
Ministry of Water Supply (MoWS)	<ul style="list-style-type: none"> a. MoWS will provide overall guidance with regard to water and wastewater management in Kathmandu valley including policy decision. b. MoWS will lead sectorial and cross-sectoral coordination for resolving issues related to functionality and sustainable operation of WTP. c. MoWS will monitor and supervise the performance of stakeholders engaged for sustainable service delivery.
Kathmandu Valley Water Supply Management Board (KVWSMB)	<ul style="list-style-type: none"> a. KVWSMB will take over the WTP for operation with immediate effect. b. KVWSMB will supervise and audit the performance of the operator. c. KVWSMB will cause the operator to maintain the physical, hydraulic and treated water quality. d. KVWSMB will cause the operator to maintain the effluent quality of water to permissible to be discharged to the Bagmati River after backwashing. e. KVWSMB will cause the operator to manage safely the sludge deposited in the lagoons in coordination with the concerned authorities.
Kathmandu Upatyaka Khanepani Limited (KUKL)	<ul style="list-style-type: none"> a. Provide uninterrupted operation and necessary maintenance of the plant. b. Adopt and comply with the operating manuals and operating procedures and practices for operation of WTP. c. Management of necessary power, operating fuels, chemicals and required manpower for the O&M of WTP. d. Maintain security and safety in the premises. e. Provide access to MWSDB, its consultants and the contractor in commissioning of Mini-hydro units, closure of the contracts WTP/01 and WTP/02 and further future expansion of the plant.
Melamchi Water Supply Development Board (MWSDB)	<ul style="list-style-type: none"> a. MWSDB will cause the WTP/01 contractor to successful commissioning of the Mini-hydro units and closure of the contracts. b. Facilitate rectification of defects, if any (identified during functionality

Organization	Roles and Responsibilities
	assessment by KVWSMB within 2 months) during operation. c. Following information/documents/materials, spare parts have been handed over along with this MOA and shall form integral part of this handover. <ul style="list-style-type: none"> i. Operation and maintenance manual (both WTP/01 and WTP/02) ii. List of spare parts and fittings (both WTP/01 and WTP/02) iii. Inventory of chemicals iv. Taking Over Certificate (both WTP/01 and WTP/02) <ul style="list-style-type: none"> A. As Built Drawings B. Test Certificates

If the water conduction from the Melamchi River is stopped during the rainy season, the planned 170 MLD of water cannot be obtained, and the operation rate of the water treatment plant will drop significantly. In such a case, the only source of water for the water treatment plant would be the adjacent Bagmati River, from which water intake would be available for about 2 to 3 months starting in late June, with a possible intake of 40 MLD. As of September 2023, emergency water intake is possible with the two existing water pipelines, but KUKL is planning to install a third pipeline in order to secure as much water production as possible for the water treatment plant.

[Photograph] Conduction pipe from the Bagmati River



(3) Bulk Distribution System

The BDS project is one of the components of the Melamchi Water Supply Project, which is the construction of water transmission pipes and service reservoirs to supply water to the Kathmandu Valley from the New Sundarjal WTP. The package has been added and modified in stages since the project started in 2014.

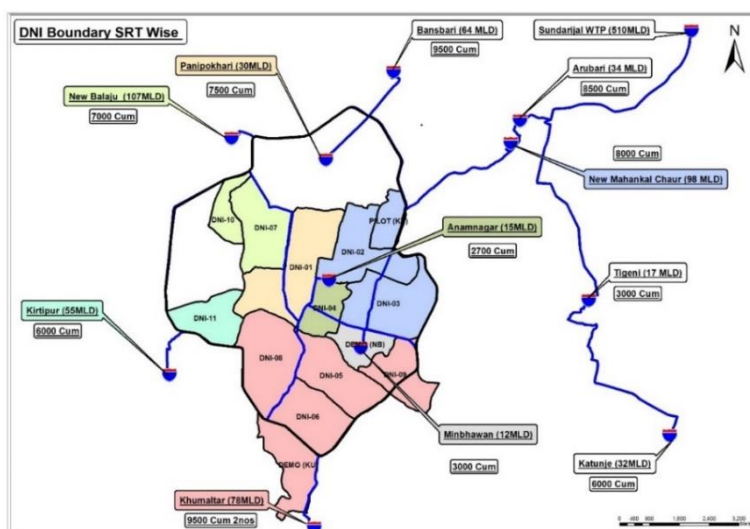


Figure 1.6.2 Overview of BDS project

An agreement by the four Nepalese government agencies was also signed as of January 31, 2023 for some of the facilities constructed under the BDS project. The agreement became effective on February 1, 2023.

[Handed over facilities (Package 1 to 4)]

- Transmission Pipeline from the New Sundarijal WTP to several service reservoirs
- Service Reservoirs 9 sites (Arubari, Mahankalchaur, Bansbari, Panipokhari, Balaju, Kirtipur, Khumaltar, Tigeni, Katunje)

Table 1.6.2 Agreement for the handover of BDS facilities

Organization	Roles and Responsibilities
Ministry of Water Supply (MoWS)	<ul style="list-style-type: none"> a. MoWS will provide overall guidance with regard to water and wastewater management in Kathmandu Valley including policy decisions. b. MoWS will lead sectoral and cross-sectoral coordination for resolving issues related to functionality and sustainable operation of Bulk Distribution System. c. MoWS will monitor and supervise the performance of stakeholders engaged for sustainable service delivery.
Kathmandu Valley Water Supply Management Board (KVWSMB)	<ul style="list-style-type: none"> a. KVWSMB will subsequently hand over the BDS including SRTs for operation with immediate effect. b. KVWSMB will supervise and audit the performance of the operator. c. KVWSMB will cause the operator to maintain the physical hydraulic and water quality integrity of the BDS.
Kathmandu Upatyaka Khanepani Limited (KUKL)	<ul style="list-style-type: none"> a. Provide uninterrupted access to construction sites for installation of supervisory control and data acquisition (SCADA) system components (Reservoir Management Unit - RMU, Outlet Management Unit - OMU and Air Management Unit - AMU) at various locations along BDS and SRTs currently under construction by PID. b. Provide construction sites for connecting BDS 5 (currently under constructions) with BDS 1 as scheduled by PID. c. Provide adequate quantity of water to DNIs (during testing and commissioning process) free of cost on mutually agreed scheduled to PID. d. Ensure uninterrupted operation of BDS for continuous supply of water to SRTs and downstream DNIs, e. Carry out routine, recurrent and periodic maintenance of BDS lines, various valves, water flow meters, valve chambers, thrust blocks, SRTs including their reservoir management units and outlet management units from the date of taking over, for the cases other than constructional defects. f. Notify PID in case of constructional defects for rectification within the Defect Notification Period (DNP). Upon expiry of the DNO for respective BDS packages, PID shall officially notify KVWSMB/KUKL. g. Adopt and comply with the operating manuals and operating procedure and practices for operation of BDS and SRT.
Project Implementation Directorate (KUKL-PID)	<ul style="list-style-type: none"> a. PID will cause the contractor to rectify any constructional defects, if any till the Defect Notification Period (DNP). b. PID will timely inform KVWSMB/KUKL for site access (SCADA, BDS-5 etc.) and schedule of testing that requires water supply through the handed over BDS and SRTs. c. Undertake rectification of defects, if any as identified and verified by KVWSMB through a functional study within 2 months. d. Following information/documents/materials, spare parts have been handed over along with this MOA and shall form integral part of this handover. <ul style="list-style-type: none"> i. Bulk Distribution System Operational Guideline ii. List of spare parts and fittings iii. Two vehicles will be handed over exclusively for BDS operation iv. Taking Over Certificate <ul style="list-style-type: none"> A. As Built Drawings B. GIS shape files of the network C. Operation Manual D. Test Certificates

When water is piped in from the Melamchi River, 170 MLD can be supplied, but only about 40 MLD can be supplied from the Bagmati River during the rainy season. Since the Support Division is responsible for the operation and management of the BDS and the Operation Division is responsible for water distribution management downstream from the service reservoirs, both divisions cooperate in planning and implementing water operations under the restricted water production.

The scheme diagram of the BDS is shown below. The reservoirs are divided into two groups, with Group 1 receiving water from the New Sundarrijal WTP for three consecutive days, and then switching to Group 2 for the following three days.

For service reservoirs that are not in this group, the water may not be delivered or may be supplied from an existing water source.

Table 1.6.3 Water distribution plan for each group

Group 1		Group 2	
SRTs	Distribution (m ³ /h)	SRTs	Distribution (m ³ /h)
New Khumaltar	700	New Mahankalchaur	400
New Mahankalchaur	300	New Balaju	300
Anamnagar	250	Existing Balaju	700
Minbhawan	300	Kirtipur	300
Katunje	150	-	-
Total	1,700	Total	1,700
	(40,800 m ³ /day approx.)		(40,800 m ³ /day approx.)

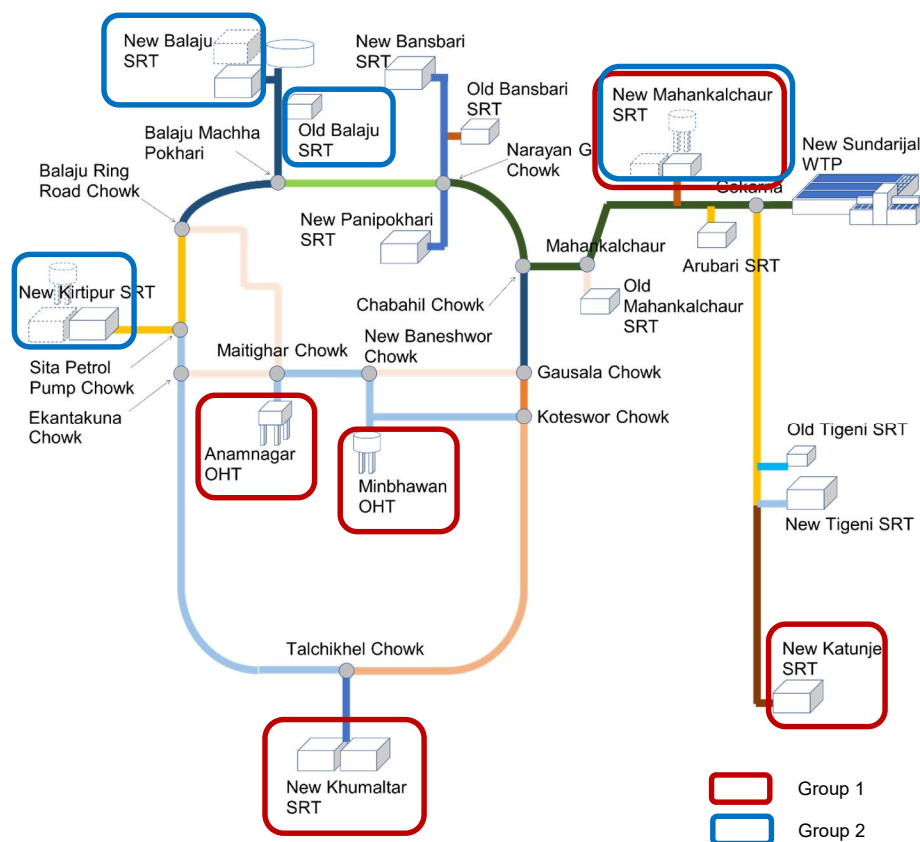


Figure 1.6.3 Scheme Diagram of BDS Network

[Photograph] Service Reservoirs constructed by BDS project



(4) Distribution Network Improvement (DNI)

DNI's component is the construction of a distribution network aimed at efficiently supplying water from the existing water treatment plant after renovation and the New Sundarijal WTP constructed under the Melamchi Water Supply Project (Sub-Project 1).

- Rehabilitation and replacement of primary and secondary distribution pipelines,
- Rehabilitation and replacement of tertiary distribution networks,
- Replacement of cluster property connections with new metered connections,
- Installation of new tertiary distribution pipes in areas currently not served, and
- Installation of a service saddle in the tertiary distribution pipes, and water meters at every service connection.

The water supply area within the ring road is divided by reservoirs wise, and water is supplied to each house connection by gravity flow starting from each reservoir.

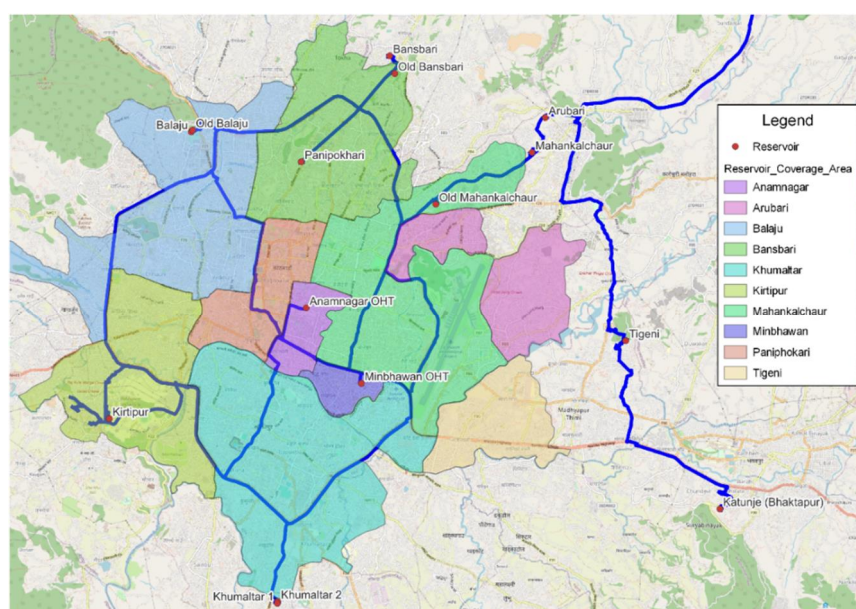


Figure 1.6.4 Water distribution area starting from the BDS service reservoir

Each distribution area is divided into hydrologically independent District Metered Areas (DMAs), and each DMA is further divided into Sub-DMAs. The amount of water entering the Sub-DMA can be measured with a bulk meter, and by measuring the amount of water consumption in the Sub-DMA, the non-revenue water rate can be calculated.

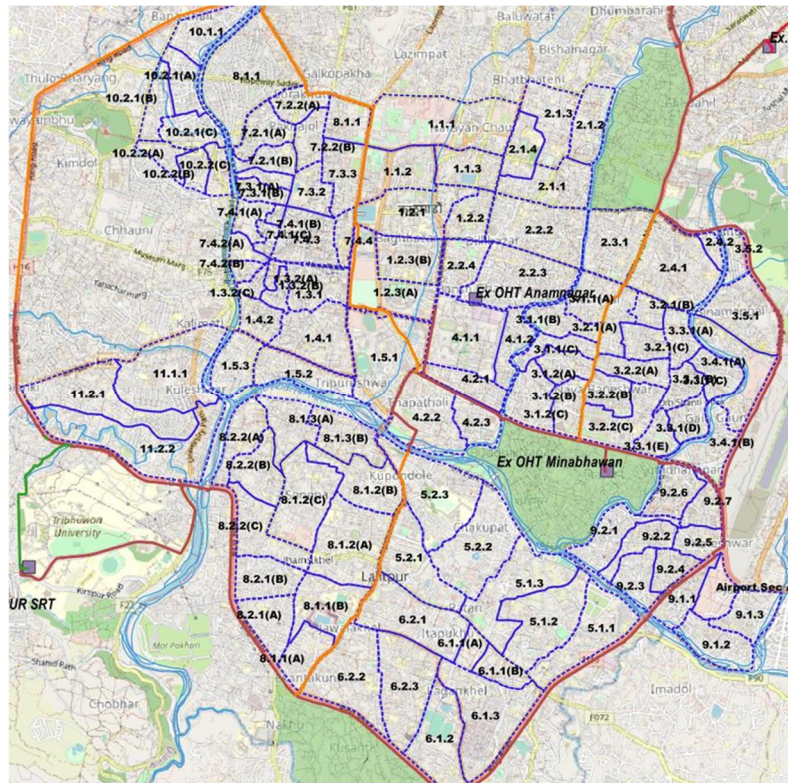


Figure 1.6.5 Classification of Sub-DMA

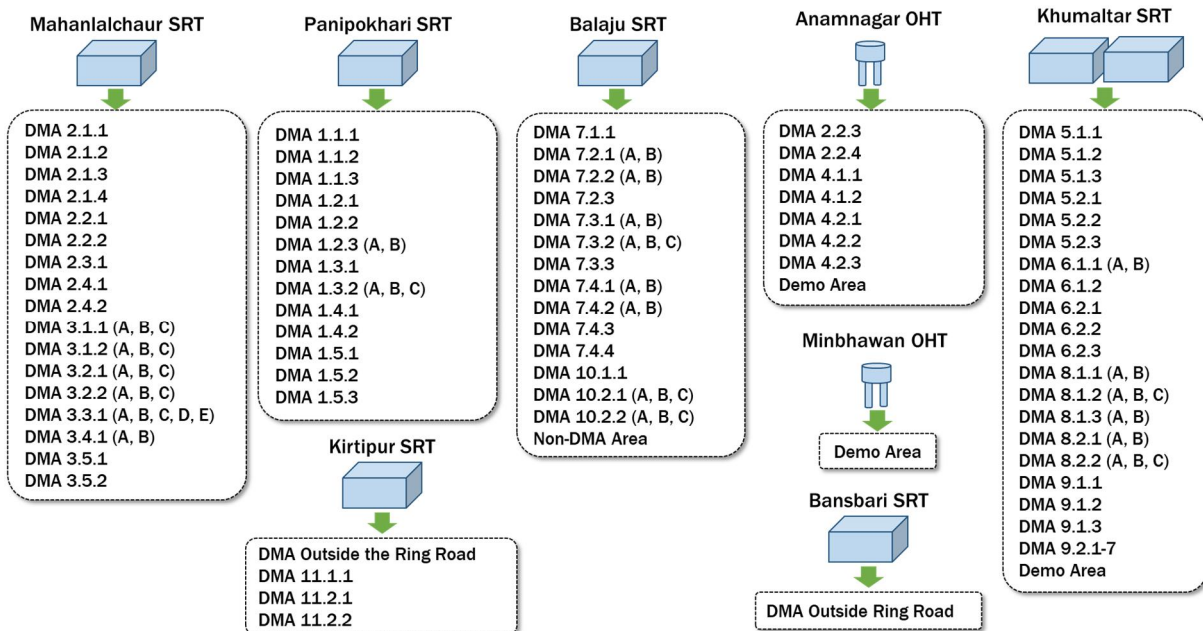


Figure 1.6.6 Relation between service reservoir and sub-DMA

At the end of Term-2, the following four DMAs were completed and handed over to KUKL, among which TU is located outside the ring road and three belong to inside the ring road.

[Completed DMA with official handover on June 22, 2023]

- DMA 2.4
- DMA 3.5
- DMA 9.1
- TU (Tribhuvan University)

The above DMAs have only been handed over on paperwork and water has not yet been supplied from the new water distribution pipes for the following reasons:

- Due to the shutdown of water conduction from the Melamchi River during the rainy season, the service reservoirs do not receive an enough water supply.
- Contractors are laying service pipes to houses that are not registered as customers with KUKL.
- Water meters cannot be installed until KUKL's customer registration is completed.

Along with the handover of the DMA, GIS data containing water supply facilities and customer information was provided by PID. However, several errors have been identified in the GIS data created by the contractor, which need to be corrected.

1.6.2 Management system for facilities handed over to KUKL

KUKL must be responsible for the operation and maintenance of facilities constructed under the BDS project, but the documented handover has been carried out without preparing a sufficient organizational structure in KUKL.

As for the DNI project, the department responsible for the management of the constructed DMA has not been clarified within KUKL, and its management methods and protocols have not been determined.

In addition, the boundaries of some of the DMAs do not match the current management areas of the branches, which poses a major problem for future implementation of post-handover maintenance and non-revenue water management.

Since ADB has similar concerns about the appropriate management system for BDS and DMA, The JICA Expert Team compiled a proposal on matters necessary to resolve the issues and submitted it to KUKL at the end of May 2023.

In preparing this proposal, the following stakeholder meetings were held to confirm the need for the reorganization and to agree on the concept proposed by the expert team. The results were also presented at the 4th JCC and are included in the Minute as an agreed upon item.

Table 1.6.4 Stakeholder meeting about management system of BDS facilities

Date	Confirmed Items
16/May/2023	➤ Discussion with ADB representative at JICA office (Mr. Saugata Dasgupta : Senior Project Management Specialist, Nepal Resident Mission)
18/May/2023	➤ Confirmation of policy at KVWSMB with CEO of KUKL, Production Division Chief of KUKL, and Operations Division Chief of KUKL
22/May/2023	<ul style="list-style-type: none"> ➤ Confirmation of policy at KVWSMB with CEO of KUKL, Production Division Chief of KUKL, Operation Division Chief of KUKL and Project Director of PID ➤ The JICA Expert Team will submit a proposal for the reorganization of the branch offices by the end of May. Also, by the end of June, KUKL will secure its implementation structure and confirm that it will be put into action starting in the new fiscal year.
31/May/2023	➤ Joint meeting with Secretary of MoWS, CEO of KUKL, Production Division Chief of KUKL, JICA Nepal Office, The JICA Expert Team, and ADB (Mr. Saugata Dasgupta) to review roles and obligations of all parties for handover of Melamchi Water Supply Project.

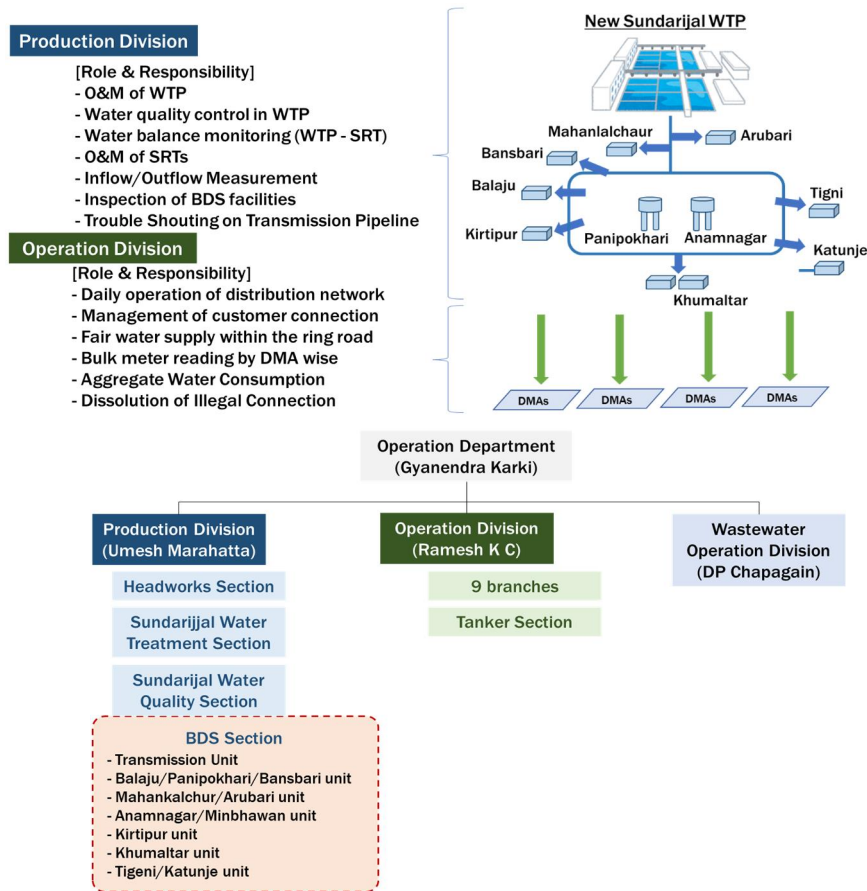


Figure 1.6.7 Draft assignment of role and responsibility for management of BDS/DNI facilities to be handed over

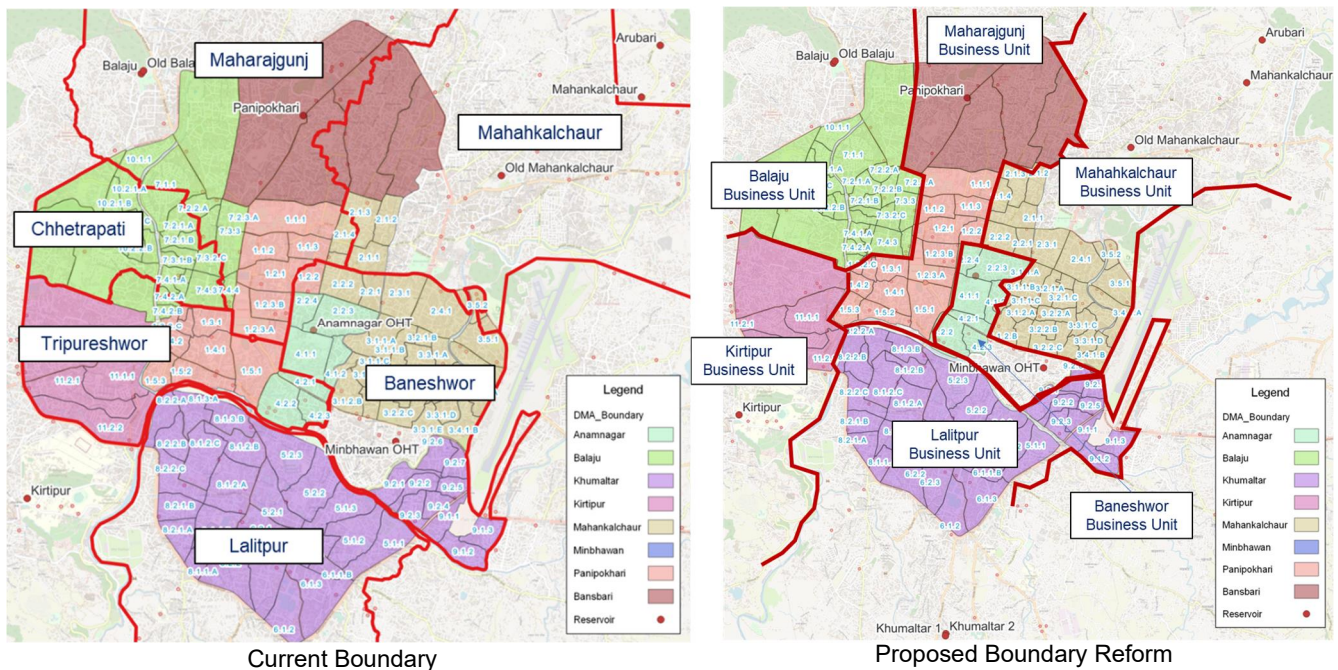
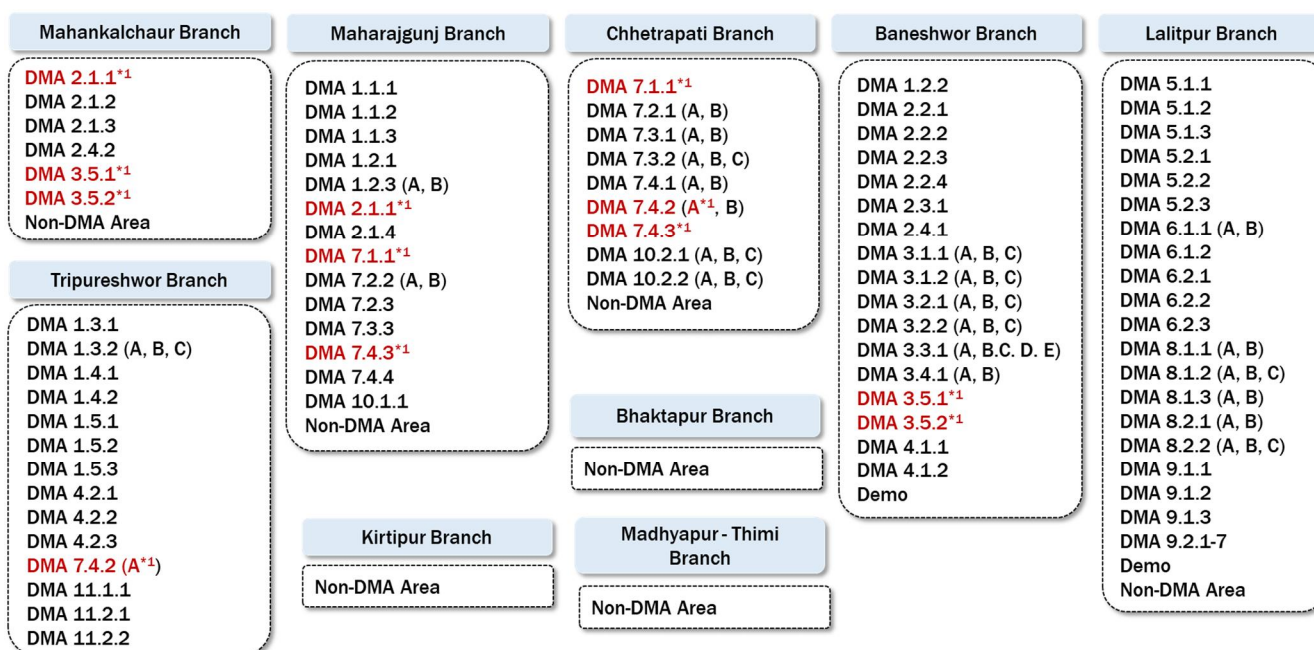


Figure 1.6.8 Proposed realignment of branch boundaries based on the extent of water supply for distribution reservoirs



*1: DMAs belonging to the administrative areas of multiple branches

Figure 1.6.9 Current branch administrative area and sub-DMAs

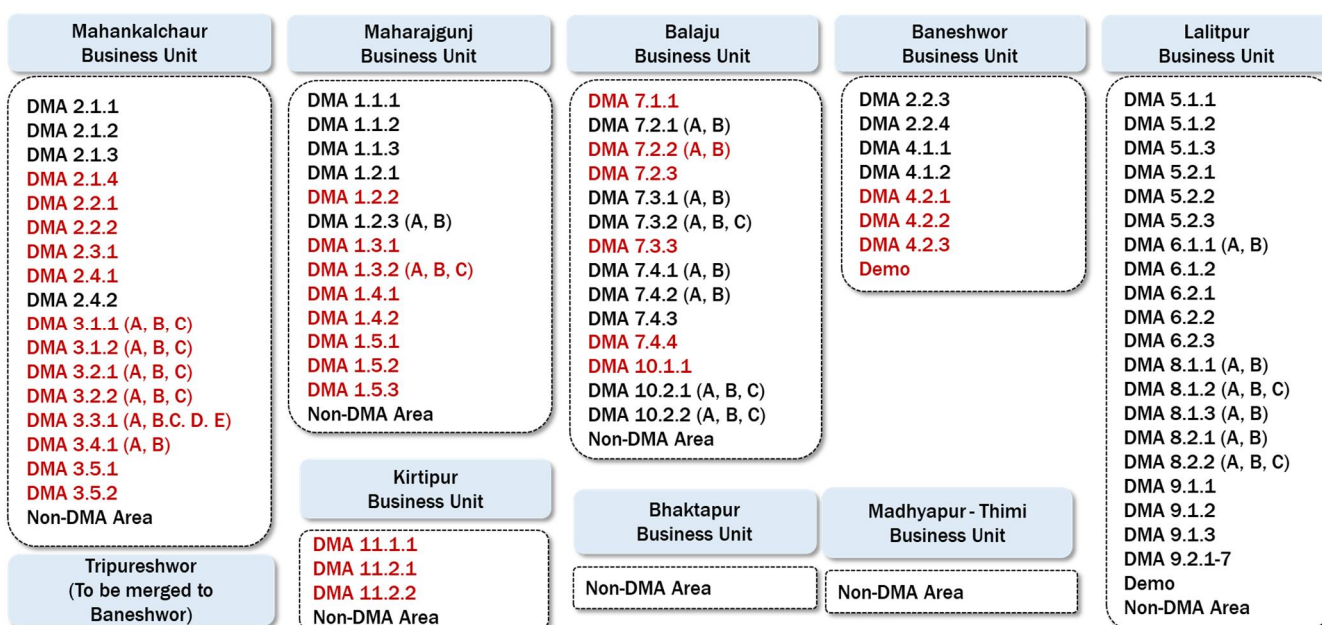


Figure 1.6.10 Sub-DMAs to be managed by branch offices based on the proposed reform plan of branch administrative area

1.7 Planned work schedule and its performance

Although the future work schedule may still be slightly affected by the progress of related projects, the constraints for the activities of this project are as follows.

[Melamchi Diversion Tunnel]

The area around the intake facility suffered flood damage in June 2021, and the intake gate has not yet been fully rehabilitated. The tunnel is operated by MWSDB, but it is highly unlikely that the original intake facilities can be restored since the flooding of the Melamchi River cause mudslides and damages every rainy season.

In order to prevent sediment inflow into the tunnel, the water diversion tunnel will be closed from early June to late October for the time being, and water conduction from the Melamchi River will be limited to the dry season from November to May.

[New Sundarijal WTP]

Due to the operational restrictions of the Melamchi Diversion Tunnel, the operating rate of the water treatment plant changes significantly between the dry and rainy seasons.

During the dry season, the planned water production of 170 MLD can be secured, but during the rainy season, the water intake is switched from the Bagmati River, which reduces the water production to less than 50%. Therefore, water supply conditions within the Kathmandu Valley during the rainy season are worse than during the dry season, and water supply hours are greatly restricted.

Regarding water treatment and water quality management, the required technologies differ depending on the difference in water sources and changes in turbidity between the rainy and dry seasons. Activities are planned to focus on on-the-job training to increase the production capacity of water treatment plants in the dry season when water quality is good, and on turbidity management in the rainy season when raw water turbidity is high.

On the other hand, activities using the distribution network (hydraulic analysis, non-revenue water management, and customer service) will be concentrated during the dry season, when water supply is relatively high, to maximize capacity enhancement within the project period.

[New Distribution Network]

Delays in the handover and in-service of the new water distribution network within the ring road will have a direct impact on the expression of the OJT performance for Output 1 and Output 2.

At this time, several DMAs are scheduled to be completed and handed over in early 2024, and it is expected that each branch will be able to update GIS data and measure non-revenue water ratio while operating the actual water distribution network in the areas under their jurisdiction.

However, the completion and handover of all DMAs will still take time to be realized because the temporary closure of the Melamchi Diversion Tunnel will limit the amount of water available for leak testing and flashing work in the pipes.

While it is difficult to develop such activities throughout the entire ring road, the activities in Term-3 aim to achieve at least one or more DMA operations within each branch's administrative area and to complete the necessary technical transfer.

Table 1.7.1 Activity Schedule and Past Achievements

Year	2021年												2022年												2023												2024												2025												2026																																																																																																																																							
	第1期												第2期												Term 2												Term 3												Term 3																																																																																																																																																			
Division of the Project Period	1												2												3												4												5												6												7												8												9												10												11												12																																																															
Month (The shade is in the rainy season)	1												2												3												4												5												6												7												8												9												10												11												12																																																															
Activity Plan																																																																																																																																																																																																				
Common	0.1 Preparation of Work Plan and consent	WP1(Draft)												WP1(Final)												WP2(Draft)												WP2(Final)												WP3(Draft)												WP3(Final)																																																																																																																																						
	0.2 Regular monitoring / Preparation of Monitoring Sheet	MS (Draft)												MS1												MS3												MS4												MS5												MS6												MS7												MS8												MS9																																																																																																		
	0.3 Mid-term review (▽) / Final evaluation (▲)													★ Finalization																								★ Revision												▽ Intermediate Mission																								▲ Final Evaluation Mission																																																																																																																										
	0.4 Consideration and finalization of evaluation Indicators													BN1												▽ (Public Awareness Material)																								BN2												▽																								▽																																																																																																														
	0.5 Planning and implementation of training in Japan / third country																																																																																																																																																																																																			
	0.6 Public Relation / Press Release / Project Brief Note																																																																																																																																																																																																			
	0.7 Consideration of next activity plan and building of consensus																																																																																																																																																																																																			
Output 1	1.1 Decide the utilization plan and operation rule of GIS.																																																																																																																																																																																																			
	1.2 Conduct training program (OJT) on GIS operation.													(Online Seminar)												(GIS Basics)												(OJT)												(OJT)												(OJT)												(OJT)												(OJT)												(OJT)																																																																																																		
	1.3 Import GIS data which is taken over from PID into KUKL's GIS system. (★: Expected data submission time)																																																																																																																																																																																																			
	1.4 Compile the customer data by DNI/DMA wise																																																																																																																																																																																																			
	1.5 Conduct hydraulic analysis of distribution network utilizing GIS.																																																																																																																																																																																																			
	1.6 Prepare the water distribution plan based on the results of hydraulic analysis and actual situations of water distribution.																																																																																																																																																																																																			
	1.7 Conduct trainings on hydraulic analysis and water distribution management (OJT)													(Online Seminar)												(OJT)												(OJT)																																																																																																																																																														
	1.8 Prepare an SOP on data input and updates of GIS.																																																																																																																																																																																																			
	1.9 Update GIS data as daily routine work.																																																																																																																																																																																																			
	1.10 Examine integration or computerized billing system and information of customer complaints into GIS.																																																																																																																																																																																																			
Output 2	2.1 Define the roles/responsibilities of Head Office and Branches for NRW reduction activities.																																																																																																																																																																																																			
	2.2 Decide the data collection process or NRW ratio.																																																																																																																																																																																																			
	2.3 Conduct trainings on NRW reduction measures																									(Preparation of training)												(Preparation of training)												(OJT Basic)												(TOT)																																																																																																																																						
	2.4 Prepare maintenance plan for maintaining NRW ratio low.																																																																																																																																																																																																			
	2.5 Implement maintenance plan for maintaining NRW ratio low.																																																																																																																																																																																																			
	2.6 Calculate NRW ratio monthly.																																																																																																																																																																																																			
	2.7 Head Office compiles Performance Indicators, such as amount of water production, amount of water distributed, or NRW ratio, which are collected at Branches.																																																																																																																																																																																																			
Output 3	3.1 Define the roles/responsibilities of WTPs, Branches, Head Office and laboratories in water quality control.																																																																																																																																																																																																			
	3.2 Conduct trainings on water treatment and water quality control.													(Online Seminar)												(OJT)												(OJT)												(TOT)												(OJT)												(OJT)												(TOT)												(Increase of production)												(TOT)												(Internal Training)												(Internal Training)																																																														
	3.3 Prepare SOPs of water treatment and water quality control.																																																																																																																																																																																																			
	3.4 Prepare monitoring plan of water treatment and water quality control.																																					(Trial)												(Review and Revision)																																																																																																																																																		
	3.5 Monitor the water quality based on the monitoring plan prepared in Activity 3-4.																																																																																																																																																																																																			
	3.6 Reflect the monitoring results to water quality improvement and effective water treatment																																																																																																																																																																																																			
Output 4	Online lectures (Regular meeting/ seminar) : Item newly proposed																																																																																																																																																																																																			
	4.1 Prepare a plan of customer satisfaction survey including survey design and TOR for survey company.																																																																																																																																																																																																			
	4.2 Conduct customer satisfaction survey at baseline, mid-term and end-line.																																																																																																																																																																																																			
	4.3 Prepare a plan for measures to improve customer satisfaction.													(1st survey)																																																																																																																																																																																						
	4.4 Review the Customer Grievance Module's level of functioning on the Computer Billing and Accounting System (CBAAS) and current practice of customer care (internal arrangements such as internal procedures or staff allocation)																																																																																																																																																																																																			
	4.5 Identify activities necessary to fully utilize the Customer Grievance Module and improve the customer care management.																																																																																																																																																																																																			
	4.6 Prepare an activity plan for data management utilizing the Customer Grievance Module, analysis of customer complaints and improvement of customer care management.																																																																																																																																																																																																			
	4.7 Analyze the customer complaints.																																																																																																																																																																																																			
	4.8 Report the results of analysis on customer complaints to KUKL management.																																																																																																																																																																																																			
	4.9 Conduct trainings on customer care (how to behave to customers) targeting for staff in charge or customer care and meter readers.													(Online Seminar)																																																																																																																																																																																						
	4.10 Prepare a plan of activities for public awareness.																																																																																																																																																																																																			
	4.11 Conduct public awareness activities based on Activity 4-10.																																																																																																																																																																																																			
4.12 Summarize and review the results of public awareness activities and utilize it for next plan.																																																																																																																																																																																																				
Output 5	5.1 Identify the training necessary for KUKL staff.																																																																																																																																																																																																			
	5.2 Prepare an overall training program (rough plan) necessary for KUKL staff.																																																																																																																																																																																																			
	5.3 Prepare a database (on Excel basis) on training programs.																																																																																																																																																																																																			
	5.4 Prepare a manual for internal training management.																																																																																																																																																																																																			
	5.5 Conduct trainings on internal training management targeting for the nominated staffs of Output 5 members and Human Resources Development Section																																																																																																																																																																																																			
	5.6 Prepare training programs (modules) on the fields that the Project targets such as GIS, Hydraulic Analysis, Water Distribution Management, Water Quality Control, Water Treatment, Customer Management) in collaboration with staff in the relevant section.																																																																																																																																																																																																			
	5.7 Prepare for trainings such as development or training materials, examination or how to measure the effectiveness of training, etc., in collaboration with staff in the relevant section.																																																																																																																																																																																																			
	5.8 Conduct trainers of training (TOT) in each area.																																																																																																																																																																																																			
	5.9 Conduct trainings. (Support training implementation as staff in charge of training management)																																																																																																																																																																																																			
	5.10 Summarize and review the results of trainings.																																																																																																																																																																																																			
	5.11 Reflect the training results to next training plans.																																																																																																																																																																																																			
Meeting/Workshop/Training, etc.																																																																																																																																																																																																				
Joint Coordinating Committee (JCC)													▲ ① Online												▲ ②												▲ ③												▲ ④												▲ ⑤												▲ ⑥												▲ ⑦												▲ ⑧												▲ ⑨												▲ ⑩																																																																											
Training in Japan (▲) / Training in third country (▲)																																																																																																																																																																																																				
Local work (Plan) █ Local work (Achieved) █ Domestic work in Japan Work to be continued → Activity affected by the progress of related project 																																																																																																																																																																																																				

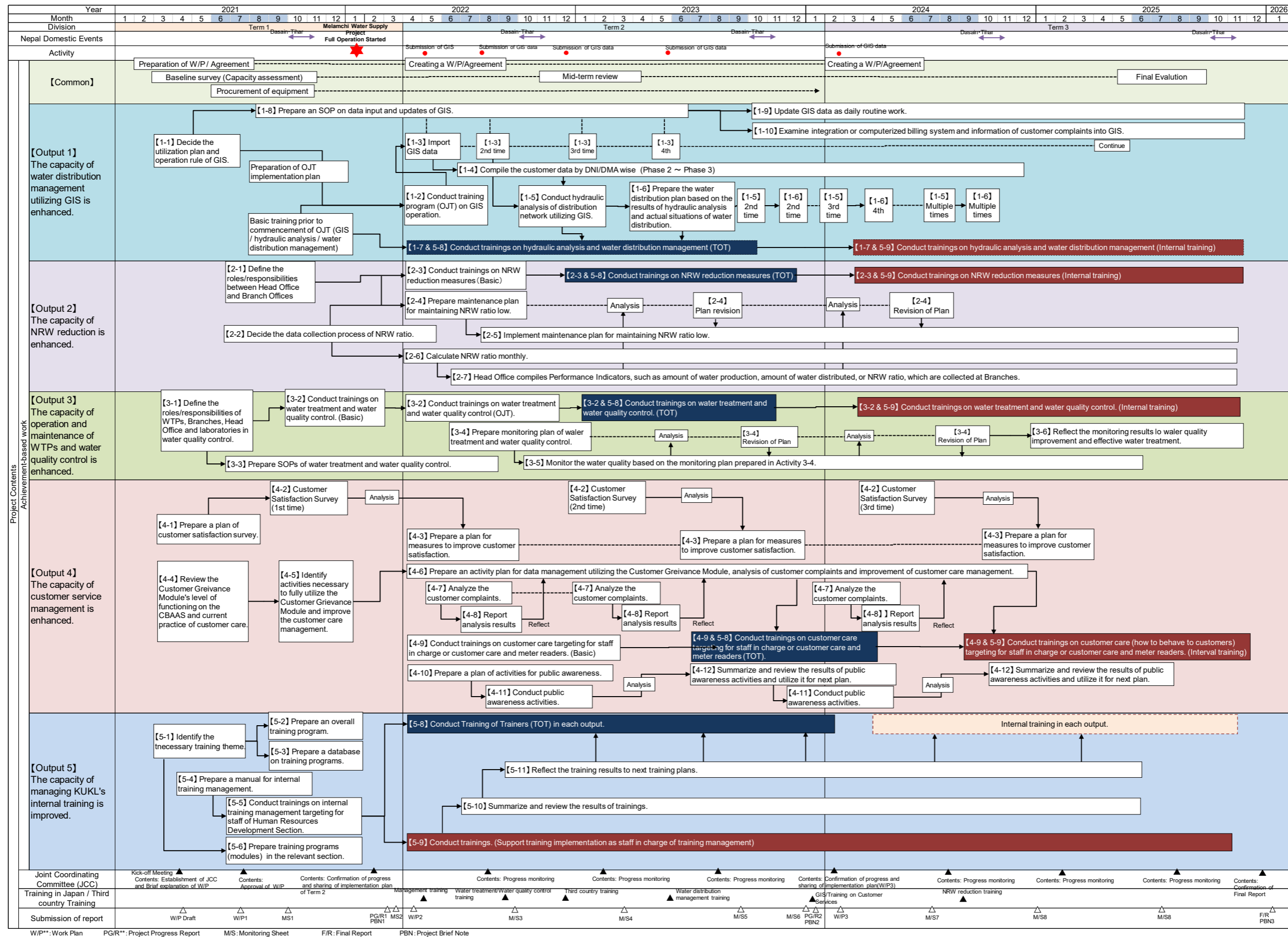


Figure 1.7.1 Work Flowchart

Chapter 2: Record of input

Chapter 2: Record of input

2.1 Dispatch Record of the JICA Expert Team

By the end of Term 2 (2022-2023), the following experts were engaged in in work in Nepal and in Japan. The dispatch record and future dispatch schedule are shown below:

Table 2.1.1 Dispatch Record of the JICA Expert Team

Field of responsibility	Name	Organization	Months	
			Term-1	Term-2
Project Manager / Water Distribution Plan	Koji NAITO	CTI Engineering International Co., Ltd.	5.80	8.70
Hydraulic Analysis	Naoki MATSUO	CTI Engineering International Co., Ltd.	5.10	3.20
GIS 1	Takeo SUGIMOTO	Pasco Corporation	2.70	3.00
GIS 2*1	Raghunath JHA	CTI Engineering International Co., Ltd.	-	3.70
NRW Reduction Measure 1	Daizo IWATA	Nihon Suido Consultants Co., Ltd.	1.20	5.50
NRW Reduction Measure 2 / Coordinator	Toru MIYAO	CTI Engineering International Co., Ltd.	3.30	2.73
Operation and Maintenance of Water Treatment Plant	Shinichi OSAKA	TEC International Co., Ltd.	4.50	7.70
Water Quality Control 1	Yasuhiko MORITA	TEC International Co., Ltd.	3.37	4.00
Water Quality Control 2*2	Bibas GURAGAI	TEC International Co., Ltd.	1.73	-
	Phatta THAPA	TEC International Co., Ltd.	-	4.00
Customer Service 1 / Awareness Activities	Koji KIMURA	Nihon Suido Consultants Co., Ltd.	3.50	5.50
Internal Training System	Kenichiro SUGIYA	International Development Center of Japan Inc.	5.00	4.90
Customer Service 2	Yoji MATSUO	Tokyo Water Co., Ltd.	1.20	2.00
Total			37.40	54.93

Note *1: Additional personnel added in the middle of Term-2.

Note *2: Replacement of personnel at the start of Term-2.

2.2 Knowledge Co-Creation Program (Training in Japan)

2.2.1 Overview of training

The project planned and provided a training program for KUKL staff and other officials in the water and sanitation sector in Nepal, utilizing the high-quality and diverse assets of the Tokyo Metropolitan Bureau of Waterworks (TMBW).

The TMBW conducts various training programs at the Training and Development Center, the largest waterworks training facility in Japan, along with the preparation of training plans based on the "Policy for Securing and Developing Human & Resources".

At this center, not only classroom lectures on the training system and specialized fields, but also practical training using the training field was conducted, providing Nepal with the training implementation and supervision know-how necessary for the development of a training system within KUKL.

In addition, the project also selected facilities to be visited among the various water treatment plants scattered throughout Tokyo, taking into consideration the scale and characteristics of Nepal, and planned and implemented a comprehensive training program that included the actual operation and management organization, water treatment management, and water quality management system.

Table 2.2.1 Overview of KCCP in Japan

No	Theme	Target group	Number of participants	Period
1	Management of Water Supply Business	Managerial staff of KUKL Managerial staff of PID-KUKL Managerial staff of KVWSMB	5	20/Sep/2022 - 1/Oct/2022
2	Water Treatment and Water Quality Control	Member of Output 3 Action Team Engineer of MoWS	6	12/Dec/2022 - 23/Dec/2022
3	Water Distribution Management	Member of Output 1 Action Team Engineer belonging to New-Sundarijal WTP	9	5/Sep/2023 - 13/Sep/2023
4	Customer Care	Member of Output 4 Action Team Staff of MoWS	7	18/Dec/2023 - 26/Dec/2023
5	NRW Management	Member of Output 2 Action Team	7*1	Sep 2024 (Tentative)

Note *1: Member of Output 2 Action Team (6 from KUKL permanent staff, 1 from KVWSMB)

2.2.2 Follow-up after training is conducted

Each training period will be short, approximately one week, and will consist mainly of short, intensive lectures and site visits.

The results were also shared with the JICA Nepal Office upon their return to Nepal. In addition, based on the strong request from the Nepalese government, JICA Expert Team accepted the participation of staff belonging to MoWS and KVWSMB in some of the training sessions, with a view to enhancing the Nepalese water and sanitation sector and developing human resources.

For each technical training participant, an action plan was compiled on what they should incorporate into their daily work after returning to Nepal and what they need to improve in the future, and these plans were presented at the evaluation meeting on the final day of each training session.

The action plan will be reported to the CEO of KUKL through the project team or JCC meeting, then each of them will periodically review the progress of his/her own action plan until the end of the project.

2.2.3 Training conducted in Term-2 (2022 - 2023)

In Term-2, a total of four training sessions were held in Japan. A summary is given below.

Table 2.2.2 Outline of the 1st Training Course in Japan

Item	Contents	
Period	20/Sep/2022 - 1/Oct/2022	
Objective	Raise the awareness of managerial staff in Nepalese water sector, clarify the direction of business improvement, and acquire knowledge for smooth operation of the project	
Training items	1. Current status and management structure of waterworks in Japan / Current status and management structure of Tokyo Metropolitan Bureau of Waterworks 2. History of Tokyo Waterworks' Challenges and Responses 3. Overview of the four areas of technical training 4. Tour of Tokyo Waterworks facilities 5. Internal training programs/awareness raising/special topics (asset management, disaster response, etc.)	
Participants	Dr. Sanjeev Bickram Rana (Executive Director, KVWSMB) Mr. Rajendra Sapkota (Project Director, KUKL-PID) Mr. Ramesh K C (Deputy Manager, Chief of Water Operation Division, KUKL) Dr. Dol Prasad Chapagain (Deputy Manager, Chief of Wastewater Operation Division, KUKL) Mr. Umesh Babu Marahatta (Deputy Manager, Chief of Supporting Division, KUKL)	
Result	The Questionnaire confirmed that the training objectives were achieved. The training provided a useful opportunity for participants to understand the differences between Japan and Nepal, and to consider what kind of technology and know-how could be applied in Nepal. Another output was a deeper understanding of knowledge and methods related to organizational management, facility maintenance and management, and customer service.	
Program	20/Sep/2022	Arrival in Tokyo
	21/Sep/2022	[AM] Briefing and Orientation [PM] Visit to the Tokyo Waterworks Historical Museum
	22/Sep/2022	[AM] Visit to the Water Conservation Forest in Okutama, Ogouchi Dam and the Water and Green Museum [PM] Visit to the Himura Water Purification Station
	26/Sep/2022	[AM] Visit to the Customer Call Center [PM] Courtesy Visit to Director General of Tokyo Metropolitan Bureau of Waterworks, Current status and management structure of waterworks in Japan
	27/Sep/2022	[AM] Lecture (Current status and management structure of Tokyo Metropolitan Bureau of Waterworks, History of Tokyo Waterworks' Challenges and Responses about Administration and Finance) [PM] Lecture (History of Tokyo Waterworks' challenges and responses about securing water source, / Installation of facilities / Tariff collection / Customer Management / Water meter management)
	28/Sep/2022	[AM] Lecture (Internal Training System - Outline / Human resource development / Human resource management / Facilities management / Visit to the Training & Technical Development Center) [PM] Lecture (Approach to the future development of water supply facility, Business Continuity Plan, Disaster responses)
	29/Sep/2022	[AM] Lecture (Outline of four technical field for internal training (Water Treatment and Quality Control, Distribution Management, GIS and NRW) [PM] Visit to the Asaka Water Purification Plant
	30/Sep/2022	[AM] Raising staff awareness (Public relations / Public hearing, Raising staff awareness of improvement) [PM] Evaluation Meeting, Opinion Exchanges, Presentation of diplomas
	1/Oct/2022	[PM] Departure from Tokyo

Table 2.2.3 Outline of the 2nd Training Course in Japan

Item	Contents	
Period	12/Dec/2022 - 23/Dec/2022	
Objective	In preparation for the full-scale operation of the new Sundarijal WTP, in order to further focus on the provision of "safe water", technical training focusing on water treatment and water quality management is conducted to gain insight into practical methods and a broad perspective, which will be applied to daily operations in a manner appropriate to KUKL.	
Training items	<ol style="list-style-type: none"> 1. Current status and management structure of Tokyo Metropolitan Bureau of Waterworks 2. Water Treatment / Water Quality Control / System of Inspection and Certification 3. Recognition of challenges / changing one's way of thinking / Internal Training System / Chemical Dosing Control 4. Tour of Tokyo Waterworks facilities 5. Visit to Japanese Manufacturer 	
Participants	Mr. Jagarnath Das (Senior Divisional Engineer, Section Chief, Water Quality & Service regulation Section, DWSSM) Ms. Shailaja Adhikari (Asst. Manager, Chief of Water & Wastewater Quality Assurance Division, KUKL) Mr. Krishna Hari Budhathoki (Asst. Manager, Chief of Electromechanical Dept., KUKL) Mr. Dipesh Dhakal (Electromechanical Engineer, Chief of New Sundarijal WTP, KUKL) Mr. Bashant Kumar Pal (Senior Lab Technician, Water & Wastewater Quality Assurance Division, KUKL)	
Result	The Questionnaire confirmed that the training objectives were achieved. This training provided a valuable opportunity to understand the differences between Japan and other countries in the operation and maintenance of water treatment plants, and to consider what kind of technology and know-how can be applied in their own countries. Another output was a better understanding of what kind of maintenance and management system could be implemented in the future.	
Program	12/Dec/2022	Arrival in Tokyo
	13/Dec/2022	[AM] Briefing and Orientation [PM] Lecture (Outline of waterworks in Tokyo)
	14/Dec/2022	[AM] Lecture (Water treatment / Water quality control) [PM] Visit to the Ozaku Purification Plant
	15/Dec/2022	[AM] Visit to the Ogouchi Dam, Water and the Water and Green Museum [PM] Visit to Himura Water Purification Plant and Hikawa Water Purification Plant
	16/Dec/2022	[AM] Lecture (Operation and maintenance of mechanical and electrical equipment at water purification plants, inspection and certification systems, and engineer certification systems) [PM] Visit to the Water Quality Control Center in Tama
	19/Dec/2022	[AM] Lecture (Overview of Internal Training in Tokyo, Raising staff awareness of improvement) [PM] Visit to the mechanical and electrical facilities
	20/Dec/2022	[AM] Issue analysis based on the PCM method [PM] Exchange of opinions for the creation of an action plan
	21/Sep/2022	[AM] Discussion (A review of chemical injection management at a water treatment plant in Kathmandu) [PM] Visit to a chemical injection pump manufacturer
	22/Dec/2022	[AM] Visit to valve factory / Water treatment experiment facility / Water quality analysis laboratory [PM] Visit to the Kasumigaura Water Purification Plant
	23/Dec/2022	[AM] Evaluation Meeting, Opinion Exchanges, Presentation of diplomas [PM] Departure from Tokyo

Table 2.2.4 Outline of the 3rd Training Course in Japan

Item	Contents	
Period	5/Sep/2023 - 13/Sep/2023	
Objective	In order to develop and realize an efficient and fair water distribution plan in Kathmandu, the project provides a training related to the actual situation of water transmission and distribution network management and human resource allocation planning in Tokyo, in order to gain insight into practical methods and a broader perspective, which can be applied to daily operations in a manner suitable for KUKL.	
Training items	<ol style="list-style-type: none"> 1. Current status and management structure of Tokyo Metropolitan Bureau of Waterworks 2. Operating system of water supply in Tokyo and its management system 3. SCADA and its operating policy 4. Quality control of piping material 5. Raising Staff Awareness 	
Participants	Mr. Ujjwal Shrestha (Deputy Manager, Chief of Planning & Monitoring Division, KUKL) Mr. Milan Thapa (Asst. Manager, Chief of Training & Research Section, KUKL) Mr. Anil Kumal Tikhatri (Engineer, Manager of Madhapur-Thimi Branch) Mr. Tej Binod Pandey (Engineer, KVWSMB) Mr. Bikram Shrestha (Engineer, IT Section, KUKL) Ms. Shalini Jha (Engineer, Lalitpur Branch, KUKL) Mr. Jhanak Thapa (Asst. Computer Officer, IT Section, KUKL) Mr. Amardip Kumar Sah (Overseer, New Sundarjal WTP, KUKL)	
Result	The Questionnaire confirmed that the training objectives were achieved. This training provided a valuable opportunity to understand the differences between Japan and Nepal in the water transmission and distribution, and to consider what kind of technology and know-how can be applied in their own countries. Another output was a deeper understanding of measures to minimize damage in the event of earthquakes and other disasters.	
Program	5/Sep/2023	Arrival in Tokyo
	6/Sep/2023	[AM] Briefing and Orientation [PM] Lecture (Outline of waterworks in Tokyo)
	7/Sep/2023	[AM] Visit to Tama Waterworks Integrated Management Office [PM] Lecture (Water distribution management system - Distribution plan and operation)
	8/Sep/2023	[AM] Visit to the Training and Technical Development Center [PM] Lecture (Design of distribution network / Drawing control / Supervision / Inspection)
	11/Sep/2023	[AM] Lecture (Application of GIS in Japan) [PM] Lecture (Quality control of piping material, Water distribution management)
	12/Sep/2023	[AM] Lecture (History of leakage reduction in Tokyo, Raising staff awareness of improvement) [PM] Evaluation Meeting, Opinion Exchanges, Presentation of diplomas
	13/Sep/2023	[AM] Departure from Tokyo

Table 2.2.5 Outline of the 4th Training Course in Japan

Item	Contents	
Period	18/Dec/2023 - 26/Dec/2023	
Objective	To introduce practical customer management methods using information technology and its efforts to improve services for equitable water distribution and customer service in Kathmandu's new water distribution system, with the aim of gaining insights from a broad perspective and applying them to daily operations in a manner appropriate to KUKL.	
Training items	<ol style="list-style-type: none"> 1. Current status and management structure of Tokyo Metropolitan Bureau of Waterworks 2. Meter Reading and Tariff Collection, Customer Management, Service Connection 3. Personnel management and training system of the Waterworks Bureau in Tokyo 4. Public relations methods and manuals 5. Raising Staff Awareness 	
Participants	Mr. Prakash Kumar Rai (Manager, Chief of Finance Division, KUKL) Mr. Ram Bandhu Sharma (Under Secretary, Monitoring & Evaluation Section, MoWS) Mr. Yogendra Bahadur Bam (Asst. Manager, Chief of Administration & Human Resources Division) Ms. Chapala Dhakal (Asst. Manager, Chief of General Administration Dept.) Mr. Purna Bahadur Kuwar (Asst. Manager, Chief of IT Section, KUKL) Ms. Susila Paudel Dahal (Section Officer, Administration Section, MoWS) Mr. Kamal Bahadur Khatri (Personal Secretary Secretariat, Honorable Minister, MoWS)	
Result	The Questionnaire confirmed that the training objectives were achieved.	
Program	18/Dec/2023	Arrival in Tokyo
	19/Dec/2023	[AM] Briefing and Orientation
		[PM] Lecture (Outline of waterworks in Tokyo)
	20/Dec/2023	[AM] Lecture (Meter reading/tariff collection, Customer management, Water meter management)
		[PM] Visit to Customer Call Center
	21/Dec/2023	[AM] Lecture (Customer service by branch office, Human resource management, Training system and OJT)
		[PM] Visit to the Training and Technical Development Center
	22/Dec/2023	[AM] Lecture (Manual on publication)
		[PM] Visit to the Tokyo Waterworks Historical Museum and the Tokyo Water Science Museum
25/Dec/2023	[AM] Lecture (Publication/Public hearing, Reforming staff awareness)	
	[PM] Evaluation Meeting, Opinion Exchanges, Presentation of diplomas	
26/Sep/2023	[PM] Departure from Tokyo	

[Photograph] Training in Japan

		
<p>[The 1st Training] Courtesy Visit to Director General of TMBW</p>	<p>[The 1st Training] Discussion about raise of Staff Awareness</p>	<p>[The 1st Training] Presentation of Diplomat</p>
		
<p>[The 2nd Training] Presentation of Action Plan</p>	<p>[The 2nd Training] Water Quality Control Center in Tama Area</p>	<p>[The 2nd Training] Kasumigaura Water Purification Plant</p>
		
<p>[The 3rd Training] Lecture about Operation System of Water Distribution</p>	<p>[The 3rd Training] Lecture about design of distribution network and drawing control</p>	<p>[The 3rd Training] Lecture about history of leakage reduction</p>
		
<p>[The 4th Training] Customer service system in the branch office</p>	<p>[The 4th Training] Public relations and hearings</p>	<p>[The 4th Training] Meter reading and tariff collection/Customer control/Meter control</p>

2.3 Training in a third country

2.3.1 Objective in a third country training

The objective of training in a third country is to learn from good practices in neighboring countries the know-how required for the establishment of internal training systems and human resource development in KUKL, and to understand the current status of the operation of training systems at a water utility, so that all concerned can clearly recognize the future vision of the human resource development system in the water sector in Nepal.

2.3.2 Background of conducting a third country training

For the National Water Supply and Sewerage Development Board (NWSDB) of Sri Lanka, JICA's technical cooperation "The Project for Enhancement of Operational Efficiency and Asset Management Capacity of Regional Support Center-Western South of NWSDB" was implemented from 2018 to 2021. Here, activities related to a pilot project for non-revenue water control and the construction of training field and capacity building for implementation of training were developed, mainly to improve pipeline management. The training curriculum and the training field for leak detection and plumbing installation techniques developed by the project have contributed to enhancing the practical training system for staff nationwide.

After the completion of the above project, NWSDB has been vigorously engaged in activities aimed at improving the technical level of all water service providers in Sri Lanka, such as initiating plumber training for private contractors as well as human resource development for its own organization.

Since then, the NWSDB, with the support of ADB, has built a training facility and conference hall, and has gone on to develop a wide range of external activities related to water sanitation under the name of the Centre of Excellence for Water and Sanitation (CEWAS).

To kick off such efforts, the international conference "Water for Sustainable Development" was held at CEWAS from December 14 to 16, 2022, and the personnel involved in the technical cooperation project being implemented in Nepal were invited to the conference.

This project, with KUKL as the implementing agency, has set the implementation of internal training and the establishment of a sustainable human resource development system as activities under Outcome 5. Therefore, the training in Sri Lanka was a good opportunity for the top management of the organization to see and hear successful examples and specific implementation efforts.

2.3.3 Participants in the training in Sri Lanka

The Nepalese officials dispatched by the project are as follows:

Table 2.3.1 Participants in the training in Sri Lanka

No	Name	Organization* ¹	Role and Responsibility
1	Mr. Dilman Shakya	Section Officer, MoWS	Inter-departmental collaboration in WASH Sector of Nepal
2	Mr. Rajit Ojha	Senior Divisional Engineer, DWSM	Inter-departmental collaboration in WASH Sector of Nepal
3	Mr. Arjun Babu Dhakal	Acting Manager, KUKL-PID	Leader of Output 5 Action Team
4	Mr. Umesh Babu Marahatta	Deputy Manager, Chief of Support Division	Member of Output 5 Action Team
5	Mr. Dipendra Bahadur Oli	Asst. Manager, Chief of Procurement Section and Legal Section	Member of Output 5 Action Team
6	Mr. Bir Bahadur Chand	Asst. Manager, Chief of Human Resources Development Section / Customer Relation Section / Training & Research Section	Member of Output 5 Action Team
7	Ms. Niru Burlakoti	Microbiologist, Water/Wastewater Quality Assurance Division, Bansbari	Member of Output 5 Action Team
8	Mr. Akrur Nath Sharma	Engineer, Planning & Support	Member of Output 5 Action

No	Name	Organization*1	Role and Responsibility
		Department, Head Office	Team
9	Mr. Shankar Thapa	Engineer, Chief of Tanker Section	Member of Output 5 Action Team
10	Ms. Radha Dhakal	Engineer, KVWSMB	Member of Output 5 Action Team

Note *1: Organization as of the date of training.

2.3.4 Training program

The training program is as follows:

Table 2.3.2 Training Program in Sri Lanka

Date	Time	Contents
13/Dec/2022		Transportation (Kathmandu to Colombo)
14/Dec/2022	08:30	Visit to the NWSDB Manpower Development & Training Division (MD/TD) Visit to the pipeline training yard constructed by JICA's technical experts, followed by a question-and-answer session. [Meeting partners] • Ms. Disna Panilla (Assitant General Manager, MD/TD) • Ms. Dedunu Wimalasiri (Enginner)
	10:30	Visit to the NWSDB Regional Service Center Western-South [Meeting partners] • Ms. Nalayani Goonewardana, Assitanta General Manager W/S
	11:00~14:00	Visit to the pilot site of JICA project [Meeting partners] • Mr. Chandana Epa (Officer in Charge, Panadura) • Mr. Janaka Karunamuni (Engineer)
	15:00~17:00	Reception of Internal Conference, Opening Ceremony, Keynote Speech
15/Dec/2022	09:00	Technical session with ADB Expert
	11:00	Technical session with JICA Expert (Mr. Ogata)
	14:00	Group session about Integrated Water Resource Management Country presentation by Mr. Arjun Babu Dhakal
16/Dec/2022	08:30~11:30	Visit to the NWSDB Manpower Development & Training Division (MD/TD) and discussion about internal training, human resources development system [Meeting partners] • Ms. Disna Panilla (Assitant General Manager, MD/TD) • Ms. Dedunu Wimalasiri (Enginner) From Nepal, Mr. Raju Mahat (Director, NWSSTC) and Mr. Rajit Ojha (DWSSM) gave an overview of the water and sanitation sector and a presentation on the current status of human resource development.
	PM	Documentation
17/Dec/2022	Full day	Tour of Kandy's water facilities • Visit to the Centre of Excellence for Water and Environment, built with grant aid from China • Inspection of a sewage treatment plant constructed with a Japanese Loan
18/Dec/2022		Transportation (Colombo to Kathmandu)

Table 2.3.3 Agenda of the international conference in Sri Lanka

▶ DAY 01 (14th December 2022)		
14:00	15:00	Registration of Participants
15:00	15:05	Welcoming Guests at the Main Entrance
15:05	15:10	Ushering the guests in procession to the Plaque
15:10	15:15	Unveiling the Plaque
15:15	15:20	Ushering the guests in procession to the Main Hall
15:20	15:30	Lighting of traditional oil lamp
15:30	15:35	National Anthem
15:35	15:45	Welcome Dance
15:45	16:00	Welcome Speech - General Manager
16:00	16:15	Opening Remarks - Chairman
16:15	16:20	Inauguration of the Bottled Water Plant by NWSDB
16:20	16:35	Address by the Minister
16:35	16:45	Oriental Dance
16:45	17:00	Address by the Chief Guest
17:00	17:45	Keynote Speech
17:45	18:00	Coffee Break & Networking

▶ DAY 02 (15th December 2022)					
Inauguration of Expert Session / Technical Session					
Hall D					
09:00	09:30	Opening Remarks - Chairman			
09:30	10:30	Expert Session 01 (ADB) -Sustainable NRW Management / Integrated Water Resource Management			
10:30	11:00	Coffee Break / Poster Session (2nd floor lobby)			
11:00	12:00	Expert Session 02 (JICA) -Different Country Perspectives of Water Utility Management			
12:00	13:00	Expert Session 03 (AFD) -Water Management, corporation and partnership for cost recovery			
13:00	14:00	Lunch			
14:00	15:30	Technical Session 01			
15:30	16:00	Coffee Break / Poster Session (2nd floor lobby)			
16:00	17:00	Technical Session 04			
Hall F					
Opening Remarks - <i>Live Streaming</i>					
Expert Session 01 (ADB) - <i>Live Streaming</i>					
Coffee Break / Poster Session (2nd floor lobby)					
Expert Session 02 (JICA) - <i>Live Streaming</i>					
Expert Session 03 (AFD) - <i>Live Streaming</i>					
Lunch					
Technical Session 02					
Coffee Break / Poster Session (2nd floor lobby)					
Technical Session 05					
Hall G					
Opening Remarks - <i>Live Streaming</i>					
Expert Session 01 (ADB) - <i>Live Streaming</i>					
Coffee Break / Poster Session (2nd floor lobby)					
Expert Session 02 (JICA) - <i>Live Streaming</i>					
Expert Session 03 (AFD) - <i>Live Streaming</i>					
Lunch					
Technical Session 03					
Coffee Break / Poster Session (2nd floor lobby)					
Technical Session 06					
Inauguration of Business Forum					
Hall A		Hall B	Hall C	Hall E	Hall H
11:00	13:00	Business Forum 01	Business Forum 02	Business Forum 05	Business Forum 04
13:00	14:00	Lunch	Lunch	Lunch	Lunch
14:00	16:00	Business Forum 06 (CRIWMP)	Business Forum 07 (Tokyo Supermix)	Business Forum 08 (Daiki Axis)	Business Forum 09
					Business Forum 10

▶ DAY 03 (16th December 2022)					
Inauguration of Expert Session / Technical Session					
Hall D					
09:00	09:30	Opening Remarks - Chairman			
09:30	10:30	Expert Session 04 (World Bank) -Disaster Management & Lesson Learned			
10:30	11:00	Coffee Break / Poster Session (2nd floor lobby)			
11:00	12:00	Expert Session 05 (CAS)			
12:00	13:00	Expert Session 06 (Korea Eximbank)			
13:00	14:00	Lunch			
14:00	15:30	Technical Session 07			
15:30	16:00	Coffee Break / Poster Session (2nd floor lobby)			
16:00	17:00	Closing Ceremony - Conference Declaration			
Hall F					
Opening Remarks - <i>Live Streaming</i>					
Expert Session 04 (World Bank) - <i>Live Streaming</i>					
Coffee Break / Poster Session (2nd floor lobby)					
Expert Session 05 (CAS) - <i>Live Streaming</i>					
Expert Session 06 (Korea Eximbank) - <i>Live Streaming</i>					
Lunch					
Technical Session 08					
Coffee Break / Poster Session (2nd floor lobby)					
Technical Session 10					
Hall G					
Opening Remarks - <i>Live Streaming</i>					
Expert Session 04(World Bank) - <i>Live Streaming</i>					
Coffee Break / Poster Session (2nd floor lobby)					
Expert Session 05 (CAS) - <i>Live Streaming</i>					
Expert Session 06 (Korea Eximbank) - <i>Live Streaming</i>					
Lunch					
Technical Session 09					
Coffee Break / Poster Session (2nd floor lobby)					
Technical Session 11					
Inauguration of Business Forum					
Hall A		Hall B	Hall C	Hall E	Hall H
11:00	13:00	Business Forum 01	Business Forum 03	Business Forum 04	Business Forum 05
13:00	14:00	Lunch	Lunch	Lunch	Lunch
14:00	16:00	Business Forum 06 (IHE)	Business Forum 08	Business Forum 09	Business Forum 10









2.3.5 Participants' comments after the training in Sri Lanka

The following is a summary of the most important feedback comments received from each participant after the training.

Table 2.3.4 Participants' comments after the training in Sri Lanka

Item	Comments
Training insights and ideas for your own work	[Rajit Ojha] I realized that there is a big difference in the management level of water utilities compared to Nepal. The idea of a water utility partnership is very good if it is realized in the medium to long term. I believe that collaboration between training centers in both countries could produce impactful results to advance this sector in Nepal.
	[Niru Burlakoti] Unlike Nepal, the internal training system was very functional, as the NWSDB is the sole organization responsible for water supply and sewage systems throughout the country. It is also impressive that the operation and management of the sewage treatment plant constructed with JICA assistance is going very well. I could understand what kind of training facilities are effective and how they should be operated, and this approach is also necessary in Nepal.
	[Dilman Shakya] NRW is one of the key issues in water supply services, and I understand that policies and strategies from both organizational and operational aspects are important to minimize it. Both infrastructure as well as human resource development are essential to strengthen Nepal's water supply services.
	[Bir Bahadur Chand] I realized that an independent training section would be very useful for proper training supervision within the organization. Training yards that reinforce practical skills are also extremely effective in reducing non-revenue water.
	[Akrur Nath Sharma] I realized that an independent training section would be very useful for proper training supervision within the organization. Training yards that reinforce practical skills are also extremely effective in reducing non-revenue water.
	[Shankar Thapa] Training based on an annual plan and the development of manuals for this purpose are needed. As for the water distribution management area (DMA) established in the pilot project, the remote management using IT was very instructive.
Future Expectations	[Rajit Ojha] I would very much like to explore the possibility of a partnership between the NWSDB and the NWSSTC.
	[Dilman Shakya] The visit was very useful, and I hope the collaboration between the two countries can continue on the online platform.
	[Bir Bahadur Chand] I understand that a clear vision of training to be implemented in the future, such as an annual plan and schedule, is important for internal training development, and I would like to work on this immediately.
How can we apply the results of the training to our work? How can you apply the results of the training to your work?	[Rajit Ojha] I would like to prepare a concept note for the realization of the partnership and exchange views with relevant parties (stakeholders).
	[Niru Burlakoti] To develop SOPs for training on multiple topics related to water treatment plants and distribution pipe networks. We would also like to propose the construction of a training yard for practical training.
	[Dilman Shakya] Political, organizational, and practical problems exist behind the low quality of Nepal's water supply services. The Ministry of Water Supply needs to formulate policies to strengthen the organization, promote good governance, and improve the competitiveness of all, including KUKL and other water service providers. As an official of the Ministry of Water Supply, I believe that I can apply the results of this training to policy making. Also, a strong initiative needs to be realized to make the training center under the Ministry of Water Supply work in capacity building of all water utilities.
	[Bir Bahadur Chand] KUKL is undergoing a major organizational change. I would like to suggest to the committee members that they create an independent training section with sufficient human resources. As I am the chief of the training section, this experience has been helpful in designing the training and creating an annual plan.

[Photograph] Training in Sri Lanka

		
<p>Lecture by Manpower Development & Training Division</p>	<p>Lecture by Manpower Development & Training Division</p>	<p>Explanation of training yard</p>
		
<p>Explanation of training yard</p>	<p>Training facilities for plumbers</p>	<p>Group photo</p>
		
<p>Technical session of the international conference</p>	<p>Table discussion about Integrated Water Resource Management</p>	<p>Country Report by Mr. Arjun Babu Dhakal</p>
		
<p>Exchange of opinions about human resources development system</p>	<p>Overview of CEWSS</p>	<p>Wastewater treatment plant constructed with Japanese Loan in Kandy City</p>

2.4 Procurement of equipment and materials

2.4.1 Classification of equipment and materials

The materials and equipment to be procured under the project are categorized as follows:

Table 2.4.1 Categorization of equipment and materials

Type	Descriptions	Property rights
Equipment for donation	Goods and equipment to be provided at the request of the government of the recipient country for technical cooperation projects, etc.	KUKL
Equipment for project management (Property Lending)	Goods and equipment used by experts and study members to carry out technical transfer and local study.	JICA

The list of equipment and materials proposed at the start of the project was based on the plans at the time of the detailed planning study in 2017, and its content needed to be finalized after confirmation of actual needs of KUKL.

In a web-conference with the Action Team for each output, a list of equipment and materials based on the work plan was presented. The required items were then finalized by aligning the opinions of the JICA Expert Team to each item with the needs of KUKL.

There is still a concern about how to deal with any failure or malfunction, since the project will last for about five years and the responsibility of the project will be transferred to KUKL once the equipment and materials are donated.

For this reason, it was decided that, in principle, all equipment and materials, except for consumables and those that are essential to be donated immediately, would be classified as “Equipment for project management” under the property of JICA, and now the JICA Expert Team assume a response to any defects during the project period. At present, all equipment and materials are scheduled to be provided to KUKL by the end of Term-3.

2.4.2 Procured equipment and materials

The following is a list of materials and equipment procured by the end of Term-2.

Table 2.4.2 Procured equipment and materials

Items	Quantity	Price (JPY)	Remark	Current Status
GIS Equipment (Output 1)				
GIS Application Software	1 set	0	Free of charge	-
Desktop PC for GIS Operation including UPS and Security Software	6 pcs	2,203,762	Equipment for project management (Property Lending)	In use at KUKL branch office and head office
GIS server including UPS, Security Software, Cabinet	1 pc	2,617,058	Equipment for project management	In use at KUKL head office (Tripureshwor branch building)
RTK-GNSS (Rover)	6 pcs	1,343,934	Equipment for project management	In use at KUKL branch office and head office
RTK-GNSS (Control Mobile Device)	6 pcs	476,880	Equipment for project management (Property Lending)	In use at KUKL branch office and head office
Inspection Device of Customer Meter (Output 2/Output 4)				
Portable test meter	9 pcs	2,134,278	Equipment for project management (Property Lending)	In use at KUKL branch office
Electronic water meter	1 pc	22,822	Consumables	Stored in the JICA Project Office

Items	Quantity	Price (JPY)	Remark	Current Status
Portable pulse logger	1 pc	25,000	Consumables	Stored in the JICA Project Office
Equipment for rehabilitation of WTP (Output 3)				
Portable ultrasonic flow meter	1 pc	1,490,000	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Water Quality Measurement (Output 3)				
Potable Residual Chlorine Meter	9 pcs	1,122,238	Equipment for project management (Property Lending)	In use at KUKL branch office
Portable Turbidity Meter	9 pcs	1,290,716	Equipment for project management (Property Lending)	In use at KUKL branch office
Multi Pocket Meter	4 pcs	191,891	Equipment for project management (Property Lending)	In use at KUKL branch office
Equipment for the activities of public awareness (Output 4)				
Laptop PC	1 pc	121,997	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Video Camera	1 pc	40,105	Consumables	Stored in the JICA Project Office
Projector	1 pc	46,508	Consumables	Stored in the JICA Project Office
Equipment for customer care (Output 4)				
Desktop PC	7 pcs	1,053,718	Equipment for project management (Property Lending)	In use at KUKL branch office and head office
Water Pressure Monitoring (Output 1)				
Pressure Data Logger including Coiled Hose	10 pcs	450,895	Consumables	Stored in the JICA Project Office
PC Communication Cable for Datalogger	5 pcs	133,032	Consumables	Stored in the JICA Project Office
Others for project activities				
Multi-function color photocopy machine	1 pc	532,174	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Radio Handset Guiding System	1 set	260,378	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Sound set for small scale lecture	1 set	86,600	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Sound set for middle scale lecture	1 set	150,124	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Supporting device for remote management work				
Smartphone	3 pcs	44,940	Consumables	Stored in the JICA Project Office
Speakerphone for small scale meeting	1 pc	15,319	Consumables	Stored in the JICA Project Office
Action Camera (GoPro)	1 pc	55,880	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Laptop PC	3 pcs	365,991	Equipment for project management (Property Lending)	Stored in the JICA Project Office
Speakerphone for middle scale meeting	1 pc	61,957	Equipment for project management (Property Lending)	Stored in the JICA Project Office

Table 2.4.3 Other equipment (miscellaneous expenses)

Items	Quantity	Price (JPY)	Remark	Current Status
Supporting Devices for GIS				
Tablet Device	29 pcs	1,231,080	Consumables	In use at KUKL branch office and head office
Printer	6 pcs	150,458	Consumables	In use at KUKL branch office and head office
Materials for Public Awareness				
Cap for Trainees of OJT	220 pcs	130,670	Consumables	Donated
Polo Shirts for Trainees of OJT	237 pcs	326,524	Consumables	Donated
Clipboard with logo	100 pcs	34,454	Consumables	Donated
Stickers with QR code	2,500 pcs	60,820	Consumables	Donated

2.5 Input by Nepalese side

2.5.1 Members of Joint Coordinating Committee (JCC)

The Joint Coordinating Committee (JCC) was established as a forum for approving activities, results, and plans for the project, and for making decisions to resolve issues, and the following members were appointed from the Nepalese side.

Table 2.5.1 Nepalese members of JCC

Roles	Name	Organization
Chair	Mr. Sunil Kumar Das* ¹	Joint Secretary, Ministry of Water Supply (MoWS)
	Ms. Meena Shrestha	Joint Secretary, Ministry of Water Supply (MoWS)
Project Director	Mr. Milan Kumar Shakya* ²	Chief Executive Director, KUKL
	Mr. Gyanendra Bahadur Karki	Chief Executive Director, KUKL
Project Manager	Mr. Umesh Babu Marahatta	Deputy Manager, Chief of Support Division, KUKL
Advisory Member	Mr. Sanjeev Bickram Rana	Executive Director, KVWSMB
Member	Mr. Chandan Kumar Shah	Engineer, KVWSMB

Note *1: Replaced by the successor upon retirement in February 2020.

Note *2: Replaced by the successor upon dismissal in June 2023.

2.5.2 Allocation of the counterpart personnel

At the second JCC on February 14, 2022, the members of the Action Team responsible for this project activity were selected from KUKL staff and approved in JCC.

Subsequently, after changes due to several personnel promotions, transfers, and retirements, the membership composition was modified and decided as follows as of the end of Term-2.

In addition, when basic training and on-the-job training provided by the JICA Expert Team were conducted, other KUKL staff members engaged in work in the field participated in those training as supporting members.

Table 2.5.2 Members of action team for each output

Output	Name	Organization
Output 1	Dr. Dol Prasad Chapagain (Leader)	Deputy Manager, Chief of Wastewater Operation Division, Lalitpur
	Mr. Ujjwal Shrestha	Deputy Manager, Chief of Planning & Monitoring Division, Head Office
	Mr. Milan Thapa	Assistant Manager, Wastewater Operation Division, Lalitpur
	Mr. Tej Binod Pandey	Engineer, KVWSMB
	Mr. Bikram Shrestha	Engineer, IT Section - Head Office
	Mr. Krishna Kumar Sah	Engineer, Manager of Lalitpur Branch
	Ms. Shalini Jha	Engineer, Lalitpur Branch
	Mr. Anil Kumar Tikhatri	Engineer, Manager of Madhyapur-Thimi Branch
Output 2	Mr. Amardip Kumar Shah	Overseer, Tripureshwor Branch
	Mr. Ramesh K.C. (Leader)	Deputy Manager, Chief of Water Operation Division, Head Office
	Mr. Narayan Karna	Assistant Manager, Manager of Mahankalchaur Branch
	Mr. Susil K.C.	Engineer, KVWSMB
	Mr. Hem Bahadur Budhathoki	Engineer, Manager of Bhaktapur Branch
	Mr. Akrur Nath Sharma	Engineer, Planning & Support Department, Head Office
	Mr. Surya Bahadur Khatri	Account Officer, Wastewater Operation Division, Lalitpur
	Mr. Surendra Rawal	Engineer, Manager of Chhetrapati Branch
Output 3	Mr. Krishna Kumar Sah	Engineer, Manager of Lalitpur Branch
	Ms. Bina Maharjan	Engineer, Manager of Kirtipur Branch
	Ms. Shailaja Adhikari (Leader)	Assistant Manager, Chief of Water/Wastewater Quality Assurance Division
	Mr. Krishna Hari Budhathoki,	Assistant Manager, Chief of Electromechanical Section
	Ms. Niru Burlakoti	Microbiologist, Water/Wastewater Quality Assurance Division
	Mr. Chandan Kumar Sah	Engineer, KVWSMB
	Mr. Prem Paudyal	Chemist, Water/Wastewater Quality Assurance Division, Mahankalchaur
	Mr. Pravin Bhurtel	Overseer, Madhyapur-Thimi Branch
Output 4	Mr. Bashant Kumar Pal	Assistant Technical Officer, In charge of Old Sundarijal WTP
	Mr. Dipesh Dhakal	Engineer, Chief of New Sundarijal WTP
	Mr. Prakash Kumar Rai (Leader)	Manager, Chief of Administration and Finance Division, Head Office
	Mr. Purna Bahadur Kuwar	Assistant Manager, Chief of IT Section - Head Office
	Mr. Yogendra Bahadur Bam	Assistant Manager, Chief of Adm. & Human Resources Division - Head Office
	Ms. Chapala Dhakal	Assistant Manager, Chief of Customer Relation Section, Head Office
	Mr. Bodhraj Dahal	Engineer, KVWSMB
Output 5	Mr. Chet Bahadur Ayer	Assistant Technical Officer, Mahankalchaur Branch
	Mr. Arjun Babu Dhakal (Leader)	Acting Manager, KUKL-PID
	Mr. Dipendra Bahadur Oli	Assistant Manager, Chief of Procurement Section / Legal Section
	Mr. Bir Bahadur Chand	Assistant Manager, Chief of Human Resources Development Section - Head Office
	Mr. Shankar Thapa	Engineer, Chief of Tanker Section, Mahankalchaur
	Mr. Akrur Nath Sharma	Engineer, Planning & Support Department, Head Office
	Ms. Radha Dhakal	Engineer, KVWSMB
	Ms. Niru Burlakoti	Microbiologist, Water/Wastewater Quality Assurance Division, Bansbari
Ms. Bina Khanal	Assistant Manager, Chief of Training & Research Section	

Note *1: Organization as of December 2023

Table 2.5.3 Supporting Members for each output

No.	Name	Section	Position	Remark
Output 1 Supporting Members				
1	Mr. Hem Bahadur Budhathoki	Manager - Bhaktapur Branch	Engineer (Level 7)	Joined in 2022
2	Mr. Pravin Bhurtel	Madhapur-Thimi Branch	Overseer (Level 5)	
3	Ms. Roshani Khatri	Tripureshwor Branch	Overseer (Level 5)	Joined in 2022
4	Mr. Bijay Bishwakarma	Baneshwor Branch	Engineer (Level 7)	
5	Mr. Jitendra Shah	Maharajgunj Branch	Overseer (Level 5)	
6	Mr. Niwash Guragian	Lalitpur Branch	Asst. Tech. Officer (Level 6)	
7	Mr. Aknur Nath Sharma	Planning and Support Department, Head Office	Engineer (Level 7)	
8	Mr. Nrigendra Shrestha	Head Office	Tech. Officer (Level 7)	
9	Mr. Puspa Bhandari	Maharajgunj Branch	Supervisor (Level 5)	
10	Mr. Raushan Kumar Shah	Tripureshwor Branch	Overseer (Level 5)	Joined in 2022
11	Mr. Chet Bahadur Ayer	Mahankalchaur Branch	Asst. Technical Officer (Level 6)	
12	Mr. Ranjit Bohara	Wastewater Operation Division	Civil Overseer (Level 5)	
13	Mr. Prativa Bhattarai	Wastewater Operation Division	Civil Overseer (Level 5)	
14	Mr. Suman Bahadur Basnet	Manager, Tripureshwor Branch	Engineer (Level 7)	
15	Mr. Sumit Kumar Shah	New Sundarijal WTP	Supervisor (Level 5)	
16	Mr. Rajendra Deshar	Chhetrapati Branch	Asst. Technical Officer (Level 6)	
17	Mr. Ajaya Kumar Chaudhary	Baneshwor Branch	Overseer (Level 5)	
18	Mr. Udaya Acharya	Maharajgunj Branch	Overseer (Level 5)	
19	Ms. Bina Maharjan	Manager, Kirtipur Branch	Engineer (Level 8)	
	Mr. Kamal Pun	Lalitpur Branch	Engineer (Level 7)	Resigned in Sep 2022
	Mr. Madhav Pandey	Maharajgunj Branch	Asst. Tech. Officer (Level 6)	Retired in Dec 2022
	Mr. Rabin Khadka	Maharajgunj Branch	Engineer (Level 7)	Resigned in July 2023
	Mr. Yamuna K C	Chhetrapati Branch	Overseer (Level 5)	Resigned in 2021
	Ms. Rachana Adhikari	Planning and Support Department, Head Office	Engineer (Level 7)	Resigned in 2022
Output 2 Supporting Members				
1	Mr. Krishna Hari Bhdhathoki	Manager - Electromechanical Dept.	Asst. Manager (Level 8), Technical	
2	Mr. Durga Bahadur Basnet	Head Office	Asst. Manager (Level 8), Administrative	
3	Mr. Pravin Bhurtel	Madhapur-Thimi Branch	Overseer (Level 5)	
4	Mr. Amardip Kumar Sah	Tripureshwor Branch	Overseer (Level 5)	
5	Mr. Tijendra Jung Karkee	Electromechanical Dept.	Asst. Account Officer (Level 6)	
6	Mr. Nabin Neupane	Maharajgunj Branch	Senior Asst. Account Officer (Level 5)	
7	Mr. Buddha Ram Maharjan	Kirtipur Branch	Asst. Tech. Officer (Level 6)	
8	Ms. Urmila Bhandari	Madhapur-Thimi Branch	Asst. Account Officer (Level 6)	
9	Mr. Udaya Acharya	Maharajgunj Branch	Overseer (Level 5)	
10	Mr. Rajendra Bahadur Bam	PID	Adm. Officer (Level 7)	
11	Mr. Krishna Bahadur Shrestha	Chhetrapati Branch	Supervisor (Level 5)	
12	Mr. Sumit Kumar Shah	New Sundarijal WTP	Supervisor (Level 5)	
13	Ms. Sita Kandel	Tripureshwor Branch	Senior Asst. Account Officer (Level 5)	Joined in 2022
14	Mr. Sudarshan Sapkota	Lalitpur Branch	Senior Meter Reader (Level 4)	
15	Mr. Bikash Maharjan	Madhapur-Thimi Branch	Engineer (Level 7)	
16	Mr. Rajendra Deshar	Chhetrapati Branch	Asst. Tech. Officer (Level 6)	
17	Mr. Kapil Karki	IT Section - Head Office	Overseer (Level 5)	
	Ms. Rachana Adhikari	NRW - Head Office	Engineer (Level 7)	Resigned in 2022
	Mr. Rabin Khadka	Maharajgunj Branch	Engineer (Level 7)	Resigned in July 2023
	Mr. Satish Kumar Dutta	Head Office	Act. Deputy CEO	Retired in Dec 2021
	Mr. Gopi Krishna Khadka	Tripureshwor Branch	Senior Account Asst. (Level 5)	Resigned in 2022

The Project on Capacity Development of KUKL to Improve Overall Water Supply Service in Kathmandu Valley

Progress Report (Term-2)

No.	Name	Section	Position	Remark
Output 3 Supporting Members				
1	Ms. Bina Maharjan	Manager - Kirtipur Branch	Engineer (Level 7)	
2	Mr. Manish Dhungana	Manager - Maharajgunj Branch	Asst. Manager (Level 8), Technical	
3	Mr. Bickram Acharya	PID	Engineer (Level 7)	
4	Mr. Gyanendra Bdr. Karki	CEO - Head Office	Act. Deputy CEO (Level 11), Technical	
5	Mr. Hem Bahadur Budhathoki	Manager - Bhaktapur Branch	Engineer (Level 7)	
6	Ms. Roshani Khatri	Tripureshwor Branch	Overseer (Level 5)	
7	Mr. Krishna Kumar Sah	Manager - Lalitpur Branch	Engineer (Level 7)	
8	Mr. Sumit Kumar Shah	New Sundarijal WTP	Supervisor (Level 5)	
9	Ms. Sachita Dhital	New Sundarijal WTP	Senior Lab Technician (Level 5)	
10	Mr. Pundari Nepal	Water/Wastewater Quality Assurance Division (KVWSMB)	Lab Assistant (Level 3)	
11	Mr. Santosh Kaphle	Water/Wastewater Quality Assurance Division (Bode)	Lab Technician (Level 4)	
12	Ms. Pranita Tuladhar	Water/Wastewater Quality Assurance Division (Central)	Senior Lab Technician (Level 5)	
13	Mr. Dinesh Adhikari	New-Sundarijal WTP	Senior Lab Technician (Level 5)	
14	Ms. Puranjan Nepal	New-Sundarijal WTP	Lab Assistant (Level 3)	
15	Ms. Ratna Bhatta	Water/Wastewater Quality Assurance Division (Bode)	Senior Lab Technician (Level 5)	
16	Mr. Dipak Thapa	New Sundarijal WTP	Overseer (Level 5)	
17	Mr. Suresh Pradhananga	Bode WTP	Overseer (Level 5)	
18	Mr. Bhola Dhungana	Mahankalchaur Branch	Asst. Tech. Officer (Level 5)	
19	Mr. Niwash Babu Bhattarai	Water/Wastewater Quality Assurance Division (Bansbari)	Lab Assistant (Level 3)	
20	Mr. Bhim Prasad Koirala	New Sundarijal WTP	Supervisor (Level 5)	
21	Mr. Laxman Chaudhary	New Sundarijal WTP	Civil Overseer (Level 5)	
22	Ms. Reshma Kawang	Electromechanical Dept.	Engineer (Level 7)	Joined in 2022
	Mr. Madhav Pandey	Bansbari WTP	Asst. Tech. Officer (Level 5)	Retired in Dec 2022
	Mr. Satish Kumar Dutta	Head Office	Act. Deputy CEO	Retired in Dec 2021
	Mr. Sunil Kumar Shah	New Sundarijal WTP	Engineer (Level 7)	Resigned from KUKL in Sep 2021
	Mr. Hariram Rimal	Chief - Bode WTP	Engineer (Level 7)	Resigned from KUKL in Sep 2022
Output 4 Supporting Members				
1	Mr. Nawal Singh Saud	Customer Service -(CR /PR)-Mahankalchaur	Administrative Officer (Level 7)	
2	Ms. Geeta Pokhrel	Customer Service -(CR /PR)-MaharajGunj	Administrative Officer (Level 7)	
3	Ms. Matina Shakya	Customer Service -(CR /PR)-Tripureshwor	Administrative Officer (Level 7)	
4	Mr. Chudamani Luitel	Customer Service -(CR /PR)-Baneshwor	Asst. Administrative Officer (Level 6)	
5	Mr. Bishojit Bhandari	Customer Service -(CR /PR)-Kirtipur	Assistant Administration (Level 4)	
6	Ms. Rita Paudel	Customer Service -(CR /PR)-Madhyapur Thimi	Assistant Administration (Level 4)	
7	Mr. Binod Kumar Oli	Customer Service -(CR /PR)-Quality	Assistant Administration (Level 4)	Joined in Jan 2022
8	Mr. Rajeev Kumar Singh	Customer Service -(CR /PR)-Chhetrapati	Assistant Administration (Level 4)	Joined in May 2022
9	Mr. Pradeep Chapagain	Customer Service -(CR /PR)-Mahankalchaur	Assistant Administration (Level 4)	Joined in Apr 2022
10	Mr. Rakesh Chaudhary	New Sundarijal WTP	Assistant Account (Level 4) Admin	Joined in June 2022
11	Mr. Shailendra Shrestha	Customer Service -(CR /PR)-Wastewater Operation Division	Senior Assistant (Level 5)	Joined in Nov 2022
12	Ms. Ambika Bogati	Customer Service -(CR /PR)-Lalitpur	Assistant Administration (Level 4)	Joined in Nov 2022
13	Mr. Kabin Dhvaj Adhikari	Customer Service -(CR /PR)-Head Office	Senior Assistant (Level 5)	Joined in Nov 2022
14	Ms. Kaushila Bhandari	Customer Service -(CR /PR)-Head Office	Office Assistant	Joined in Nov 2022
15	Ms. Bimala Khadka	Customer Service -(CR /PR)-Bhaktapur	Senior Computer Operator	Joined in Nov 2022
16	Mr. Santos Raj Ojha	Customer Service -(CR /PR)-Thimi	Senior Meter Reader (Level 4)	Joined in June 2022
17	Ms. Pramila Kunwar	Customer Service -(CR /PR)-Tripureshwor	Asst. Assistant (Level 4)	Joined in July 2022
18	Mr. Shankar Pun Magar	IT Section - Head Office	Senior Computer Operator (Level 5)	Joined in July 2023
	Mr. Bijay Timilsina	Chief-Administration and Finance Dept., Head Office	Act. Deputy CEO (Level 11)	Retired on Nov 2023
	Ms. Santusha Kasapal	Customer Service -(CR /PR)-Dhal Mahaskha	Asst. Computer Officer (Level 6)	Retired on Sep 2023
	Mr. Kamal Bahadur Bam	Customer Service -(CR /PR)-Lalitpur	Administrative Officer (Level 7)	Replaced in Nov 2022
	Mr. Labu Thapa	Customer Service -(CR /PR)-Madhyapur Thimi	Asst. Administrative Officer (Level 6)	Replaced in 2021
	Ms. Rita Paudel	Customer Service -(CR /PR)-Madhyapur Thimi	Assistant Administration (Level 4)	Replaced in June 2023
	Mr. Shankar Raj Joshi	Customer Service -(CR /PR)-Baneshwor	Administrative Officer (Level 7)	Replaced in 2021
	Mr. Pramodnath Rimal	Customer Service -(CR /PR)-Bhaktapur	Asst. Administrative Officer (Level 6)	Replaced in June 2022
	Mr. Rajendra Bahadur Bam	Customer Service -(CR /PR)-Chhetrapati	Administrative Officer (Level 7)	Replaced in 2021
	Ms. Maya Lama Poudyal	Customer Service -(CR /PR)-Quality	Asst. Computer Officer (Level 6)	Replaced in Jan 2022
Output 5 Supporting Members				
1	Mr. Gyanendra Bdr. Karki	CEO, Head Office	Act. Deputy CEO (Level 11), Technical	
2	Ms. Manju Manandhar	Human Resources Development Section	Admin. Officer (Level 7)	
3	Mr. Ramesh Dhungana	Human Resources Development Section	Asst. Admn. Officer (Level 6)	
4	Mr. Kabin Dhoj Adhikari	Human Resources Development Section	Senior Assistant (Level 5)	
5	Mr. Sunil Chaudhary	Human Resources Development Section	Computer Operator (Level 4)	
6	Ms. Neha Adhikari	Head Office - IT Section	Overseer (Level 5)	
	Mr. Bijaya Bajracharya	Human Resources Development Section	Senior Assistant (Level 5)	Resigned in June 2022

2.5.3 Working environment

Based on the Record of Discussion (R/D), the following facilities were provided by KUKL to the JICA Expert Team.

- Office space for JICA Expert Team in KUKL Tripureshwor Building
- Office furniture (Desk, Chair and Cabinet)
- Storage space of equipment for training
- Storage space of equipment and materials

2.5.4 Local operation cost

Based on the R/D, it was confirmed at the 1st JCC that the following will be borne by KUKL.

The obligation of KUKL has been fulfilled as planned in the past activities.

As for manuals and training materials, the JICA Expert Team has covered the printing cost of manuals and training materials since basic training and TOT are being conducted under the leadership of JICA experts until Term-2. From Term-3 onward, when KUKL's internal training is implemented, KUKL will bear the necessary expenses.

- Cost of transportation related to the Project such as counterpart personnel as well as equipment, water samples, etc.
- Chemicals cost for water treatment and water quality measurement
- Operational cost of internal training such as transportation cost, rental fees for training rooms, etc.
- Cost of printing manuals, training materials, PR materials etc.
- Public utilities such as water, electricity related to the project activities
- Provision of suitable space for the placement of computers to utilize GIS
- Provision of suitable space for the implementation of internal training

2.6 Actual local operating expenses

2.6.1 Local re-commissioning cost

In this project, customer satisfaction surveys will be conducted by local consulting firm to determine customer perceptions of water service improvements. The survey will be conducted three times: at the beginning of the project, in the middle of the project, and before the end of the project.

Table 2.6.1 Outline of the Customer Satisfaction Survey

Item	Contents
Survey area	The areas within the ring road
Target	The customers of KUKL's water supply service
Sampling method	<ul style="list-style-type: none"> • Set a target number of customers per DNI based on the number of customers in each DNI. • In each DNI, random sampling will be used to select interviewee. • In principle, the subjects of the first survey will be surveyed in the second and subsequent surveys. • If it is difficult to survey the same clients as the previous survey, randomly select clients who reside in the same residential area.
Sample size	1,000 cases as an effective value
Survey method	On-site survey
Location tracking	IS data will be shared with KUKL and the JICA Expert Team on the location of the survey targets for use in subsequent surveys.
Survey items	<ol style="list-style-type: none"> 1. General information of customers 2. Overall satisfaction of water supply 3. Satisfaction level of the following items <ul style="list-style-type: none"> • Amount of water supplied • Supply hour and duration • Timeliness of water supply • Water pressure and water quality • Utilization of water (drinking, cooking and others) • KUKL's staff behaviors to customers • Any comments about water supply service

The first on-site survey was conducted in October 2021 as part of the baseline survey.

The second on-site survey was conducted in June 2023, after the start of operation and management of the New Sundarijal WTP by KUKL with the resumption of operation of the Melamchi Diversion Tunnel.

Table 2.6.2 Cost of the Customer Satisfaction Survey

Time	Contract period	Cost
The first survey	8/Oct/2021 - 18/Feb/2022	NPR1,797,830
The second survey	1/May/2023 - 31/Aug/2023	NPR1,956,482

Chapter 3: Details of activities implemented up to Term-2

Chapter 3: Details of activities implemented up to Term-2 (2021-2023)

3.1 Record of activities related to Output 1

Output 1	The capacity of water distribution management utilizing GIS is enhanced.
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3.1.1 Direction of activities

In the Kathmandu Valley, GIS data for the new water distribution network will be provided to KUKL as part of the handover documents in the areas covered by the BDS and DNI projects.

This project will provide the training necessary to effectively utilize this GIS data for water distribution management, and develop human resources to operate and update GIS data at the KUKL Head Office and the branch offices.

The project will also enhance the capacity for water distribution management, including hydraulic analysis techniques and water pressure control techniques necessary for equitable distribution of drinking water supplied from the New Sundarijal WTP and the existing water treatment plant within the Kathmandu Valley.

When these efforts are developed on the PDCA cycle, the growth spiral shown below will be realized, and equitable water distribution will lead to increased customer confidence. To achieve Output 1, the JICA Expert Team will assist KUKL in making this PDCA cycle work as part of its daily operations.

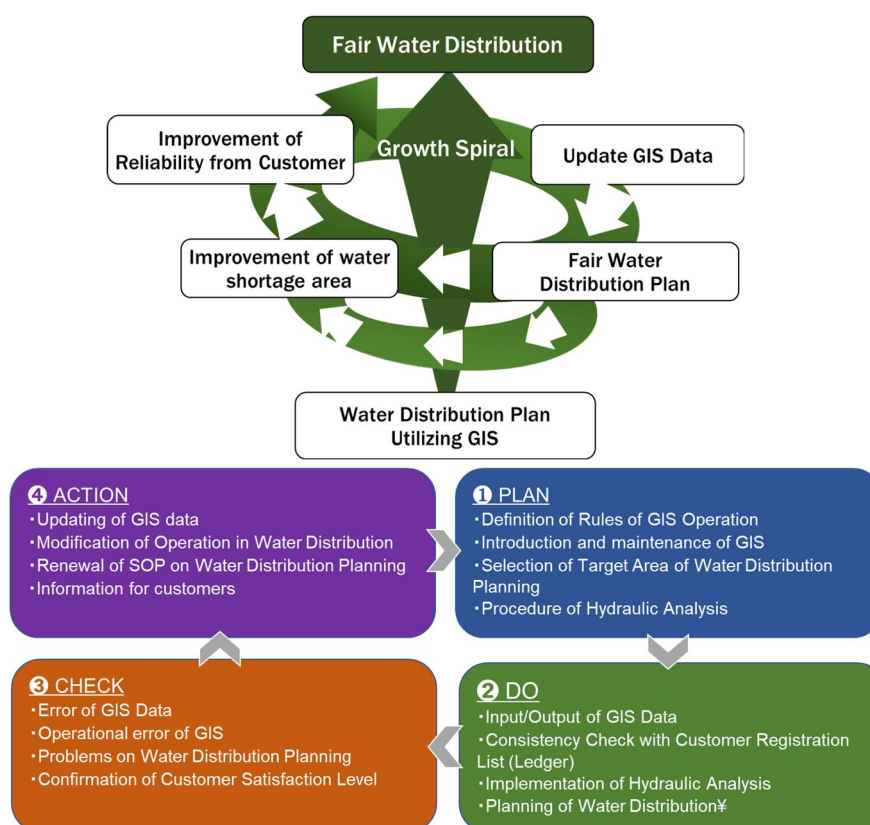


Figure 3.1.1 PDCA Cycle for Sustainable Water Distribution Management

3.1.2 [Activity 1-1] Decide the utilization plan and operation rule of GIS.

With the start of local activities in November 2021, several discussions were held with the Output 1 Action Team based on the information on KUKL's IT environment collected up to that point. The JICA Expert Team also frequently consulted with the IT Section which has the necessary knowledge for GIS development, and compiled a draft GIS operation plan in a form suitable for the actual situation of KUKL.

The proposed operation plan was explained to the CEO at that time on January 5, 2022 and agreed upon by upper managerial staff, including items to be covered by KUKL.

(1) Survey of IT environment

In establishing rules for the operation and management of GIS-based water distribution network information, the following items were investigated.

- File server, software/hardware and IT network environment within KUKL
- Routine methods of collecting customer information
- Management Methodology of Information for Existing Water Distribution Network

Table 3.1.1 Results of the current status survey to define GIS operation methods

Item	Result of survey
[Organization] Understanding and cooperation within and outside the organization, current IT system management system	<ul style="list-style-type: none"> ➤ All KUKL servers are centrally managed by a private data center (outsourced contract). ➤ KUKL pays a monthly management fee to the data center based on the number of units that KUKL manages. ➤ There are various challenges in IT management within KUKL. Since IT technology is deeply related to all operations, it is essential to improve IT technology in order to ensure sustainable operational management of KUKL in the future, and KUKL desires the JICA Expert Team to transfer technology to KUKL.
[Infrastructure] Current state of infrastructure required for efficient and stable GIS operations	<ul style="list-style-type: none"> ➤ The KUKL Head Office does not have a suitable physical environment or secure room for the installation of a server machine, and there is insufficient power and air conditioning capacity for the server machine. Installation of a new server machine would require expansion work. ➤ Server OS is Linux; most client PCs are operated on Windows. ➤ Varies from office to office, but many staff do not have a dedicated PC for business use. ➤ All offices are equipped with Internet access; KUKL's Internet connection to the outside world is through a data center. ➤ The internal network connection allows staff at the Head Office and at each branch office to access KUKL's internal customer management software and database using a login ID. ➤ All KUKL branch offices do not have file servers that allow file sharing. Each office operates files under different rules, and some have their own file servers for sharing. ➤ Data management and backup are done by each staff member. ➤ Some staff members use AutoCAD to create drawing data.
[Information Security] Secure Management of Information Assets	<ul style="list-style-type: none"> ➤ Customer information and other business information is managed in a secure room with security protection measures in the data center, in a good environment. ➤ Employees are not permitted to directly access files stored on servers or other PCs. ➤ All KUKL offices do not have file servers that allow file sharing. Each office operates differently, and some have their own file servers for sharing. ➤ When staff members share data with each other within KUKL, they use the Internet or USB drives. ➤ Firewalls (network traffic monitoring and filtering) are installed in data centers.

Item	Result of survey
[Data maintenance and use] <u>Establish accuracy and reliability of data maintenance</u> <u>Cross-cutting data operations</u>	<ul style="list-style-type: none"> ➤ KUKL do not have any software related to GIS. ➤ All existing pipe network information recorded in CAD data and paper drawings is not maintained and updated. ➤ Much of the information is not shared in data or documents and is known only to the staff member who was in charge. Sometimes information is elicited from retired staff. ➤ Even though the new water distribution network has been in operation for some time, the existing network still needs to be maintained. Methods to manage old and new pipe network information in GIS also need to be considered. ➤ For field work (measurement, information collection, data preparation, etc.), there is no work manual, so each staff member or office conducts the work in their own different way; through OJT and actual work, a standard manual for the work (measurement, recording, data update/editing, maintenance, etc.) ➤ KUKL have a handheld GPS in several branch offices and are using a measuring tape and scale to measure the location and length of conduits in the field. The required positional accuracy is about 30 cm. ➤ When staff members share data with each other within KUKL, they use the Internet or USB drives.

(2) Introducing GIS Server

KUKL had plans to set up a data center in the new building of the Tripureshwor branch in 2022, so the GIS servers provided in this project were installed in the same building. The data servers currently operated by KUKL are located in the head office building, but they too will be relocated in the future.

Table 3.1.2 Comparison of proposed GIS server installations

Location	AWT Data Center (Private)	KUKL head office (IT Section)	KUKL New Data Center
Advantage	<ul style="list-style-type: none"> ➤ No maintenance work required by KUKL ➤ Fully equipped with security measures, air conditioning, communication lines, etc. 	<ul style="list-style-type: none"> ➤ Reduction of maintenance and management costs ➤ Continuous monitoring and countermeasures can prevent system failures ➤ Quick response to defects 	<ul style="list-style-type: none"> ➤ Reduction of maintenance and management costs ➤ Continuous monitoring and countermeasures to prevent system failures ➤ Quick response to defects
Disadvantage	<ul style="list-style-type: none"> ➤ Maintenance and upkeep costs are high. 	<ul style="list-style-type: none"> ➤ There is not enough space in the existing server room. 	<ul style="list-style-type: none"> ➤ Security measures, air conditioning, internet connection, and other incidental work required
Evaluation	Selectable	Unrecommended	Fully recommended

(3) Management of GIS data

The GIS server will centrally manage GIS master data related to the new water distribution network. The GIS server and the GIS operation PCs at each branch office were connected via an internal network, and access rights for each user were set on the PCs at each branch office for the folders/files in the GIS server.

GIS staff at each branch office will collect GIS data on new customers, new water supply facilities, leakage information, etc., and periodically update the data in the server. In addition, tablet devices were distributed to supervisors responsible for field work so that they could manage customer information on new connections/disconnections with GIS data.

Table 3.1.3 Agreements on how to operate the GIS

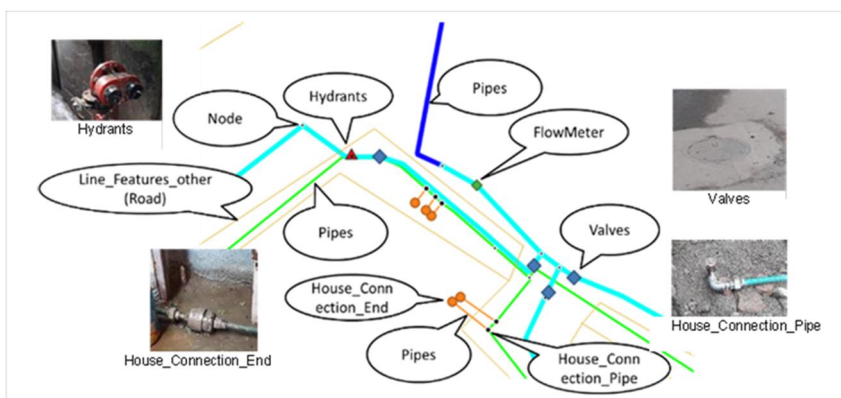
Item	Agreements
Basic Policies of GIS Operating Rules	<p>The following three basic policies have been established as method of operation for the time being. These policies will be reflected in the preparation of future Standard Operating Procedures (SOPs).</p> <ul style="list-style-type: none"> ➤ Proper capture and recording of field information ➤ Improve accuracy of GIS data update process ➤ Joint work with IT section for data management and security
Data Operation System	<p>The management method of GIS data to be exchanged between the server at the Head Office and the operation PCs at each branch office shall be defined separately for the initial operation phase and the subsequent full-scale operation phase, respectively.</p> <p>In the initial phase of operation, the server will be used as a file server to manage the data files of each branch office in an integrated manner.</p> <p>Subsequently, full-scale operation will start when the GIS skills and GIS data management capabilities of each GIS staff have been improved. At that stage, Data Base Software (open source) will be installed on the server and the transition will be made to GIS data management using a database.</p>

(4) Selection of GIS data management equipment

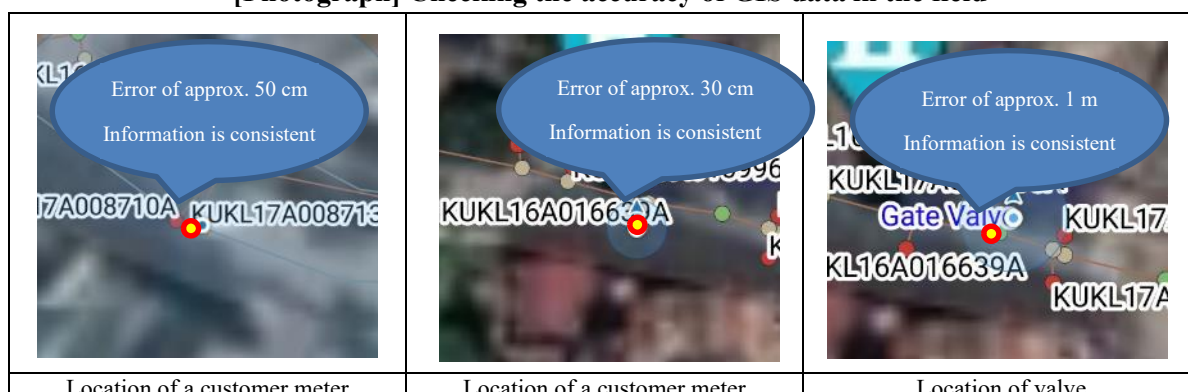
In 2021, The JICA Expert Team inspected the quality and its accuracy of GIS data informally provided by PID, including the location of each object (relative position), and confirmed that the data has been created with sufficient level for routine management. Each layer of data (map information) contains a database linked to a lot of attribute information (customer name, customer contract number, meter number, conduit type, conduit extension, etc.).

Table 3.1.4 Contents of GIS data for new water distribution network

Outline of data	Data Format: ESRI Geodatabase (*.gdb) Data size : Approx. 33MB																																							
Target Area (DNI)	sDMA4.1.2/sDMA4.2.1/sDMA4.2.2/sDMA4.2.3																																							
Layer (Map information)	<table border="1"> <thead> <tr> <th>Layer Name</th> <th>Object Type</th> <th>Quantity of data (Record)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>FlowMeter</td> <td>Point</td> <td>7</td> <td>Flowmeter</td> </tr> <tr> <td>House_Connection_End</td> <td>Point</td> <td>1790</td> <td>Meter location</td> </tr> <tr> <td>House_Connection_Pipe</td> <td>Point</td> <td>1790</td> <td>Position of tapping saddle</td> </tr> <tr> <td>Hydrants</td> <td>Point</td> <td>12</td> <td>Hydrant</td> </tr> <tr> <td>Service_Reservoir</td> <td>Polygon</td> <td>0</td> <td>Reservoir</td> </tr> <tr> <td>Valves</td> <td>Point</td> <td>65</td> <td>Valves</td> </tr> <tr> <td>Line_Features_other</td> <td>Polyline</td> <td>493</td> <td>Roadside edge, Wall line</td> </tr> <tr> <td>Pipes</td> <td>Polyline</td> <td>2313</td> <td>Distribution pipe Extension: Approx. 33km</td> </tr> </tbody> </table>				Layer Name	Object Type	Quantity of data (Record)	Remarks	FlowMeter	Point	7	Flowmeter	House_Connection_End	Point	1790	Meter location	House_Connection_Pipe	Point	1790	Position of tapping saddle	Hydrants	Point	12	Hydrant	Service_Reservoir	Polygon	0	Reservoir	Valves	Point	65	Valves	Line_Features_other	Polyline	493	Roadside edge, Wall line	Pipes	Polyline	2313	Distribution pipe Extension: Approx. 33km
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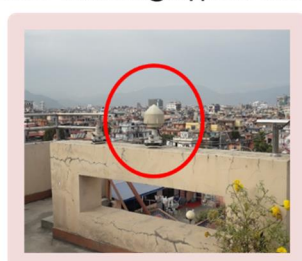
[Photograph] Checking the accuracy of GIS data in the field



In order to update the GIS data produced by the DNI project in the future, equipment capable of measuring equivalent positional accuracy will be required.

The following is a list of major GPS measurement devices. For water supply facilities, positional deviations of a few centimeters are not a major problem, so the high-precision devices required in the surveying field are not necessary. On the other hand, cellular phones and handheld GPS are not appropriate because the measurement error can be up to 10 meters, depending on the position and number of satellites.

Base Station @Supplier's facility



Rover Station @User location

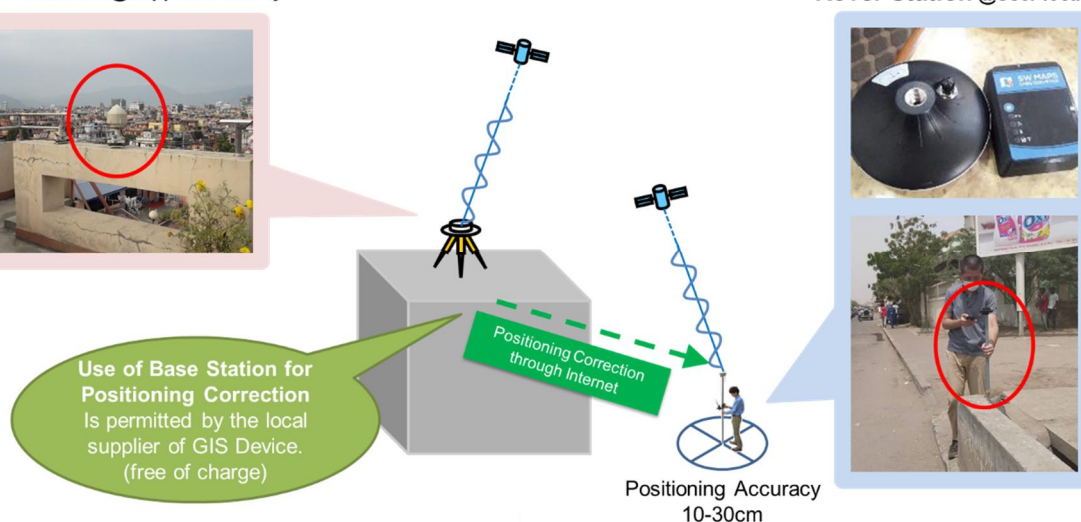


Figure 3.1.5 Positioning methods for updating GIS data

The advantage of using GIS for information management is the ability to visualize various facility and customer information on a map with the correct location. The new pipe network information is maintained as GIS data, and RTK-GNSS is used to obtain location information by the contractor of the Melamchi Water Supply Project.

RTK-GNSS is a positioning method that can determine the position of a mobile station in real time

by simultaneously performing GNSS observations at the reference station, whose exact position is known, and the mobile station, whose position is to be determined, and correcting errors using information received from the reference station and satellites.

If the reference station can be set up on the roof of a building or in other locations where continuous observation is possible, on-site observation can basically be handled by a single person on the mobile station side.

The measurement equipment has also become more and more convenient in recent years, as it is designed to allow observers to move around on foot, and can use the mobile Internet for communication with the reference station, and the measurement controller can be operated with a smartphone and an application.

Since a reference station (Base) has been established in the Kathmandu Valley by the Melamchi Water Supply Project, the JICA Expert Team selected equipment that can utilize this reference station for efficient GIS operation.

Table 3.1.5 Comparison of GPS Devices

Type	Handheld GPS	RTK-GNSS	High Precision GNSS
Accuracy	Between 5 m to 10 m	10 mm + 1 ppm	8 mm + 1 ppm
Positioning System	Single positioning	Relative positioning (Real-Time Kinematic)	Relative positioning (Real-Time Kinematic)
Type of device	Mobile device	Mobile device and receiving pole	Mobile device and receiving pole
Cost	Less than USD1,000 / unit	Less than USD2,000 / unit	Less than USD10,000 / unit
Ease of operation	Easy to use	Easy to use	A little difficult
Target user	General user	General user	Professional user
Photo			

(5) Application for GIS operation

There are two options for application software that handles GIS: paid (e.g., ArcGIS) and free open-source type (e.g., QGIS). The paid version has more functions and is used by private companies and universities in the surveying and civil engineering fields, etc. However, the initial cost as well as the ongoing license contract are costly.

On the other hand, in recent years, international cooperation projects have actively encouraged open-source programs, and QGIS is increasingly used on a daily basis by academic and educational institutions in Japan and private companies in developing countries.

In this project, the JICA Expert Team selected the QGIS application software which is available free of charge. Currently, KUKL has newly appointed staff in charge of GIS at the Head Office and at each branch office, and each staff member is in the process of learning GIS technology from now on. Since the number of staff handling GIS within the organization will gradually increase as project

activities progress, it is desirable to introduce an open-source GIS with no restrictions on the number of licenses in the initial stage.

When the GIS operation and data management skills of the staff in charge improve through on-the-job training and reach a level where they can handle advanced processing (network analysis, 3D data display/editing, etc.), it will be necessary to consider introducing paid GIS in a phased manner.

(6) Procured equipment for GIS management

Based on the above studies, the following equipment necessary to establish a GIS data management system was procured, distributed to each branch office, and set up.

Table 3.1.6 Procured equipment for GIS management

Item	Qty	Use	Remarks
GIS Application Software	1 set	Browsing and processing of GIS data	Open source (Free of charge)
PC for GIS Operation	6 pcs	Updating GIS data at five major branches and head office	Including UPS and security software
GIS Server	1 pc	Storage of GIS Master Data	Including UPS, security software and cabinet
RTK-GNSS (Rover)	6 pcs	On-site acquisition of customer location and water supply facility location information and conversion to GIS data	
RTK-GNSS (Control Mobile Device)	6 pcs	[Controller for RTK-GNSS observation] On-site acquisition and GIS data conversion of customer location and water supply facility location information	
Tablet Devices	29 pcs	GIS data collection and management by supervisors assigned to branch offices.	
A4 size network printer	5 pcs	Streamlining the customer registration process handled by supervisors in the five branches	

(7) Support for business improvement through DX (Digital Transformation)

1) Utilization of tablet devices

In the past, supervisors handwrote and kept an abbreviated diagram and information on customer connection/disconnection on a predetermined form, but it was difficult for a third party to identify the exact location and to refer to the customer's information in a timely manner.

The digitization of information using mobile devices and the use of GIS proposed by the JICA Expert Team will enable third parties in KUKL other than the surveyor/supervisor to check customer information in a timely manner in the future.

Initially, the use of smartphones owned by each supervisor to handle GIS data was considered, but in addition to the lack of device capacity, it was necessary to prepare a mobile device exclusive for their business from the perspective of protecting personal information such as customer data.

As of April 2023, a total of 25 supervisors were eligible for the program, but four have since been assigned as supervisors, so the tablet devices were distributed to a total of 29 supervisors.

There were also issues of Internet connection fees and Internet access in the field, and after comprehensively considering these issues and the current situation, the counterparts decided to use offline background maps for the mobile GIS.

Since the supervisors at each branch office are assigned the following daily tasks, the project has taken care not to impose a heavy burden on them by limiting the items for data collection to the minimum number of items that can only be obtained in the field.

<Supervisor's primary role>

1. Supervision of contractor's leak repair work
 2. On-site attention to complaint from customers and necessary care
 3. Monitoring of water distribution schedules
 4. On-site survey at the time of application for new connection
- ※Perform field data collection work in situations such or 4 above.

2) Effects of work improvement

While delays in the DNI project have prevented work on utilizing GIS data for the new water distribution network, the branch offices are working on updating GIS data for the existing water distribution network.

Data on the existing water distribution network, which is not subject to updating under the ADB project, has hardly been updated since 2005, and this has been a hindrance to the supervisors' daily work, so the use of GIS has greatly contributed to the improvement of work within the organization. In addition, in the full-scale introduction of GIS, it is important to enhance the capacity not only of engineers who operate GIS in the office, but also of supervisors who are in close proximity to customers and responsible for collecting information on water supply facilities and customers.

As a result of the training for supervisors at each branch office with the provision of the tablet devices, the results were better than initially expected and areas for improvement were identified. Supervisors had not previously had the opportunity to receive training within KUKL, and the provision of training by the JICA Expert Team contributed to an improved sense of responsibility and motivation for their work. The following are examples of the behavioral changes that resulted from these efforts.

- The only existing water distribution pipe network map exists, which was created by a JICA project about 20 years ago. This data was stored on tablets so that it could be checked directly on site. Supervisors are now able to register customer information as GIS data and are actively engaged in data collection.
- As pipe information not on the existing network map became apparent, some supervisors began to create their own layers of conduit information and use them to update the existing conduit network map.

3) Issues and measures in the work improvement process

In the process of improving the above operations, it was found that data managers, who were busy with their daily work, did not have enough time to check supervisors' data and prepare formats for customer registration, which became a bottleneck in the data registration process.

After considering ways to improve this bottleneck and establish the digitalization of supervisors' work, the supervisors themselves suggested the use of a documentation application.

If a documentation application can be installed on the tablet and the supervisors themselves can fill in and print out the necessary information on the designated sheets, they can create the necessary documents without having to rely on the data manager. This improvement measure was proposed through an exchange of ideas among supervisors, and was favorably received and adopted by KUKL's upper managerial staff.

With the chronic shortage of staff at KUKL, branch offices (Chhetrapati and Maharajgunj) where data managers were absent took a long time to get the QField application operational, but the distribution of printers eliminated the bottleneck to supervisors' work. As of September 2023, the above bottlenecks were confirmed to have been eliminated in all branch offices.

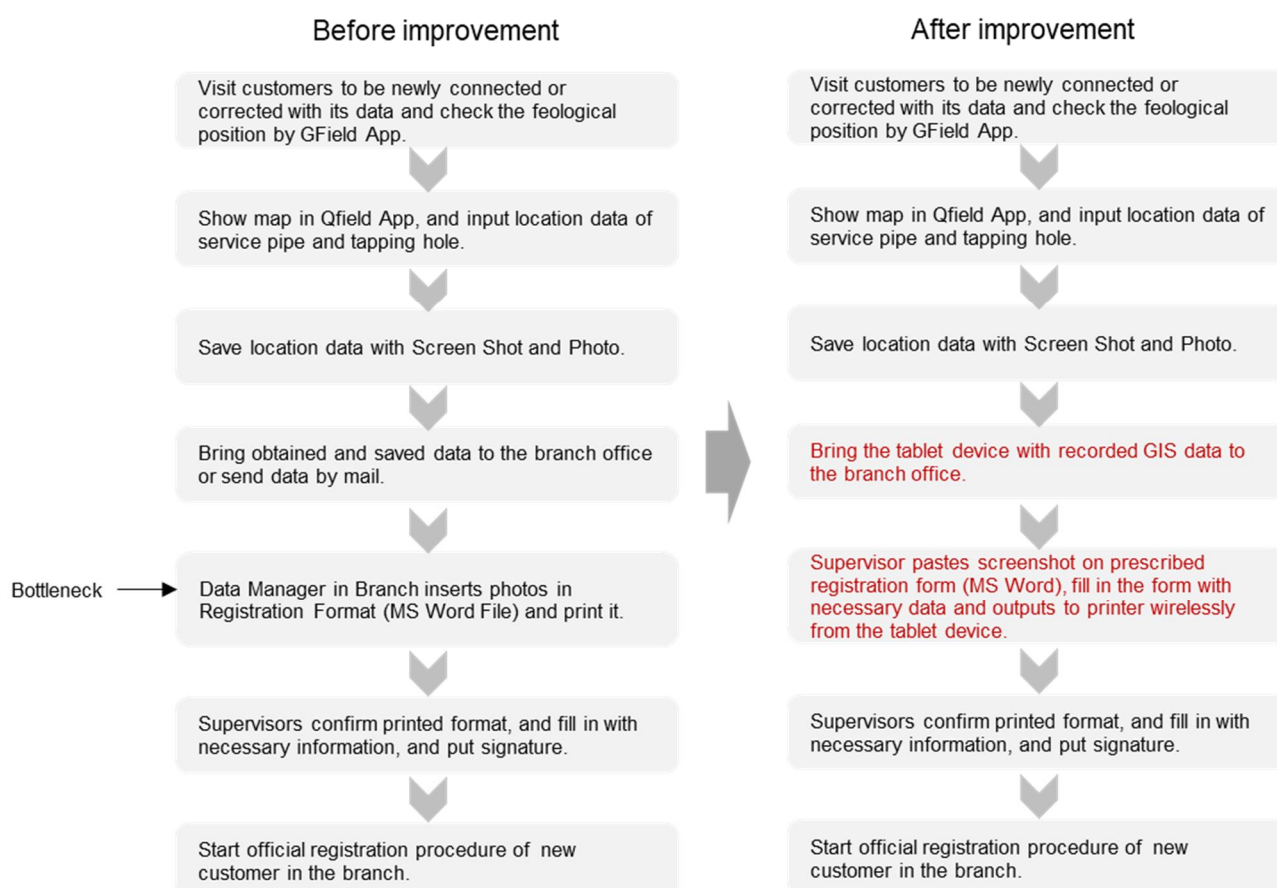


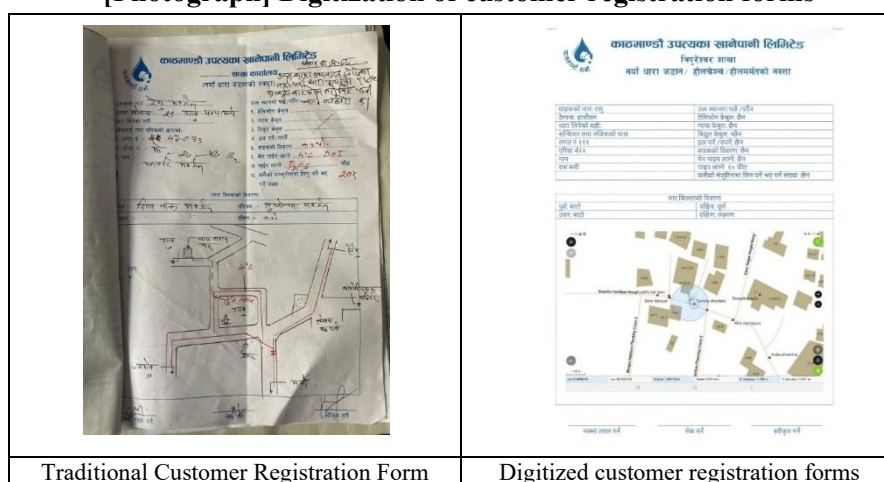
Figure 3.1.6 Improved customer information registration procedures

This improvement in work procedures has led to a significant increase in work efficiency, as each branch office has many needs for registration work for new customers who have not previously

been served by KUKL as they prepare to deliver their DMAs in 2024 and beyond.

Before the introduction of tablets, it took 20 minutes to prepare and print a registration form, but this has now been reduced to about 5 minutes. In addition, the previous handwritten location maps were often inaccurate, but now that they are digital, the locations of customers' houses and pull-in pipes can be determined quickly and accurately.

[Photograph] Digitization of customer registration forms



3.1.3 [Activity 1-2] Conduct training program (OJT) on GIS operation.

Through the training conducted in Term-2, the understanding of database creation and management of GIS of related water supply facility has been deepened among KUKL branch managers and each technical staff.

The effects of GIS utilization are evident in daily operations, such as GIS data updating and quality control by engineers, high-precision positioning using RTK-GNSS, on-site data collection work using mobile GIS by supervisors, and sharing of digital information.

Field information collected by the supervisor via mobile GIS is shared with the engineer and registered as GIS data.

When there are any changes in facility information, such as new or replacement of pipes, valves or meters, more accurate location information is required. In this case engineers will use RTK-GNSS high-precision positioning to take measurements and collect accurate location and information for new facilities.

Thus, a GIS data integration and management process was established in which KUKL staff appropriately selected the equipment to be used based on the type of field information and location accuracy, and the collected information was then shared digitally.

On the other hand, the maintenance and management of GIS data requires not only collection and updating techniques, but also quality control of GIS data and efforts to address security protection measures. For this reason, KUKL's GIS data quality standards were set for quality control in terms of completeness, consistency, accuracy, and other indicators, and GIS data quality control was introduced according to the work flow of "inspection", "error extraction" and "judgment, and correction".

As a result of these efforts, when updating GIS data, engineers now input data more carefully than before, checking the exact location of point data on a background map, checking connections between line data, checking for leaks in attribute information, etc., and this has improved engineers' awareness of quality control.

Regarding information security protection measures, the training also included guidance on the recognition of the existence of risks at KUKL, such as information leak and data loss, and how to mitigate these risks as much as possible.

Table 3.1.7 GIS operations training conducted to date

Date	Target	Contents
27/Sep/2021	18 persons Output 1 Action Team and Supporting Team	[Online Lecture] Basics of GIS, Installation of QGIS into PCs
29/Sep/2021	12 persons Output 1 Action Team and Supporting Team	[Online Lecture] Understanding of symbols and labels
30/Sep/2021	12 persons Output 1 Action Team and Supporting Team	[Online Lecture] Handling of layers, Geodetic technology, Understanding of GNSS
19-24/Dec/2021	17 persons Output 1 Action Team and Engineer	[Practice] Basic operation of GIS [Lecture] Selection of background map, Understanding of attribution information [Practice] Update of information about customer's water meter [Practice] Application of coordinate system, Input of customer's water meter information
27/July/2022 - 31/August/2022	15 persons Staff in charge of GIS in KUKL head office and 5 branches	[Lecture] GIS Update Procedures [Practice] GIS data collection and update on existing water distribution pipe [Practice] Operation of GIS operation software
5/March/2023 - 19/April/2023	13 persons Staff in charge of GIS in KUKL head office and 5 branches	[Lecture] Data management methods (folder structure, GIS data composition) [Practice] How to set the style required for map representation [Practice] How to use Open Street Map [Practice] How to set up QGIS [Practice] Data collection using QField
16/March/2023 - 19/April/2023	25 persons Supervisors in branches	[Practice] Configuration of Mobile GIS Application [Practice] Basic operation of QField App [Practice] Gathering information using QField
19-23/June/2023	12 persons Staff in charge of GIS in KUKL head office and 5 branches	[Lecture] Theory of RTK-GNSS [Practice] Field positioning method with RTK-GNSS [Practice] Import of data collected with RTK-GNSS [Practice] Attribution of GIS data, Asset ID, Code number [Practice] Style setting of GIS data, symbolization, Print layout [Practice] Data editing [Lecture] Quality of GIS data and quality check [Practice] Quality check method of GIS data [Practice] Error correction method of GIS data [Lecture] Coordinate system settings and conversions [Practice] Geoprocessing
10-13/July/2023	25 persons Supervisors in branches	[Lecture] Understanding of mobile GIS "QField" [Practice] Operation of mobile GIS "QField" (New data input and editing) [Practice] On-site information collection work (new registration of graphics and attribute information, checking consistency with local conditions) [Lecture] Information security education (understanding of potential risks such as information leaks) [Lecture] Information security measures (understanding of measures

Date	Target	Contents
		to reduce risk such as secure handling of sensitive information, password protection, encryption, regular backups, etc.) [Practice] Creation of reporting forms using tablet devices [Practice] How to update and expand GIS data of existing water distribution network

[Photograph] Training of GIS Operation

		
Training in Baneshwor Branch (Aug/2022)	Training in Tripureshwor Branch (Aug/2022)	Training in Mahankalchaur Branch (Aug/2022)
		
On-site training of Mobile GIS Device (Mar/2023)	On-site training of RTK-GNSS Positioning Device (Apr/2023)	Follow-up training (June/2023)
		
1-week group training at NWSSTC Nagarkot (June/2023)	1-week group training at NWSSTC Nagarkot (June/2023)	1-week group training at NWSSTC Nagarkot (June/2023)
		
Special training for supervisors (June/2023)	Training for supervisors about utilization of tablet device (July/2023)	On-site training for supervisors about utilization of tablet device (July/2023)

Through the training to date, the following candidate trainers for internal training on GIS have been selected.

Table 3.1.8 Candidate trainers for internal training on GIS

Module	Name	Organization*1	Position
GIS Operation	Ms. Bina Maharjan	Manager of Kirtipur Branch	Engineer (Level 7)
	Mr. Akrur Nath Sharma	Planning & Support Department, Head Office	Engineer (Level 7)
	Mr. Hem Bahadur Burhathoki	Manager of Bhaktapur Branch	Engineer (Level 7)
Mobile Apprilation	Ms. Bimala Bhattarai	Baneshwor Branch	Supervisor (Level 5)
	Mr. Mohan Lal K C	Tripureshwor Branch	Supervisor (Level 5)
	Mr. Purna Bahadur B K	Mahankalchaur Branch	Supervisor (Level 5)

Note *1: Organization as of December 2022

In November 2023, new staff were hired and assigned to the Head Office and branch offices as a result of the resumption of recruitment of KUKL staff. In response, a three-day internal training course on GIS operations was held for the staff of each branch office. The training was planned and conducted at the initiative of KUKL and was led by Mr. Akrur Nath Sharama.

Table 3.1.9 Record of Internal Training on GIS operation

Dat	Target	Contents
11,13,14/Dec/2023	11 persons New employees recruited in Nove 2023	- Basics of GIS, Installation of QGIS App - Basik operation of GIS - Selection of background map, Understanding attribution information - Understanding of QField App - Basic operation of QField App

3.1.4 [Activity 1-3] Import GIS data which is taken over from PID into KUKL's GIS system.

Among the DMAs in the ring road, DMA2.4, DMA3.5, and DMA9.1 were completed and the certification documents and GIS data were handed over to KUKL on June 22, 2023.

On the other hand, DMA4.1 and DMA4.2 have not yet been completed, but water supply through the new distribution network has started. For this reason, the JICA Expert Team requested PID to provide GIS data of those DMAs informally prior to the official hand over.

The JICA Expert Team analyzed these GIS data and converted them into Geopackage files, confirming the contents of the database structure and attribute information in advance, and imported them as provisional data to the server and PCs at the branch offices. By understanding the contents of the GIS data in advance, when the GIS data is officially provided by the PID, the data inspection and data conversion can smoothly transition to the daily data updating process.

Since the following defects have been identified in the data provided by PID, KUKL has requested PID to check and correct the quality of the data.

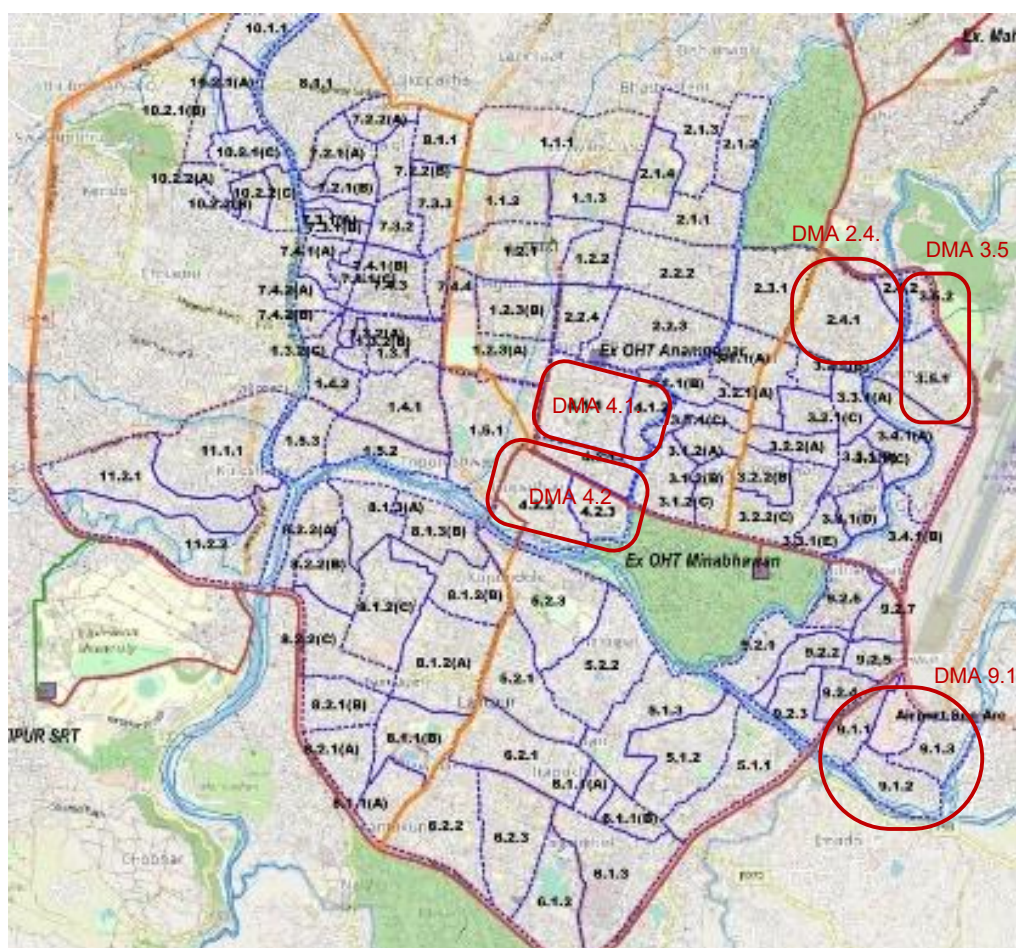


Figure 3.1.7 DMA to be constructed within the ring lead

The following problems were identified in the data provided by PID, which were corrected through a series of discussions with PID and the contractor. The KUKL branch office will take the lead in making

the corrected GIS data consistent with the information in the billing system, and JICA Expert Team will assist in this process.

According to PID, new "DMA1.5", "DMA3.3", "DMA3.4", "DMA7.1" and "DMA10.1" are being prepared for completion and handover.

The JICA Expert Team instructed KUKL that these GIS data be reviewed in advance by the data inspection team within KUKL to ensure that there were no inconsistencies in the data entered before handover.

Table 3.1.10 Defects in the GIS data handed over

Issues confirmed in Aug/2023	Issues confirmed in Sep/2023
<ul style="list-style-type: none"> ➤ The GIS data contains layers of data such as customer locations, water pipes, valves, etc., and each layer is associated with attribute information. ➤ Attribution information that should accompany each layer should be defined in advance, but the DMA GIS data handed over deviates from this rule. ➤ The Hand-over Certification Report lists customers who have completed water main connections within the DMA, but the number of customers, customer numbers, and some meter numbers do not match the GIS data. ➤ The rule for stating the customer number is incorrect. ➤ Misspelled customer number, connection number, or meter number. 	<ul style="list-style-type: none"> ➤ The description of attribute information does not yet fully comply with the rule. Since it would take time and effort to completely revise this, it would be realistic to accept the information as long as only the important information needed for the time being is described. ➤ Customer numbering in DMA 2.4 and DMA 9.1 has been mostly corrected. ➤ There are two types of data for customer identification, "Connection ID" and "Customer ID," but these are mixed in the GIS data. KUKL will not use "Connection ID" in the future, and will correct this in the GIS data update process conducted by the branch office.

The construction of the DMA by the DNI project has been delayed significantly and the handover of GIS data to KUKL will still take time. This risk of delay in external conditions has been assumed since the beginning of the project and the following activities for the new water distribution pipe network in the ring road will need to be implemented in Term-3.

[Activity 1-4] Compile the customer data by DNI/DMA wise (before implementation)

[Activity 1-5] Conduct hydraulic analysis of distribution network utilizing GIS^(*)

[Activity 1-6] Prepare the water distribution plan based on the results of hydraulic analysis and actual situations of water distribution^(*)

***1: Conducted the demonstration only.**

3.1.5 [Activity 1-7] Conduct trainings on hydraulic analysis and water distribution management.

Although training using GIS data is planned to be conducted in Term-3, confirmation of the basic knowledge required for hydraulic analysis and the technical level of KUKL is necessary for the creation of internal training modules. In addition, the required basic training must have been completed by Term-2 in order to conduct hydraulic analysis training using that training module in Term-3.

The following is a summary of the hydraulic analysis and water distribution management training conducted to date.

Table 3.1.11 Summary of training conducted to date about hydraulic analysis and water distribution management

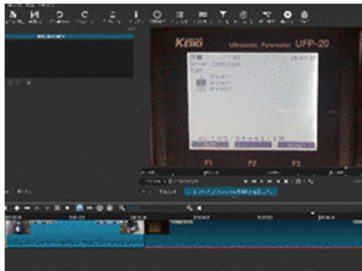





Date	Target	Contents
1/Oct/2021	7 persons Output 1 Action Team and Supporting Team	[Online Lecture] Basics of Hydraulic (Water Pressure and Water Head)
4/Oct/2021	13 persons Output 1 Action Team and Supporting Team	[Online Lecture] Basics of Hydraulic (Flow rate and Velocity)
8/Feb/2022 - 11/Feb/2022	18 persons Engineer and Assistant Engineer of KUKL staff	[Lecture] Ultrasonic flowmeter setting and measuring principle, Fundamentals of Hydraulic Engineering, Water Meter Structure and Accuracy Control [Practice] Flow measurement using ultrasonic flowmeter
14-15/July/2022	7 persons Output 1 Action Team	Training of Trainers (TOT) [Lecture] Principle of flow measurement [Practice] Inlet flow measurement at an Overhead Tank, Data Analysis
21-22/July/2022	9 persons Output 1 Action Team	Training of Trainers (TOT) [Lecture] How water pressure data loggers work, relation between pressure and flow rate [Practice] Installation of pressure loggers, measurement and result analysis
4/Aug/2022 5/Aug/2022 11/Aug/2022 15/Aug/2022	10 persons Output 1 Action Team	[Lecture] Hydraulic Analysis Hardy Cross Method [Lecture] Hydraulic Analysis Nodal Energy Method [Lecture] Hydraulic Analysis Application Software [Practice] Modelling
31/Aug/2022 - 2/Sep/2022	9 persons Output 1 Action Team	[Lecture] Setting of software “SWQ WSP”, Linkage with QGIS [Lecture] Concept of water demand patterns and modeling methods [Practice] Import of survey data and creation of numerical topographic models and sample models of water distribution pipe networks
1/Sep/2022	9 persons Output 1 Action Team	[Lecture] Water demand patterns and methods of reflecting them in models, linkage between QGIS and hydraulic analysis software
2/Sep/2022	9 persons Output 1 Action Team	[Practice] Modeling using informal GIS provisional data, visualization of hydraulic analysis results using GIS software, and output to related software
21-22/July/2022	9 persons Output 1 Action Team	[Lecture] How water pressure data loggers work, importance of water pressure monitoring [Practice] Measurement of water level variation in an overhead tank using pressure data loggers, organization and analysis of measurement data

(1) Training on distribution management: Understanding of Ultrasonic Flowmeter (8-11/Feb/2022)

Since the field work was conducted during the pandemic of the Covid-19, JICA Expert Team created some video training materials so that participants could also participate online. On the day of the

training, after confirming how to operate and set up the equipment in the seminar room, participants moved to the site to set up, install, and measure the equipment on their own.

[Photograph] Training of flow measurement using Ultrasonic Flowmeter

		
<p>Screen for creating training video materials</p>	<p>Training Video Materials</p>	<p>Lecture in the Mahankalchaur Branch (Feb/2022)</p>
		
<p>Field practice in the Mahankalchaur WTP (Feb/2022)</p>	<p>Field practice in the Mahankalchaur WTP (Feb/2022)</p>	<p>Field practice in the Mahankalchaur WTP (Feb/2022)</p>

(2) Training on distribution management: Flow Measurement (14-15/July/2022)

The internal training course in water distribution management is intended for engineers. One of the training modules, "Flow Measurement" covered the basics of hydraulics necessary for flow measurement, as well as the types and applications of flow meters, accuracy control of water meters, and flow measurement using weirs.

The objectives of this training program are as follows:

- To provide potential internal training instructors with basic knowledge essential for meter construction and accuracy management, water quantity management in water treatment plants, and water quantity management in distribution networks.
- Before the TOT is fully implemented, training should be provided to potential instructors among KUKL staff by the JICA Expert Team in order to confirm the needs of improvements in the prepared materials and textbooks, as well as practical procedures in the field.

[Photograph] Training of flow measurement technique

		
Lecture in the Project Office (July/2022)	Installation of Ultrasonic Flowmeter Practice at Anamnagar OHT (July/2022)	Use of a paper gauge Practice at Anamnagar OHT (July/2022)

(3) Training on distribution management: Water Pressure Measurement (21-22/July/2022)

One of the training modules, "Water Pressure Measurement" dealt with the relationship between water pressure and flow rate, and the techniques required for monitoring water pressure in water distribution pipe networks using water pressure data loggers.

- Potential instructors for future internal training understand how data loggers work and how to use them, learn how to install them in the field and how to record data.
- Learn how water inflow can be calculated by recording water pressure fluctuations in a overhead tank at regular intervals.

After a lecture on basic knowledge and theory of water pressure in the conference room of the Tripureshwor branch office, the water pressure in the distribution pipes (outflow pipes) of the Anamnagar OHT was measured using pressure data loggers procured by the Japanese Expert Team. After data collection, all participants reviewed the recorded data in the seminar room and calculated the inflow rate from the Mahankalchaur WTP based on the water pressure data. As a result, the participants confirmed that the inflow rate was almost consistent with the planned inflow rate and understood the relationship between water pressure and flow rate.

Table 3.1.12 Outline of training on water pressure measurement

Date	Theme	Participants*1
21/July/2022	<ul style="list-style-type: none"> ➤ Lecture by JICA Expert Team ➤ Practice of pressure logger setting at Anamnagar OHT 	<ul style="list-style-type: none"> • Milan Thapa (Kiltipur Branch Manager) • Shalini Jha (Head Office) • Amardip Kumar Sah (Baneshwor Branch) • Krishna Kumar Sah (Tripureshwor Branch Manager) • Bijay Bishwakarma (Lalitpur Branch) • Bikram Shrestha (Head office) • Ujjwal Shrestha (Head office) • Anil Kumar Tikhatri (PID) • Tej Binod Pandey (KVWSMB)
22/July/2022	<ul style="list-style-type: none"> ➤ Data collection from pressure loggers set at Anamnagar OHT ➤ Data analysis and calculation ➤ Short test: 50 questions 	Same as above

Note *1: Organization as of July 2022

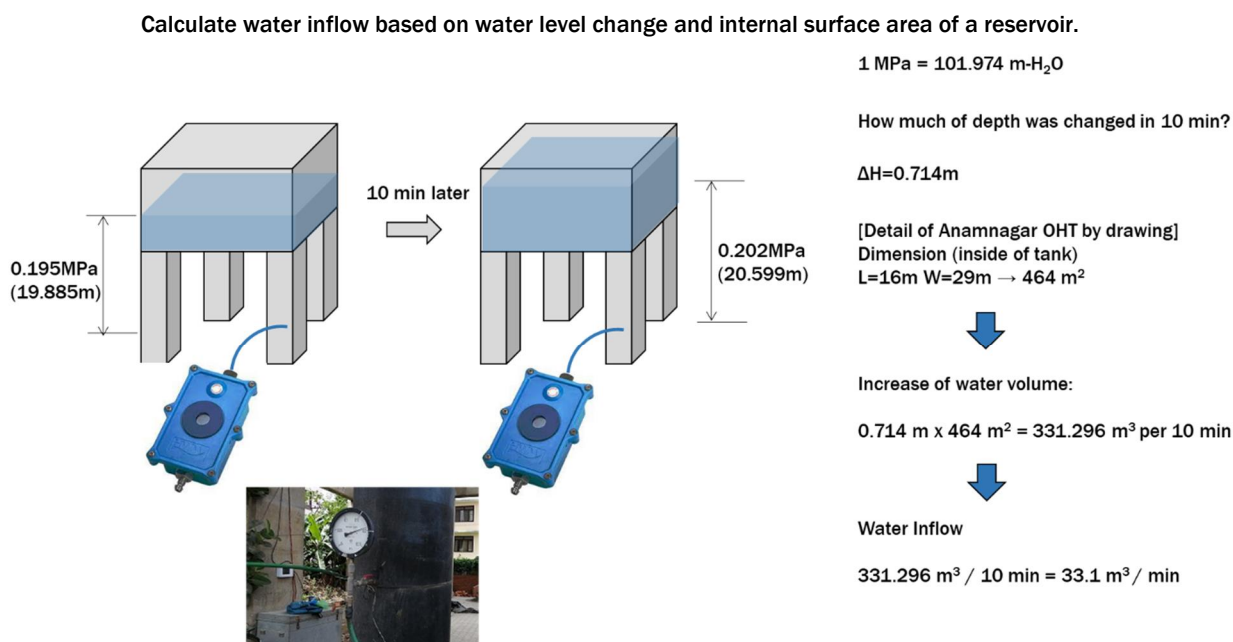


Figure 3.1.8 Flow rate calculation method at Anamnagar OHT

[Photograph] Training of water pressure measurement technique



(4) Training on distribution management: Hydraulic Analysis (4-15/Aug/2022)




One of the training modules, "Hydraulic Analysis Techniques," provided training on the principles (calculation methods) related to hydraulic analysis (pipe network calculations) currently performed by computer software, including the basics of hydraulics and calculation theory.

In addition, the participants were instructed on how to use the hydraulic analysis software on the PCs, and compared the results of manual calculations with those calculated by the analysis software.

The objectives of this training program are as follows:

- Potential internal training instructors acquire basic knowledge essential to understanding how hydraulic analysis works, as well as basic use of hydraulic analysis software.
- Before the TOT is fully implemented, training should be provided to potential instructors among KUKL staff by the JICA Expert Team in order to confirm the needs of improvements in the prepared materials and textbooks, as well as practical procedures in the field.

[Photograph] Training of hydraulic analysis

		
<p>Lecture (Aug/2022)</p>	<p>Lecture (Aug/2022)</p>	<p>Presentation of data analysis result (Aug/2022)</p>


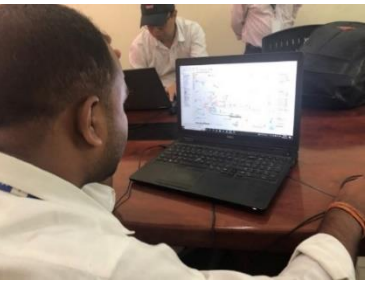

(5) Training on distribution management: Program for Hydraulic Analysis (31/Aug - 2/Sept/2022)

The project can use the application software “SW WSP V3” free of charge which is a hydraulic analysis program provided by Softwel, a supplier of GIS equipment. The training was conducted on the actual use of the software in order to deepen understanding of the usefulness of the program and how to utilize GIS data.

EPANET2 provided by the U.S. Environmental Protection Agency is known worldwide as a hydraulic analysis software that can be used free of charge, but it has problems with integration with GIS software and difficulties in importing GIS data.

Through this training, participants confirmed the compatibility of hydraulic analysis software with GIS software and understood the usefulness of SW WSP V3.

[Photograph] Training of how to use the program for hydraulic analysis

		
<p>Lecture (Aug/2022)</p>	<p>Practice of modeling (Aug/2022)</p>	

(6) Training module for Water Distribution Management

In the area of water distribution management, in addition to GIS, hydraulic analysis, flow measurement and water pressure management will be separated as specific technical areas and training materials will be developed.

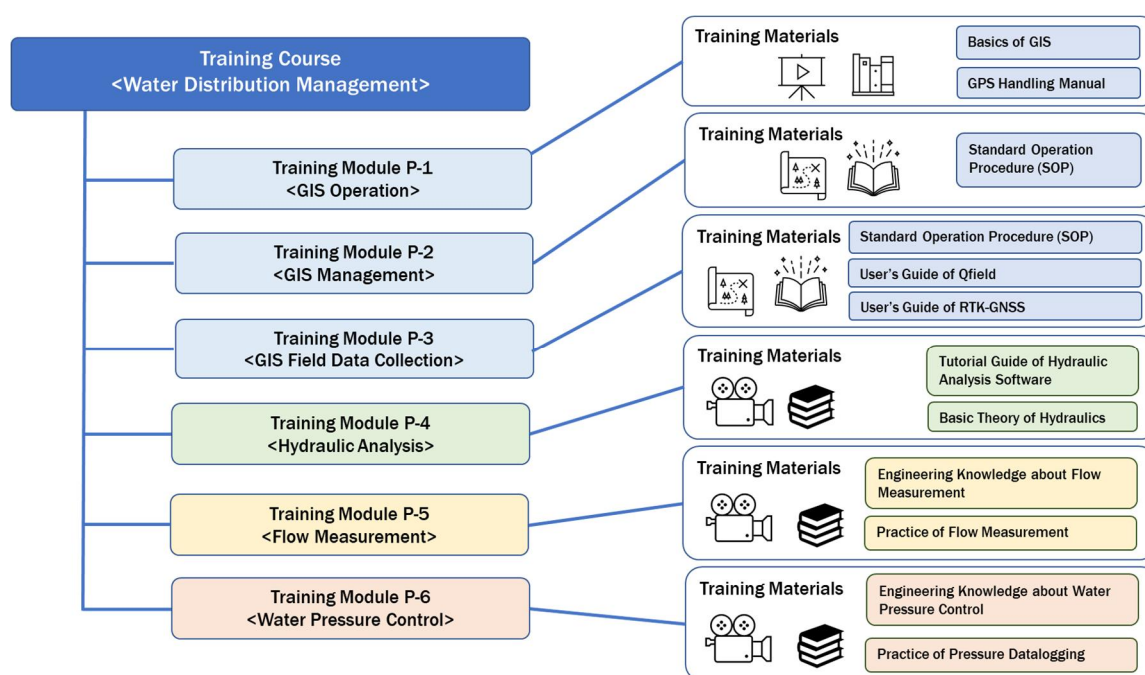


Figure 3.1.9 Composition of internal training module in the field of water distribution management

Through the training to date, the following candidate trainers have been selected for internal training on Water Distribution Management.

Table 3.1.13 Candidate trainers for internal training on Water Distribution Management

Module	Name	Organization*1	Position
Hydraulic Analysis	Krishna Kumar Sah	Manager of Lalitpur Branch	Engineer (Level 8)
	Shalini Jha	Lalitpur Branch	Engineer (Level 7)
Flow Measurement	Anil Kumar Tikhatri	Manager of Madhapur-Thimi Branch	Engineer (Level 8)
	Amardip Kumar Sah	Tripureshwor Branch	Overseer (Level 5)
Pressure Control	Anil Kumar Tikhatri	Manager of Madhapur-Thimi Branch	Engineer (Level 8)
	Amardip Kumar Sah	Tripureshwor Branch	Overseer (Level 5)

Note *1: Organization as of December 2022

Due to delays in the completion and start of service of the new water distribution pipes in DMAs, the training conducted so far has been limited to the basics of hydraulics and the use of equipment and practical training at the site. Training in practical techniques in the water distribution network in use and training necessary for future water distribution planning are needed, and these will be scheduled in Term-3.

3.1.6 [Activity 1-8] Prepare an SOP on data input and updates of GIS.

By January 2022, the first version (draft) of the SOP was prepared; from July 2022, GIS operation training was conducted using this SOP to identify items and contents necessary to update the SOP, while confirming the opinions of engineers and supervisors and challenges they face.

By the end of September 2023, operating procedures for individual instruments such as GIS, RTK-GNSS, and mobile GIS were prepared and updated to be consistent with KUKL's daily operations through on-the-job training.

Starting in 2024, an operational guideline for GIS technology describing how to utilize and operate GIS should be developed and completed as an SOP integrated with the operating procedures already developed. The final version of the SOP will be distributed to each branch office as an official document after approval by the Head Office.

Table 3.1.14 Record of SOP creation for GIS operations

Version	Contents
First draft	Establishment of GIS utilization and operation policy <ul style="list-style-type: none"> ➤ Composition of GIS equipment (GIS software, GIS server, PC for updating, RTK-GNSS, mobile device and mobile GIS App) ➤ Individual GIS technologies and policies (QGIS, QField, RTK measurement, data quality inspection, information security) ➤ GIS data structure and updates (database/layer/individual data structure and definitions, attribute information, location accuracy, background maps)
Second draft	Preparation of GIS individual operating procedures and standards <ul style="list-style-type: none"> ➤ GIS data (layer and attribute definitions, code numbering structure standards) ➤ QGIS Operating Procedures (Introduction to GIS, Basic Operations, Applied Operations, QField Project Data Preparation Procedures) ➤ QField Operating Instructions (Basic Operation, Customer Mapping) ➤ RTK-GNSS (GNSS overview, basic operation, SWMap software operation) ➤ GIS Data Quality Control Manual (quality indicators, quality requirements, quality inspection methods) ➤ Information security measures (overview, types of risks, countermeasure methods, understanding of information assets held and residual risks) ➤ GIS Server Access Authorization Policy
Final version (Plan)	Develop GIS standard operating procedures and operational guidelines 成 <ul style="list-style-type: none"> ➤ Integrate individual policies, standards documents, and operating procedures ➤ Operational Guidelines for GIS Technology and Equipment

3.1.7 [Activity 1-9] Update GIS data as daily routine work.

Through these activities, the JICA Expert Team has been able to guide the updating of data for the existing water distribution network as a routine operation, and have laid the groundwork for the future establishment of the updating process for GIS data for new water distribution networks.

PID has officially provided GIS data to KUKL for three completed DMAs, but these data need to be corrected.

On the other hand, the data on the existing water distribution pipes held by KUKL was converted to a structure equivalent to that of the GIS data to be provided by PID in the future, and is now ready to be used as supervisor's daily work.

As a result of activities in Term-2, supervisors at each branch office can now collect, record, and document field information for new connections and renewals, switching from a paper-based system to a digital one, and share information digitally with branch office engineers. The collaboration between supervisors and engineers has established a digital flow of information sharing from the field to the GIS, and the ability to update data on the existing water distribution pipe network as a routine operation has been recognized within KUKL as a major achievement of the project activities.

The completion of DMA in the DNI project has been delayed significantly and the handover of GIS data to KUKL has not been realized as scheduled. Therefore, the following activities can be implemented after the official GIS data is obtained and will be implemented in Term-3.

[Activity 1-10] Examine integration or computerized billing system and information of customer complaints into GIS. (Before implementation)

3.2 Record of activities related to Output 2

Output 2	The capacity of NRW reduction is enhanced.
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3.2.1 Direction of activities

The project will provide the skills training necessary to acquire knowledge on preventative measures, focusing mainly on commercial losses, with the aim of keeping the non-revenue water rate low for long time after handover of DMA to KUKL. To achieve Output 2, the JICA Expert Team will assist KUKL in ensuring that the PDCA cycle outlined below functions as part of KUKL's daily operations.

Along with the provision of the new distribution network, maintaining a low non-revenue water ratio in the initial phase is expected to improve the performance indicators of the water utility in the medium and long term.

Furthermore, proper evaluation of the improvement of revenue in each branch office by the Head Office will also elicit higher staff motivation to reduce non-revenue water.

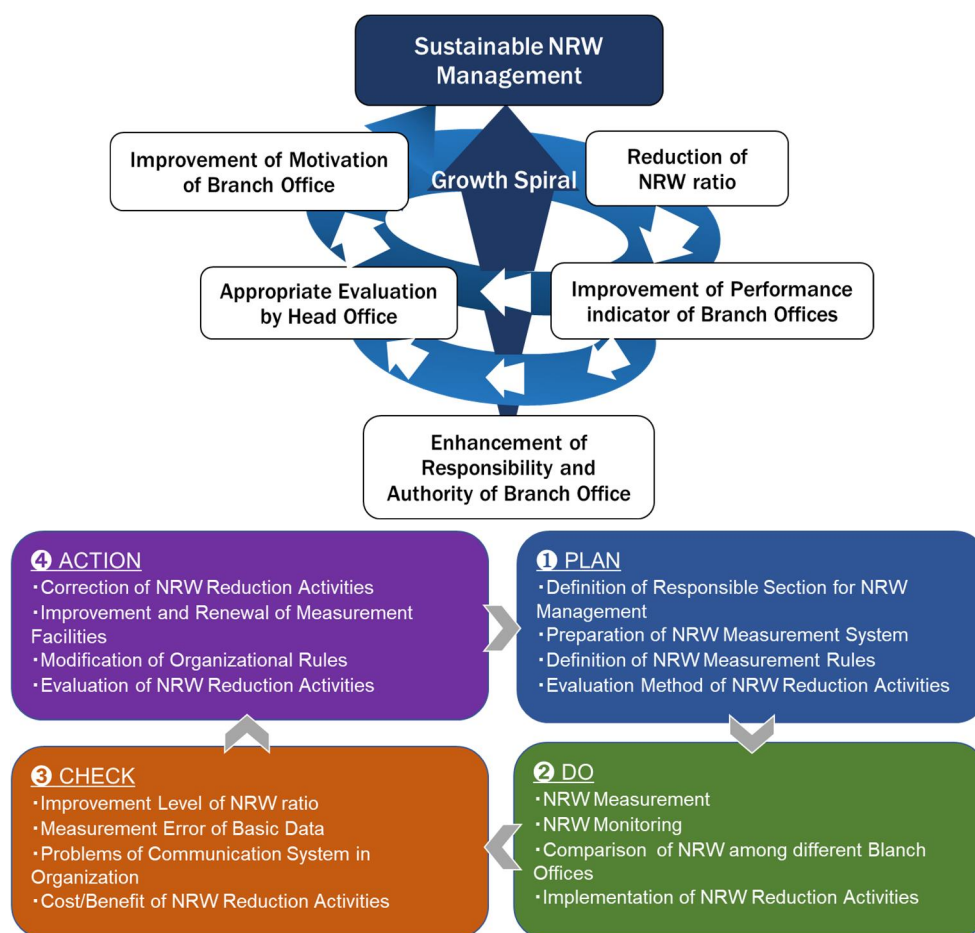


Figure 3.2.1 PDCA Cycle for sustainable NRW Management

3.2.2 [Activity 2-1] Define the roles and responsibilities of Head Office and Branches for NRW reduction activities.

(1) Understanding the division of roles within the organization

At the regular meetings with the C/P, the JICA Expert Team discussed the role of and the Head Office and branch offices, and exchanged opinions on possible improvements needed for future non-revenue water reduction activities.

Improvements from the current situation in the proposed division of roles regarding non-revenue water include the following:

- To create a policy and plan to reduce non-revenue water in the future.
- To assign dedicated NRW staff, not currently in place, to the Head Office and the Branch Offices to plan, implement and monitor non-revenue water reduction.
- The NRW Section at Head Office should aim to become a group of experts, providing guidance and support to the branch offices, calculating the NRW ratio of KUKL, preparing a draft NRW reduction plan, and supporting the policy review by the executive.
- The NRW Section of the Head Office also prepares manuals and SOPs for NRW reduction.
- To prepare GIS data on leakage points, customer information, etc. for use in non-revenue water control.
- To enhance the meter accuracy checks, which are currently carried out only at Head Office and Electromechanical section, to enable all branch offices to carry out the checks. In the case of special meters, only Headquarters will be in charge.
- To facilitate work to match the distribution areas to customer management areas on branch basis so that NRW ratio can be calculated in each branch (to be progressed following completion of the DNI).

(2) Confirmation of the current situation regarding new connections and commercial losses at KUKL

Under the KUKL Connection Policy, a Land Ownership Certificate is required to be submitted with applications for new water connections. However, there are many cases where illegal residents (e.g. on public land, along rivers, in wetlands, slums, etc.) are unable to meet this requirement and are therefore denied a connection by KUKL, leading to illegal connections.

In response to the issues raised by the C/P side, examples of new connections in Japan and overseas were collected and presented at regular meetings, with examples from Japan, the Philippines, the UK, Australia and New Zealand.

In the case of the UK, there is no requirement for land ownership etc., whereas in other countries there are requirements for land ownership etc. In the case of Japan, a building permit is required in many cases, leading to the conclusion that the policy to be adopted differs from country to country.

For illegal residents who do not have land ownership certificates, there is a possibility of allowing the connection after making the applicants swear that they will be responsible for any problems arising from the water connection. However, the Japanese side pointed out that since this is a subject that

conflicts with the law, it is necessary to have discussions with legal experts from Nepal.

In addition to the above, the following is a list of findings regarding Output 2.

- On the current organization chart of KUKL, a non-revenue water section exists at head office, but it is not staffed. There is also no dedicated non-revenue water department in the branch offices, and staff in the technical department carry out leak repairs.
- As for the measures to combat illegal connections, the branch's executives and other staff are visiting, responding to and legalizing them.
- There are many illegal connections bypassing the meter.
- Water meters are located on the user's premises. It may also be located in the house.
- In most areas, the water supply is 1-2 hours per week. In some areas, water supply is limited to one or two hours every nine or ten days. Management of the water supply schedule is a key issue.
- Meter readers find many illegal connections. A comparison of the number of inhabitants and the amount of water used allows the identification of suspected illegal connections.
- Direct connections without meters are also seen.
- Some cases of faulty meters have been seen.
- Customers bring their own water meters to the branch office to have them checked for faults.
- The number of meter readings per day is between 80 and 100. 1,750 to 2,100 per month. Including non-domestic customers. Monthly meter readings.
- The meter reading route is fixed for each meter reader and remains the same every month.
- Customer information and invoicing are computerized (CBAAS), but there is no two-way system linking the head office and branch offices online. Data entered by branch offices can be viewed at the head office.
- The meter reader records the meter readings by hand in a notebook on site. They return to the branch office and hand the notebook to the Revenue Section to enter the water consumption into the customer database.
- The bill is printed at the beginning of the month. The meter reader will give clients the bill at the next meter reading. The bill should also include any meter malfunctions from the previous reading.
- Customers pay their water bill at one of the branch offices.

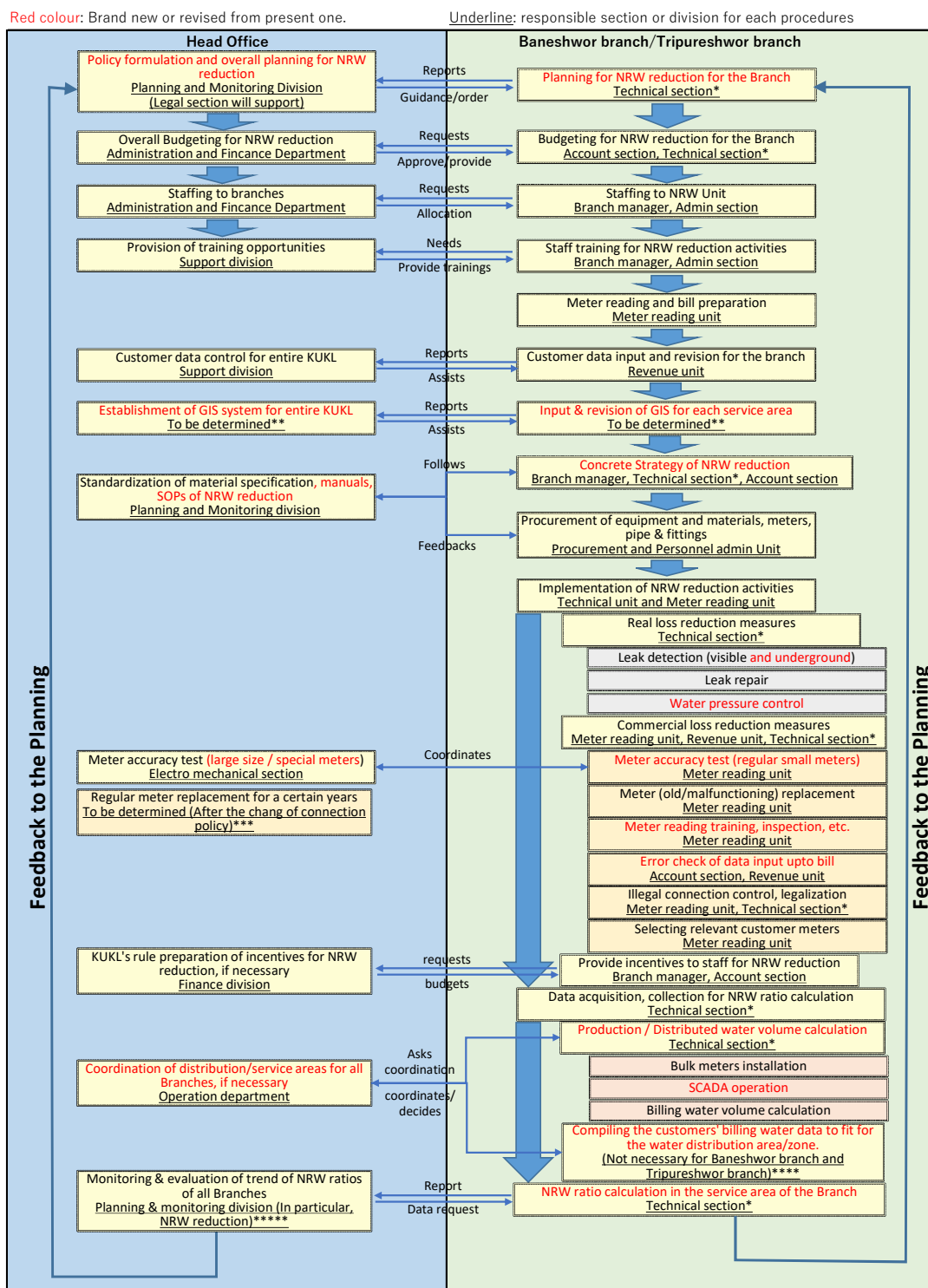
The following is a proposal for the assignment of roles related to non-revenue water at the beginning of the project and the proposed assignment of roles that should be changed throughout the project. This is a draft proposal, which needs to be finalized after it is operationalized through on-the-job training in the water distribution management area (DMA) to be developed in the DNI project, reflecting the knowledge to be gained from the training.

Therefore, this activity will be continued in Term-3.

Present situation of roles/responsibilities of HO and BO for NRW reduction

Head Office	Branch offices	No, we don't do it.
Revenue monitoring section	Administration sec.	
<input type="text" value="Monitor & evaluate NRW ratio"/>	<input type="text" value="Meter reading"/>	<input type="text" value="Calculate actual NRW ratio"/>
IT section	<input type="text" value="Customer data control"/>	<input type="text" value="Prepare NRW policy"/>
<input type="text" value="Customer data control"/>	Meter reading sec.	<input type="text" value="Future NRW reduction plan"/>
	<input type="text" value="Meter reading check/inspection"/>	<input type="text" value="Plan annual NRW reduct. measures"/>
	<input type="text" value="Bill preparation"/>	<input type="text" value="Making manuals for NRW reduction"/>
	<input type="text" value="Meter replacement"/>	
	Meter mechanics	
	<input type="text" value="Repair old/defect meters"/>	
	* clean inside, put seal	
PMU section	Revenue monitoring sec.	<input type="text" value="GIS, customer & leak location"/>
<input type="text" value="Leak repair (ADB project bases)"/>	<input type="text" value="Leak detection (visible one)"/>	
	Technical sec.	
	<input type="text" value="Leak repair"/>	
Electromechanical sec.	Maharajgunj branch only (with test bench)	
<input type="text" value="Meter accuracy test"/>	<input type="text" value="Meter accuracy test"/>	
*new sophisticated test bench	Technical sec. and Revenue sec.	
	<input type="text" value="Find Illegal connections"/>	
Procurement sec.	<input type="text" value="Legalize the illegal users"/>	
<input type="text" value="Specification of meters, pipes"/>	Technical sec. and administration sec.	
	<input type="text" value="House connection installation"/>	
Related section	Related section	
<input type="text" value="Staff training of NRW reduction"/>	<input type="text" value="Read/estimates production vol. by Revenue collection section"/>	
<input type="text" value="Set incentives to staff for NRW"/>	* Report to HO	
<input type="text" value="NRW budget decision"/>	<input type="text" value="Billing vol. compilation"/>	
<input type="text" value="NRW reduction budget (leak repair, etc) preparation"/>	<input type="text" value="PR activity for NRW reduction"/>	
	* web site, facebook, notice board, etc.	
	<input type="text" value="Request incentives to staff for NRW"/>	
	<input type="text" value="Staff allocation to NRW reduction"/>	

Figure 3.2.2 Present situation of roles and responsibilities of Head Office and Branch Offices for NRW reduction



*Technical section is consists of Production section, Distribution section and NRW section. These section chief is covered by one person in Baneshwor branch and Tripureshwor branch, so these sections can be considered as one section.

**Since the responsible person of GIS data will be decided in the future activity of output 1, the responsible section will be determined in futur

***Since the Connection policy should be revised to replace the customer meters regularly, responsible section will be decided later

****Since the boundry of DNI No.4 corresponds to the boundary of cover area of Baneshwor branch and Tripureshwor branch, it is not necessary

*****Since NRW section in Head office doesn't have enough staff, it's covered by Planning & monitoring division for the time being

Figure 3.2.3 Desirable division of roles and responsibilities of Head Office and Branch Offices for NRW reduction

3.2.3 [Activity 2-2] Decide the data collection process of NRW ratio.

While the (draft) role assignment of non-revenue water reduction measures (see previous section) has already been developed in Term-1, the operationalization of the data collection process can be carried out after the DNI project has progressed and the operation of the new distribution network in DMA has been handed over to KUKL.

As of the end of Term-2, DNI project is still ongoing and only a few DMAs have been handed over. However, water supply from Melamchi continues to be constrained and the switchover to the new distribution network has not yet been realized.

On the other hand, in DMA 4.1.2, information on the calculation of NRW ratio was started on a trial basis in June 2023 of Term-2 (see [Activity 2-6] below), since the water supply by the new distribution network was started, although before the official handover. The findings obtained here will be developed in the DMA to be transferred subsequently and reflected in decisions on the data collection process.

3.2.4 [Activity 2-3] Conduct trainings on NRW reduction measures.

In Term-2, the JICA Expert Team promoted the capacity building of KUKL staff through thematic training of trainers (TOT) based on the training plan agreed upon between KUKL and the JICA Expert Team. The commercial loss prevention on which this project will focus has four major objectives as shown in the figure below:

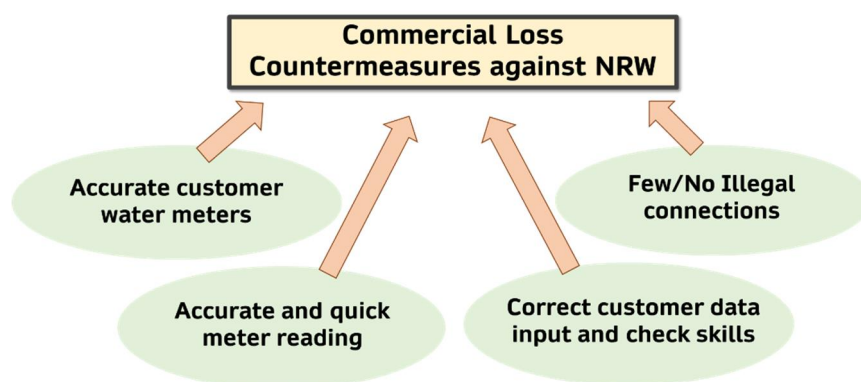


Figure 3.2.4 Implementation Policy of Commercial Loss Prevention

- ① Customer meters are accurate.
- ② Accurate and fast meter reading
- ③ Accurate customer data entry and checking.
- ④ Few or non-existent illegal connections

To achieve the above four policy, four major training courses on NRW control (commercial losses) were planned, adding a complementary basic training course as a preliminary step to raise the basic understanding on NRW.

Table 3.2.1 TOT related to non-revenue water (commercial losses) conducted to date

Date	Target	Contents
11/Dec/2022	17 persons Output 2 Supporting Team	Basic training & TOT: Lecture, group discussion, quiz
23/May/2023	14 persons Staffs of KUKL Head Office and Branches	TOT for meter accuracy test: Lecture, Practice (Operation of test meter, calculation of meter error), quiz
5/Jun/2023	20 persons Meter Reader of 9 branch offices	TOT for Meter reading skill: Lecture, Paper test, Meter reading competition
20/Jun/2023	9 persons Data entry staff for 9 branches	TOT for customer data entry and checking skill: Lecture, Q&A about Bsmart, Practice of data entry/check, competition, quiz
5/July/2023	18 persons Staffs involved in the fight against illegal connection in the 9 branch offices. (Chief of Meter Reading Section and Technical Section)	TOT for reduction of illegal connection: Lecture, Group workshop (Meter disassembly and assembly, Operation of metal detector and leak detector), quiz

In the area of non-revenue water management (commercial losses), training materials were created for each module, with the basics, customer meter accuracy verification, meter reading techniques, data entry and checking skills, and illegal connection control as separate areas.

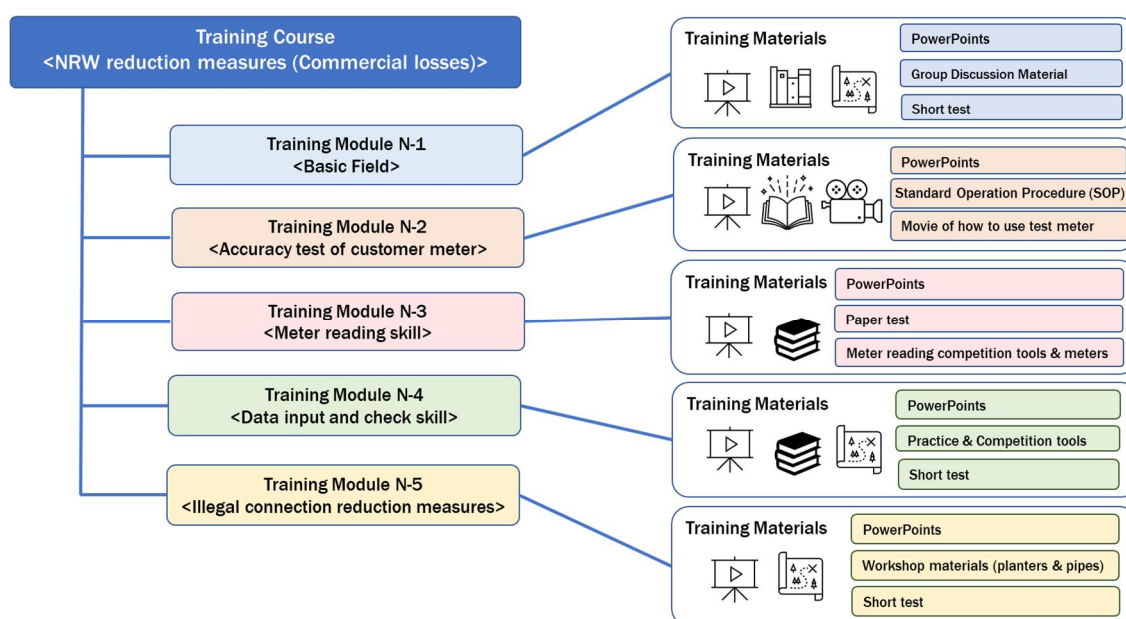


Figure 3.2.5 Composition of internal training module in NRW reduction measure

Through the training to date, the following candidate instructors were selected for internal training on non-revenue water reduction measures (commercial losses).

Table 3.2.2 Candidate trainers for internal training on Non-revenue Water Management

Module	Name	Organization* ¹	Position
Basics of NRW	Mr. Krishna Kumar Sah	Manager of Lalitpur Branch	Engineer (Level 8)
	Ms. Bina Maharjan	Manager of Kirtipur Branch	Engineer (Level 8)
	Mr. Akrur Nath Sharma	Planning & Support Department, Head Office	Engineer (Level 7)
	Mr. Pravin Bhurtel	Madhapur-Thimi Branch	Overseer (Level 5)
	Mr. Amardip Kumar Sah	Tripureshwor Branch	Overseer (Level 5)
Meter accuracy testing techniques	Mr. Hem Bahadur Budhathoki	Manager of Bhaktapur Branch	Engineer (Level 7)
	Mr. Umesh Kumar Mehata	Electromechanical Dept.	Engineer (Level 7)
	Mr. Akrur Nath Sharma	Planning & Support Department, Head Office	Engineer (Level 7)
Meter reading techniques	Mr. Puspa Raj Dahal	Baneshwor Branch	Supervisor (Level 5)
	Mr. Purna Karki	Bhaktapur Branch	Senior Meter Reader (Level 4)
	Mr. Sekhar Khadka	Bhaktapur Branch	Senior Meter Reader (Level 4)
Customer data entry/check skill	Mr. Surya Bahadur Khatri	Finance Section, Wastewater Operation Division	Account Officer (Level 7)
	Mr. Kapil Karki	IT Section	Overseer (Level 5)
	Ms. Shakuntala Khanal	Maharajgunj Branch	Assistant Finance Officer (Level 6)
	Mr. Janak K C	Madhyapur-Thimi Branch	Senior Meter Reader (Level 4)
Illegal connection reduction techniques	Mr. Krishna Kumar Sah	Manager of Lalitpur Branch	Engineer (Level 8)
	Mr. Nabin Neupane, Maharajgunj	Maharajgunj Branch	Senior Asst. Account Officer (Level 5)
	Ms. Shalini Jha, Lalitpur,	Lalitpur Branch	Engineer (Level 7)
	Mr. Udaya Acharya, Baneshwor,	Maharajgunj Branch	Overseer (Level 5)
	Mr. Buddha Ram Mahjarjan* ²	Kirtipur Branch	Assistant Technical Officer (Level 6)
	Mr. Kiran Giri* ²	Kirtipur Branch	Assistant Finance Officer (Level 6)

Note *1: Organization as of Dec 2023

Note *2: Equipment Tutor

The following is a summary of the TOT training conducted during the second phase of the project.

(1) Basic training on Non-revenue Water Management

The basic training TOT was conducted in December 2022. This basic training is not a practical or specific training course, but is intended to provide basic knowledge on the definitions, problems, and solutions for non-revenue water and commercial losses, and to promote a better understanding of non-revenue water in general. The training, led by the JICA Expert Team, consisted of classroom lectures, group discussions, and quizzes for about 20 participants in one day.

After this training, two additional basic trainings about non-revenue water control were conducted in December 2022 in both Tripureshwor and Mahankalchaur branches, hosted by the managers of both branches. The branch manager served as the lecturer, and the materials were based on the PowerPoint presentation prepared by a JICA expert and revised for ease of use by the lecturer. Both training sessions were very productive, with many questions and comments from the participating meter readers and a lively exchange of opinions.

Thus, the basic training by the JICA Expert Team has had a significant impact among KUKL staff, and the prompt organization of similar basic training at the initiative of the branch director, are major achievements in terms of capacity building and self-sustaining development of KUKL staff.

[Photograph] Training of Trainers (TOT) on Basics of Non-revenue Water

		
<p>Basic training on NRW management (Commercial Losses) (11/Dec/2022)</p>	<p>Opening Remark (11/Dec/2022)</p>	<p>Group Discussion (11/Dec/2022)</p>
		
<p>Awarding of Certificate of Completion (11/Dec/2022)</p>	<p>Additional training KUKL branch manager at Tripureshwor branch (14/Dec/2022)</p>	<p>Additional training KUKL branch manager at Mahankalchaur branch (22/Dec/2022)</p>

(2) Meter accuracy test techniques

The Training of Trainers (TOT) for water meter accuracy test techniques was conducted in May 2023 during Term-2. Using portable test meters distributed to the nine KUKL branches as equipment provided by JICA, lectures on the following topics were held in collaboration with the JICA Expert Team and KUKL staff.

- How to use a portable test meter
- Importance of ensuring meter accuracy
- Meter Accuracy vs. Commercial Losses
- Criteria for determining meter error
- Proper installation of meters, etc.

After the lecture, practical training on meter error measurement was conducted using the "Meter Inspection Training Yard" (planned and designed by the JICA Expert Team, procured and installed by KUKL), which was set up on the premises of the Mahankalchaur Branch Office, and a test to confirm understanding was conducted at the end. The results of the test are shown below:

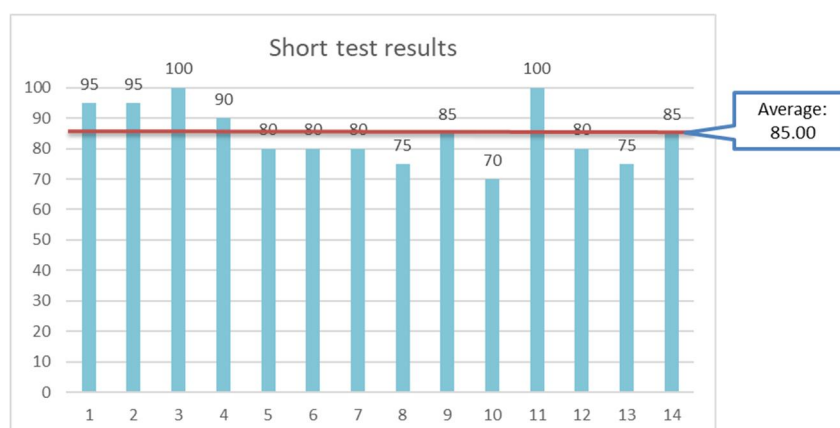


Figure 3.2.6 Quiz results from the training on water meter accuracy test techniques

The average score for the quiz was 85, with the lowest score being 70 and the highest being 100. Although there were differences in the level of understanding, overall, the lecture content was generally understood. In the training, the laminated Standard Operating Procedures (SOPs) and videos were utilized as teaching materials, in addition to PowerPoint documents.

Subsequently, in August 2023, an internal training for staff who had not participated in the previous TOT was conducted at the initiative of KUKL staff. The staff members who served as instructors were able to prepare materials, smoothly explain lectures, communicate with trainees, and answer questions without assistance from JICA experts.

The results of the quiz showed that the trainees had a sufficient understanding of the training, and that the staff members who served as instructors were fully capable of conducting the training.

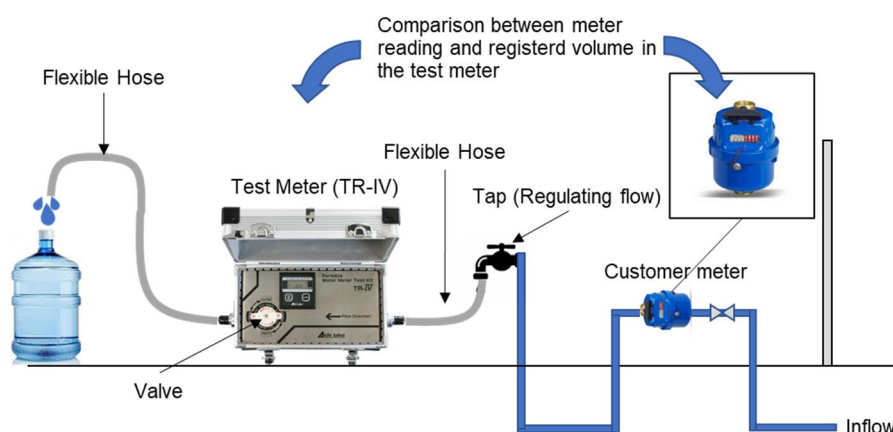


Figure 3.2.7 Setting Image of Portable Test Meter

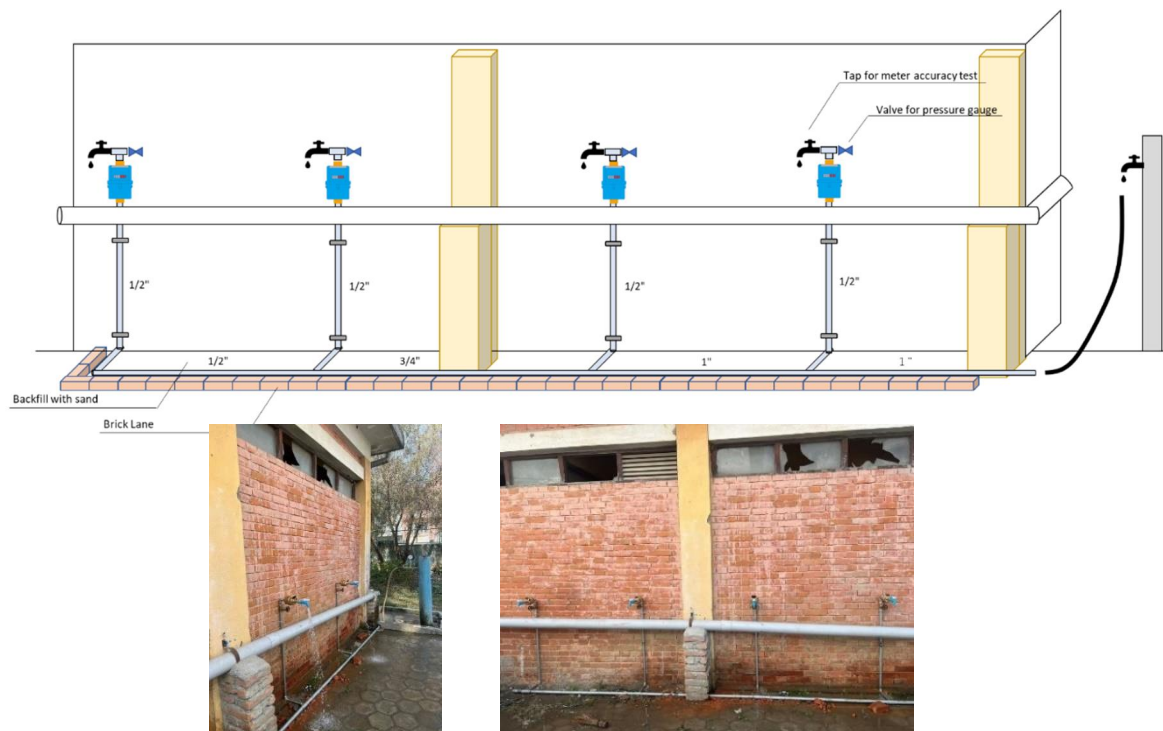


Figure 3.2.8 Training Field for Meter Accuracy Test

[Photograph] Training of Trainers (TOT) on Meter Accuracy Test Techniques

<p>Lecture in TOT about meter accuracy</p>	<p>Setting of Test Meter</p>	<p>Practice of measurement of meter error</p>
<p>Practice of measurement of meter error</p>	<p>Achievement quiz</p>	<p>Closing remarks</p>

(3) Meter reading techniques

Training of Trainers (TOT) on Meter Reading Techniques was conducted in June 2023 during Term-2 with the following objectives:

- KUKL staff understand the importance of accurate meter reading in commercial loss prevention.
- Improve the meter reading skills of meter readers at each branch office.

The training was conducted throughout the day in the training room of the Mahankalchaur branch office, with a total of 20 participants from each branch office.

In addition to classroom training, the program also included a paper test to select the correct meter reading by looking at pictures of various meters, a meter reading competition, and medals for those who excelled in the competition, among other measures to motivate trainees.

All trainees moved desks and chairs before and after the competition, and Action Team members from Output 2 and Output 5 were actively involved as lecturers, general moderators, competition venue set-up, competition officials, etc., which enabled the training session to end smoothly.

The average score for the paper test was 94.15, and the average correct score for the council was 91.4. Although some were less accurate in reading meter readings to whole numbers, the overall correct score was high.

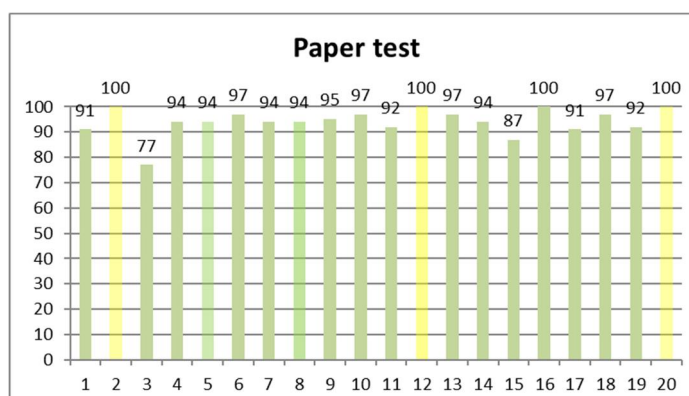


Figure 3.2.9 Result of paper test in the training on meter reading techniques

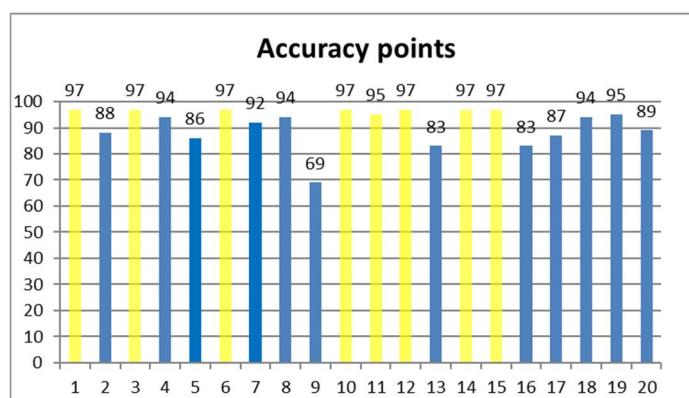


Figure 3.2.10 Meter Reading Skills Competition Score

[Photograph] Training of Trainers (TOT) on Meter Reading Techniques

		
Lecture by Lalitpur Branch Manager	Paper Test	Competition
		
Scoring by persons in charge	Competition of meter reading Start position (Right) End position (Left) Behind is a waiting area	Competition of meter reading
		
Competition of meter reading	Closing Ceremony	Closing Ceremony

(4) Ability to enter/check data into customer database

According to KUKL's business process, meter reading results are reported to each branch office by meter readers, and the results are entered into the customer database by the data entry staff at the branch office to generate the bill.

This project proposed and implemented a training in data entry/check skill with the aim of improving data entry and checking capabilities.

The Training of Trainers (TOT) was conducted in June 2023 during Term-2 and its contents are described below.

- Lecture on the importance of accurate data entry and checking and the impact of data entry errors on non-revenue water
- Q&A session on the operation of the customer database (Bsmart) (answered by IT Section staff)
- Data entry/checking practice and competition for the same

➤ Achievement tests, etc.

For the practice and the competition, three computers were prepared with Excel files saved that were made to resemble Bsmart. The trainees were divided into three groups, and each group entered and checked the results of 100 fictitious meter readings into an Excel file while looking at a sheet of paper made to resemble an actual meter reading entry form and handwritten on it.

In order to encourage a positive attitude among the trainees, a data entry/checking skills competition was held to compete in terms of percentage of correct answers and time required.

In the practice, some groups made careless mistakes, such as one wrong line in the input section, and all groups were unaware that they had overstated water usage due to a meter reading error and stated incorrect results without asking questions of the staff member who played the role of meter reader.

On the other hand, in the competition using real meters, all groups answered all questions correctly, and their ranking was determined solely by the time required, with the first-place group receiving a certificate of commendation.

Lecturers were selected from JICA experts and Action Team members for Output 2, and there was active involvement by KUKL staff, with Supporting Members providing answers to questions.

[Photograph] Training of Trainers (TOT) on Reading Data Entry/Check Skill

		
<p>Lecture by Mr. Surya Bahadur</p>	<p>Q%A with staffs of IT Section</p>	<p>Practice of data entry</p>
		
<p>Practice of data entry</p>	<p>Competition</p>	<p>Competition</p>

(5) Control of Illegal Connection

According to information provided by KUKL, there are illegal connections that bypass the pipes before and after the meter, the lack of systematic illegal connection measures, and the problem of illegal residents.

The Training of Trainers (TOT) on the control of illegal connections was conducted in July 2023, with the aim of helping participants understand the importance of controlling illegal connections and learn the necessary measures. Its contents are as follows.

- Importance of control of illegal connections and measures to reduce illegal connections (lecture)
- Examples of illegal connection measures implemented by KUKL in the past (lecture)
- Group workshop
- Achievement tests, etc.

The group workshop included meter disassembly work to understand the mechanism of water meter, and hands-on operating experience of a metal pipe detector and a leak detector. The action team members of Output 2 and Output 5 were actively involved in this workshop as lecturers, moderators, and helpers of the hands-on experience session, and were able to smoothly implement the training.

The experience of operating the equipment to detect the location of hypothetical illegal buried pipes (metal pipe detectors and water leak detectors) aroused participants' interest particularly. Initially, it was envisioned that each group would experience the operation for a short period of time, but based on the interest and wishes of many participants, this was changed so that everyone could experience the two devices.

Subsequently the participants were asked to write their answers to the six choices of buried pipe locations on a piece of paper, and the results showed that eight (44% of 18 respondents) answered correctly for metal pipe detection, four (22% of 18 respondents) answered correctly for leak detection (non-metallic pipe detection), and three (17% of 18 respondents) answered both of them correctly.

Although detecting buried pipes with a leak detector was considered quite challenging, 22% of the participants answered correctly, which was an unexpectedly good result. The equipment used was provided to KUKL in the past, and this training also provided an opportunity to encourage the active use of these devices.

[Photograph] Training of Trainers (TOT) on Illegal Connection Control

		
Lecture by Akrur Nath Sharma	Lecture by Krishna Kumar Sah	Disassemble of water meter
		
Introduction of metal pipe detectors and leak detectors	Experience operating a leak detector	Experience operating a leak detector
		
Experience operating a metal pipe detector	Achievement test	Awarding of Certificate of Completion

The results of the achievement test are shown below. The highest score was 95, the lowest was 70, and the average score was 84.7, indicating a generally good level of understanding.

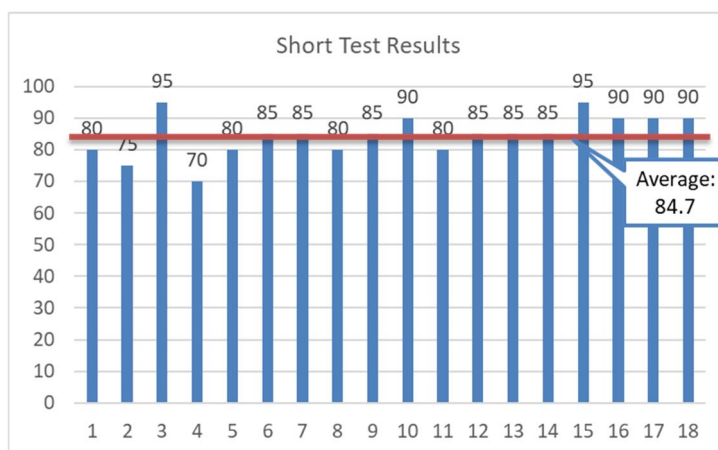


Figure 3.2.11 Result of achievement test of Illegal Connection Control

(6) Conducting the internal training

As mentioned above, the training of trainers (TOT) of Output 2 showed a good progress, then internal training was started conducted in August 2023 for meter accuracy test and in December 2023 for the basics of non-revenue water.

1) Meter accuracy test

Internal training on meter accuracy test was conducted on August 15-16, 2023. The target staff for this training was meter readers and their supervisors, and all lectures were given by KUKL staff.

- Definition of non-revenue water and components of commercial losses and basic measures

Instructor: Bina Maharjan (Manager of Kirtipur Branch)

- Importance of meter accuracy control and how to check it

Instructor: Akrur Nath Sharma (Planning & Support Dept.)

Both instructors were able to smoothly provide explanations through interactive communication in the form of asking questions to the participants, confirming that they have sufficient competence as instructors. After the classroom lecture, participants worked in groups of four to practice installing portable test meters, measuring water volume, and calculating meter accuracy. In this training, there were approximately two participants per group to ensure that everyone was able to perform the tasks.

[Photograph] Internal Training on Meter Accuracy Test

		
Lecture by Akrur Nath Sharma	Lecture by Bina Maharjan	Practice of test meter installation
		
Practice of meter error measurement	Practice of meter error measurement	Awarding of Certificate of Completion

2) Basics of non-revenue water

An internal training course for the basics of non-revenue water was conducted on December 5, 2023. Based on the pre-determined division of roles, the Training and Research Section and the instructors coordinated mutually under the support of the JICA Expert Team, and the entire process from preparation to training went smoothly.

- Factor of non-revenue water (commercial losses) and basic measures

Instructor: Krishna Kumar Sah (Manager of Lalitpur Branch)

- Non-revenue water (commercial losses) in the KUKL service area

Instructor: Akrur Nath Sharma (Planning & Support Dept.)

- Practical calculation of NRW ratio, roles and responsibility toward reduction of Non-revenue water

Instructor: Bina Maharjan (Manager of Kirtipur Branch)







The training target group consisted of 19 participants (one absent), including a staff member hired in November 2023. The instructor was able to smoothly conduct the training in a relaxed atmosphere, asking questions to the participants and incorporating innovations to keep them interested.

The time required for lectures was properly managed, and easy-to-understand lectures were provided not only through presentations, but also through the use of whiteboards to show examples of calculations, with participants taking frequent notes.

In the group discussions, core members were present in each group to provide advice, which encouraged lively discussions.

The results of the quiz to measure the level of understanding averaged 84 points (minimum 75 points, maximum 95 points), confirming the trainees' adequate level of understanding.

[Photograph] Internal Training on Basics of Non-revenue Water

		
Lecture by Krishna Kumar Sah	Lecture by Akrur Nath Sharma	Lecture by Bina Maharjan
		
Group discussion	Achievement test	Awarding of Certificate of Completion

(7) Technical transfer through regular meetings with the Action Team (core members)

In Output 2, JICA Expert Team held regular weekly and bi-weekly meetings with the Action Team (core members) during their stay in the field. In addition to discussing how to proceed with activities and the direction and content of training, the meeting also included a free Q&A session and technology transfer based on the PowerPoint material of the proposed training course.

Since these meetings are also included in "Activity 2-3 Training on non-revenue water management

", a summary of the regular meetings to date is organized below.

A total of 134 staff members have received technical transfers via PowerPoint materials through these meetings (number of participants in the lectures indicated by bold underlines in the table below).

Table 3.2.3 Regular meeting with Output 2 Action Team

Date	Target	Contents
27/Aug./2021	7 persons Output 2 Action Team	[Online lecture] Details of activities related to Output 2 and equipment and materials to be procured by JICA Expert Team
3/Sep./2021	21 persons Output 2 Action Team and Supporting Member	[Online lecture] <u>Lecture and discussion on non-revenue water components and commercial losses</u>
10/Sep./2021	23 persons Output 2 Action Team and Supporting Member	[Online lecture] Explanation and consensus building on the proposed division of roles between headquarters and branch offices regarding non-revenue water
17/Sep./2021	20 persons Output 2 Action Team and Supporting Member	[Online lecture] Explanation and consensus building on the proposed division of roles between headquarters and branch offices regarding non-revenue water, <u>PowerPoint presentation of new connection application requirements in Japan and overseas</u>
24/Sep./2021	12 persons Output 2 Action Team and Supporting Member	[Online lecture] Explanation and exchange of opinions on PDM evaluation indicators for Output 2
24/May/2022	17 persons Output 2 Action Team and Supporting Member	[Online and Face-to-face lecture] How and when to train for Output 2, Work Plan (Term-2)
9/June/2022	9 persons Output 2 Action Team / Supporting Member	[Face-to-face lecture (From then on, all are face-to-face)] Subjects and timetables for basic training and TOT courses (meter reading, meter accuracy verification, data entry/verification, and illegal connection countermeasures), venue and setup plans for meter reading competitions, and plans for hydrants for meter accuracy verification training
21/June/2022	6 persons Output 2 Action Team (6)	<u>Explanation of the case of PWSA (Phnom Penh Water Supply Authority): a successful example of water utility management improvement</u> , Progress check of TOT training preparation
29/Nov./2022	8 persons Output 2 Action Team (6) and Output 5 Staff (2)	Preparation for basic NRW training, <u>Explanation of 2 PowerPoint Materials</u> , Q&A
6/Dec./2022	10 persons Output 2 Action Team (8) and Output 5 Staff (2)	Preparation for basic training, dates and trainees for four instructor development trainings in June and July of the following year, etc., <u>Explanation and discussion of draft manual for illegal connection measures</u>
20/Dec./2022	8 persons Output 2 Action Team (8)	Reflections on the basic training and an overview of the four TOTs for the following year, <u>Details of Meter Reading Training TOT (PowerPoint presentation on the day of the training, competition methods, officers, etc.)</u> , Explanation of the draft table of contents of the maintenance plan to keep the NRW rate low.
17/May/2023	12 persons Output 2 Action Team / Supporting Member (10) and Output 5 Training Staff (2)	4 TOT preparations at the time of this dispatch, Timetable, <u>PowerPoint presentation, and Q&A session for the Meter Accuracy Confirmation TOT</u> , Role of core members and calculation of NRW rate in DMA 4.1.2
1/June/2023	13 persons Output 2 Action Team / Supporting Member (12), Output 5 Training Staff (2)	Reflections on <u>meter accuracy confirmation TOT</u> , etc., Confirmation of the schedule, trainees and timetable for the Meter Reading Training TOT, and assignment of core member roles, <u>Explanation and Q&A session on the revised PowerPoint presentation</u> .
13/June/2023	6 persons Output 2 Action Team (6)	Reflections on meter reading training TOT, etc., Confirmation of the schedule, trainees and timetable for the <u>Data Entry and</u>

Date	Target	Contents
		<u>Checking Technology TOT</u> , assignment of core member roles, <u>explanation of the PowerPoint presentation and Q&A session.</u>
27/June/2023	9 persons Output 2 Action Team (7) and Output 5 Training Staff (2)	Reflections on data entry and checking technology TOT, etc., Confirmation of the schedule, trainees and timetable of the <u>TOT against illegal connections</u> , assignment of roles of core members, <u>explanation of the PowerPoint presentation and Q&A session.</u>
12/July/2023	10 persons Output 2 Action Team (8) and Output 5 Training Staff (2)	Reflections on the TOT for illegal connection measures, etc., overview and discussion of internal training, schedule and timetable for internal training in basic areas, <u>explanation of proposed OJT activities in DMA 4.1.2 (PowerPoint)</u> , etc.
30/July/2023	7 persons Output 2 Action Team (5), Output 1 Action Team (1) and Output 5 Training Staff (1)	Explanation of the procedure for calculating the non-revenue water rate in DMA 4.1.2 and rehearsal of internal training (meter reading) by KUKL
20/Aug/2023	10 persons Output 2 Action Team (8), Output 1 Action Team (1) and Output 5 Training Staff (1)	Progress and future work on the calculation of non-revenue water rates for DMA 4.1.2, reflections on meter reading training, etc.
22/Aug/2023	11 persons Output 2 Action Team (8), Output 5 Training Staff (1) and others (2)	Long-term plan for internal training, Timetable for internal training on basics of NRW, Selection of instructors, Explanation of estimated NRW ratio in DMA 4.1.2, <u>Explanation of OJT methods (PowerPoint) for maintenance plans that keep non-revenue water ratio low in the DMA.</u>

3.2.5 [Activity 2-4] Prepare maintenance plan for maintaining NRW ratio low.

The maintenance plan to keep the non-revenue water ratio low is supposed to be applied in the water distribution network to be constructed by DNI project. The following outline was explained in the regular meeting with the Output 2 Action Team, and it was agreed that the plan would be revised as necessary during future OJTs.

Maintenance Plan for Maintaining NRW Ratio Low

Maintenance Plan to Keep Low NRW Ratio in Each DMA in the Short-Term

Maintenance Plan for Maintaining NRW Ratio Low in the Medium & Long Term

1. Components of NRW Commercial Losses

2. Accurate customer water meters

- (1) Importance of accurate meter
- (2) Periodical replacement of customer water meters
- (3) Check and replacement of customer water meters
- (4) Improvement of meter installation condition

3. Accurate meter reading

- (1) Reduction of meter unread billings
- (2) Improvement of meter reading skill
- (3) Incentive/management of meter readers

4. Updated Customer Database

- (1) Check and correction of meter reading data, data input, and bill preparation
- (2) Customer visiting / hearing investigation to update the database

5. Illegal Connection Countermeasures

- (1) Incentive to the Staff of KUKL based on Their Performance
- (2) Voluntary Disclosure (e.g., Tax Amnesty)
- (3) Ask Cooperation to Community Leaders
- (4) Legal Arrangements (delivery of reminder letter, accompany with policeman, etc.)

6. Continuous trainings for the staff related to commercial loss reduction

Initially, activities based on the above maintenance plan were planned to be implemented in the second half of 2023, but by the end of Term-2, the completion of the DMAs and its handover to KUKL have not progressed as planned. Considering these external conditions, the following activities will be implemented in Term-3 while confirming the future progress of the DNI project.

**[Activity 2-5] Implement maintenance plan (prepared by Activity 2-4) for maintaining NRW ratio low
(Before implementation)**

3.2.6 [Activity 2-6] Calculate NRW ratio monthly.

In Term-2, training on how to calculate the non-revenue water ratio was provided during the TOT on Basics of non-revenue water in December 2022.

If there is no significant progress in the completion and delivery of the water distribution management area (DMA) by the end of Term-2, this activity should be implemented in Term-3.

However, since the DMA 4.1.2, prior to handover, switched to water supply through a new distribution network, the pilot work began with the collection and analysis of bulk meter readings and customer meter reading (consumption) data necessary to calculate the non-revenue water ratio. The knowledge gained here can be used for the same work in other DMAs that are scheduled to be delivered in the future.

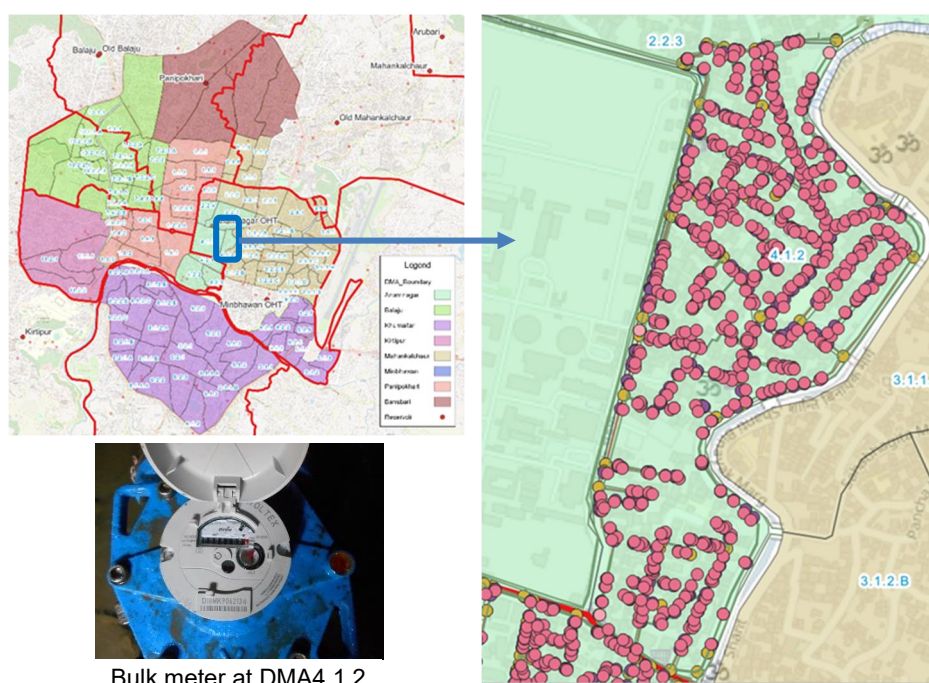


Figure 3.2.12 Location of DMA4.1.2

Bulk meter reading has been conducted once a month, around the beginning of each month of Bikram Calendar, with staff from the Baneshwor Branch, which manages the DMA4.1.2.

A list of customers within DMA 4.1.2 was extracted from the provisional GIS data in June 2023 and compared to the billed water volume data for such customers obtained through the IT Section.

However, while the GIS data shows 570 customers, the IT Section data had only 435, a discrepancy of more than 100 cases was identified. This is due to the fact that there are customers whose customer ID are not registered in the GIS data or whose customer ID are registered incorrectly, and the data does not correspond when the customer numbers are extracted from the billing system based on the customer numbers. Subsequently, together with the IT Section and the Baneshwor Branch which manages customers in DMA 4.1.2, the DMA customer ID were checked one by one, and finally 521 customers using water service were identified.

In cases where customer numbers are not registered in the GIS data, water pipes have been laid, but water service has not started because the contractor registration has not been completed. They are potential customers who may use KUKL's water supply in the future and will be added to the customer list after they start using the water supply.

The meter reading dates from the historical billed water volume data based on the DMA 4.1.2 customer list updated above can be organized as follows.

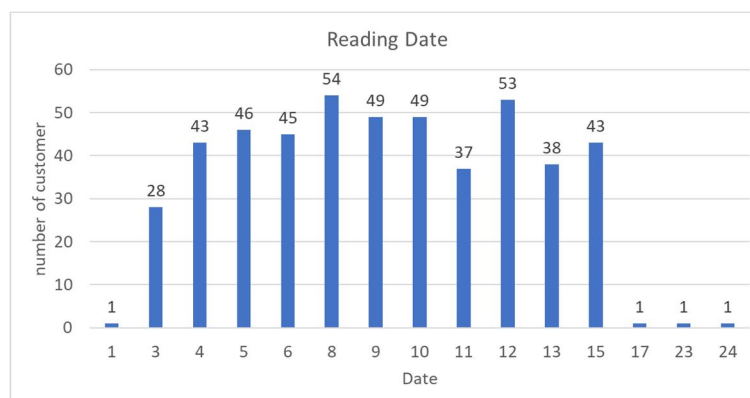


Figure 3.2.13 Meter reading date in DMA4.1.2

Almost all customers' water meters are read in the first half of each month, and the average of all customers' meter reading dates within DMA 4.1.2 is calculated to be the 9th of each month (Vikram calendar). Therefore, in principle, the bulk meter reading date is set on the 9th of each month to align with the meter reading interval, and the billed water volume obtained from the meter reading results is treated as the previous month's water consumption.

Since the meter reading interval and the period of water distribution measurement never coincide perfectly, the monthly non-revenue water rate is not important, and the non-revenue water ratio should be evaluated by a moving average over several months.

The immediate challenge is to reduce the number of customers who are not billed by meter reading (Unmetered customers), which should be addressed by the Baneshwor Branch.

Table 3.2.4 NRW ratio in DMA4.1.2

Reporting Month	Asadh 2080	Shrawan 2080	Bhadra 2080	Ashwin 2080
Bulk reading interval on Gregorian Calendar	June 16, 2023 - July 17, 2023	July 17, 2023 - Aug 26, 2023	Aug 26, 2023 - Sep 26, 2023	Sep 26, 2023 - Oct 29, 2023
Interval of bulk meter reading (days)	31	40	31	33
Distributed water volume (m ³)	8,179	10,808* ³	7,486	7,716
Billing water volume (m ³)* ¹	4,120	5,714	6,006	5,160
Un-billed water volume (m ³)	4,059	5,094	1,480	2,556
Non-revenue water ratio (%)	49.6	47.1	19.8	33.1
Moving average of Non-revenue water ratio (%)	38.5 (13189/34189)			
Number of customers	489	489	491	491
Status of customer's meter				
Number of metered customers	382	385	391	384
Number of unmetered customers* ²	107	104	100	107
Reading rate (%)	78.1	78.7	79.6	78.2

Note *1: Billed water volume for unmetered customers is counted at zero.

Note *2: Main reasons for unmetered customers are “door locks”, “meter already removed”, or “meter reading mistake”.

Note *3: Bulk meter reading intervals are greater than other months (40 days).

The above-mentioned non-revenue water data is the value immediately after the start of the calculation, and the validity of this figure cannot yet be determined. The actual situation will be revealed in more detail through continued monitoring over the next several months, but the following points should be noted at this time.

- Water inflow to DMA 4.1.2 from mid-June to mid-July 2023 (Asadh 2080) is lower than the previous month because the Melamchi Water Diversion Tunnel was shut down on June 27 and the switch of water intake to the Bagmati River, an alternative water source, began on July 14, 2023.
- Approximately 20% of the billed water volume data are cases where the water meter cannot be checked or the meter itself is not available, and the billed water volume for these customers is counted as zero. Therefore, the billed water volume in the table above is considered to be lower than the actual value.
- DMA 4.1.2 has not yet been completed and the official delivery date has not yet been determined. The reason for this is not clear.
- In December 2023, the manager of Baneshwor Branch made a list of DMA 4.1.2 customers and provided it to the JICA Expert Team, with a total of 551 customers. This list was created based on meter reader information and meter reading routes, and is considered the most accurate.

- In DMA 4.1.2, water supply is also being provided by the old distribution pipes because closing the existing old pipes would stop water supply in some areas of the adjacent DMA. Therefore, as of December 2023, there is a mix of old and new water meter readings.

The completion of the DMAs through DNI project has been delayed significantly and the handover of GIS data to KUKL will be taking time. This risk of delay in external conditions has been assumed since the beginning of the project and the following activities for the new water distribution pipe network in the ring road will need to be implemented in Term-3.

[Activity 2-7] Head Office compiles Performance Indicators, such as amount of water production, amount of water distributed, or NRW ratio, which are collected at Branches. (Before implementation)

3.3 Record of activities related to Output 3

Output 3 The capacity of O&M of WTPs and water quality control is enhanced.

3.3.1 Direction of activities

When the water supply to the residents of the Kathmandu Valley is increased by the water conduction from the Melamchi River, the reliability of KUKL's water service will improve by eliminating the main cause of customer dissatisfaction: insufficient water supply.

On the other hand, as such improvements in water supply conditions subside over time, customer requirements are expected to shift from increased water supply volume to improved water quality. Therefore, KUKL is required to enhance its internal water quality management system before customer requirements change.

The PDCA cycle for water quality control, including the division of roles among KUKL related departments, head office, branch offices, and water quality laboratories, and water treatment plants, is shown below. JICA Expert Team will support KUKL to ensure that such PDCA cycle functions as a daily operation of KUKL in order to achieve Output 3.

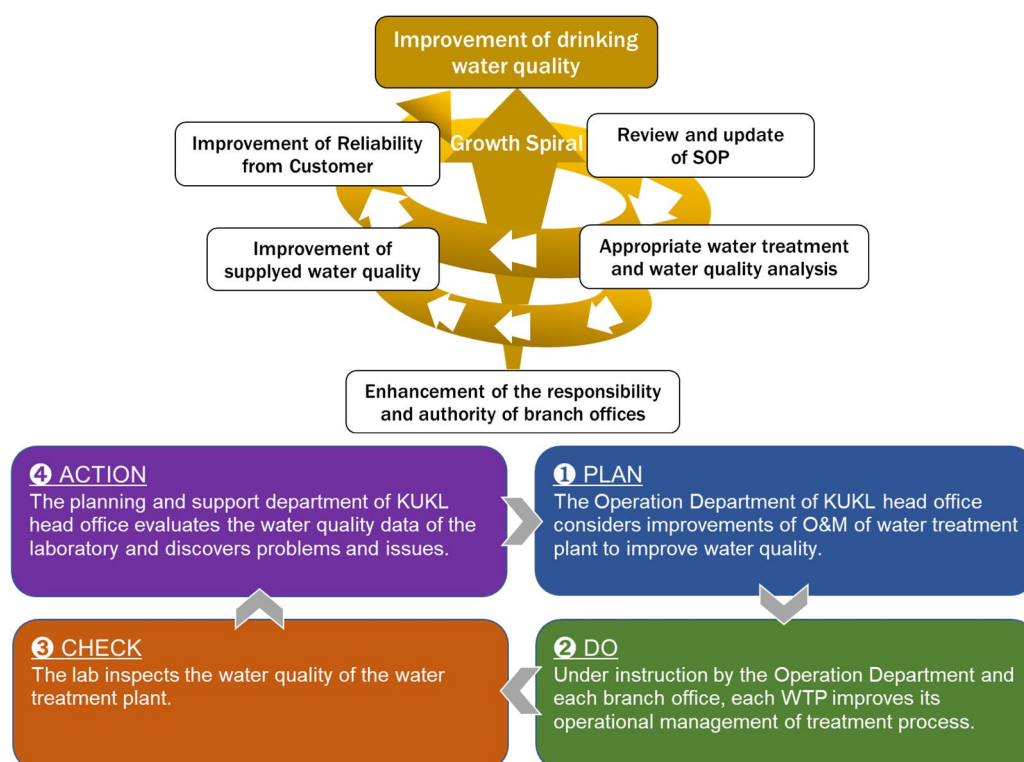


Figure 3.3.1 PDCA Cycle for Sustainable Water Quality Control

3.3.2 Selection of facilities for on-the-job training on operation and maintenance

(1) Selection of facilities for on-the-job training on operation and maintenance

The target facilities for OJT to improve operation and maintenance techniques at existing water treatment plants other than the New Sundarijal WTP were selected based on the following criteria.

- The facility allows to train in basic water treatment processes (coagulation and sedimentation, sand filtration, disinfection).
- The facility should not be automated so that the trainees can learn each operation of the water treatment process.
- Coagulation and sedimentation, sand filtration, and disinfection facilities should be operating without malfunction.
- The water treatment plant must be always in continuous operation.
- River water should be used as the water source so that the trainees can learn techniques in accordance with changes in raw water quality.

As a result of the study, among several candidate water treatment plants, it was proposed and agreed by KUKL that the Mahankalchaur WTP and the Central Water Quality Laboratory be positioned as bases for technical enhancement, and that the other existing water treatment plants be used for TOT and internal training of operators. The reasons for the selection of each of these are given below.

Table 3.3.1 Selection of facilities for on-the-job training

Target facilities	Reason of selection
Mahankalchaur WTP	<ul style="list-style-type: none"> ➤ Easy access for OJT participants as it is not far from downtown of Kathmandu. ➤ Flocculation, sedimentation, sand filtration and disinfection are manually controlled, making it suitable for learning the basics of each water treatment process. ➤ The plant receives water from river. River water tends to have large seasonal variations in water quality (especially turbidity), which makes it suitable for learning to control the water treatment process in accordance with changes in water quality.
New Sundarijal WTP	<ul style="list-style-type: none"> ➤ Since this project also aims to follow up on the water treatment plant supported by the Japanese loan, support for the operation and management of this plant should be included in the activities. ➤ This plant is expected to be responsible for the majority of the water supply within the Kathmandu Basin in the future, and proper operation of this plant is essential for a drastic improvement in the water supply situation. ➤ Unlike the existing water treatment plants, this plant is partially automated in its operation, requiring higher skills in operation management than before.
Bansbari WTP and Bode WTP	<ul style="list-style-type: none"> ➤ Those plants will continue to be used as the main water treatment plants after the completion of the Melamchi Water Supply Project. ➤ Those plants will not cover the water supply to the DNI to be served by the Melamchi Water Supply Project, but will be used to supply water to the existing water distribution areas outside the ring road.
Central Laboratory at Mahankalchaur	<ul style="list-style-type: none"> ➤ Serves as the most well-equipped central laboratory of water quality analysis laboratories owned by KUKL. ➤ Located adjacent to the Mahankartur WTP, it is easy to conduct joint sessions between the water treatment plant and the water quality analysis lab. ➤ The central laboratory has already accepted trainees and interns. With this experience, the central lab staff will be the potential candidates for future TOT and internal training instructors and this laboratory can be expected to serve as the core of the organization ➤ The laboratory is spacious and has a conference room, making it easy to hold lectures and practical training with a large number of people.

In addition, the following improvements were considered necessary in order to use the Mahankalchaur WTP for OJT.

- Installation of flow measurement facilities for raw water
- Installation of a chemical dosing system with appropriate adjustment of the dosing rate (flocculant, slaked lime, chlorine)

Regarding flow measurement, it was considered feasible to implement OJT by procuring an ultrasonic flow meter and ascertaining the typical seasonal inflow of water.

On the other hand, the chemical injection facility needs to be renovated to enable metered dose injection. As a result of discussions with KUKL related departments, it was confirmed that KUKL itself is capable of carrying out the rehabilitation work.

(2) Rehabilitation of chemical dosing facilities in the Mahankalchaur WTP

The JICA Expert Team provided various assistance to KUKL in implementing on-the-job training at the existing water treatment plants, including capacity building work to correct problems with pumps, chemical injection pipes, and other equipment.

One of the improvements was to accurately measure the coagulants injected into raw water.

At the Mahankalchaur WTP, a target facility in the OJT, the coagulants were injected by metering pumps at the time of construction, but at the start of the project they were out of order and abandoned, and the manually mixed solution was being added by gravity flow.

For this reason, the JICA Expert Team proposed that the dissolution tanks be properly utilized, prepared with solutions of a defined concentration, and improved to be maintained in such a way that they can be injected both by gravity flow and through a line via a pump.

During activities in Term-2, necessary equipment was purchased in KUKL's budget while supporting equipment selection and piping layout studies, and as of December 2023, Mahankartur's chemical dosing was ready to be properly implemented.

Furthermore, at the chlorine dosing facility, a rotameter was installed in the gravity flow line to measure the amount of chlorine injected, although the pump was out of order.

Along with this series of facility improvements, JICA Expert Team provided the practical guidance necessary for maintenance and operation. The main contents of the guidance are as follows:

- Disassembly/cleaning when rotameter malfunctions due to hard-to-dissolve components
- Compare rotameter readings to actual flow rates and create conversion tables
- Comparing the indicated value of the pump's adjustment dial with the actual flow rate and creating a conversion table
- Creating a conversion table to calculate raw water inflow from weir depths

[Photograph] Target facilities for On-the-Job training

		
<p>[Mahankalchaur WTP] Flocculation Basin</p>	<p>[Mahankalchaur WTP] Chemical Mixing Room</p>	<p>[Mahankalchaur WTP] Chemical Dosing Room</p>
		
<p>[Mahankalchaur WTP] Sedimentation Basin</p>	<p>[Mahankalchaur WTP] End of Sedimentation Basin</p>	<p>[Mahankalchaur WTP] Sand Filter Basin</p>
		
<p>[Mahankalchaur] Central Water Quality Lab</p>	<p>[Mahankalchaur] Interior in the Central Lab</p>	<p>[Mahankalchaur] Jar Tester in the Central Lab</p>
		
<p>[New Sundarijal WTP] WTP01 Filter Basin</p>	<p>[New Sundarijal WTP] WTP01 (Sedimentation Basin)</p>	<p>[New Sundarijal WTP] Chlorination Room</p>

3.3.3 [Activity 3-1] Define the roles and responsibilities of WTPs, Branches, Head Office and laboratories in water quality control.

The following survey was conducted on the competence of the staff of the departments related to water quality control and the state of cooperation between the departments.

- Technical capacity of staffs
Staff recruitment, education level, and technical training within the organization
- Collaboration among relevant departments
Coordination among WTPs, coordination between WTPs and Electromechanical Department, coordination between WTPs and water quality laboratories, coordination among laboratories, coordination among branch offices for water quality control

Table 3.3.2 Current status of relevant departments related to water quality control

Items	Status and issues
Technical capacity of staffs	<p>[O&M of WTP]</p> <ul style="list-style-type: none"> ➤ While there has been a gradual increase in staff retirements/resignation related to water treatment plant operations, there has been no increase in staff. ➤ The personnel involved in water treatment plant operation belong to position level 1-4, and their basic technology level is low. In addition, there has not been an accurate transfer of technology among staff members. ➤ Staff with relatively high technical levels are already in managerial positions, such as branch managers, and are not directly involved in water treatment plant operation and management. <p>[Water Quality Analysis]</p> <ul style="list-style-type: none"> ➤ Persons who graduate universities or master's programs are employed, and their technical knowledge is high. ➤ Since there is no established system for technical training after employment, there is no improvement of skills through work experience.
Coordination among relevant departments	<p>[Coordination among WTPs]</p> <ul style="list-style-type: none"> ➤ Mahankalchaur WTP, Bansbari WTP and Bode WTP are placed under the jurisdiction of Mahankalchaur Branch, Maharajgunj Branch and Madhyapur-Thimi Branch respectively. On the other hand, the new Sundarijal WTP is under the jurisdiction of the Production Division of the Head Office. There were no staff with knowledge of operation and management of WTP at the branch offices, and problems in water treatment plant operation were not shared among different existing WTPs. <p>[Coordination between WTPs and the Electromechanical Dept.]</p> <ul style="list-style-type: none"> ➤ The normal operation of a water treatment plant can only be maintained with the repair of its mechanical and electrical equipment and the renewal of its facilities. Maintenance and management of facilities is performed by the Electromechanical Dept., but its activities do not accurately reflect the needs of the water purification plant side. <p>[Coordination among the laboratories]</p> <ul style="list-style-type: none"> ➤ Water quality labs have been installed at the Mahankartur WTP (Central Water Quality Lab), Bansbari WTP, and Bode WTP. A laboratory has also been installed at the new Sundarijal WTP. ➤ The water quality laboratory at each water treatment plant performs analytical work under the guidance of the Mahankarthur Central Water Quality Laboratory. Water quality analysis data is compiled by the Central Water Quality Lab and published in an annual report. <p>[Coordination between the labs and WTPs]</p> <ul style="list-style-type: none"> ➤ The results of water quality analysis in the laboratories are published in the annual report, but the accumulated water quality data is not being used to improve the operation and management of the water treatment plant. ➤ The technical knowledge of the water treatment plant staff (managers and operating staff) is not sufficient to reach a level where water quality data can be interpreted and used to improve operational management.

Items	Status and issues
	<p>[Coordination among different branches]</p> <ul style="list-style-type: none"> ➤ Water quality analysis equipment (turbidity meter and residual chlorine meter) has been distributed to 9 branches of KUKL and water quality analysis has been started in order to conduct a more extensive survey and improve the quality of water supply taps in Kathmandu. ➤ The 9 branches have no previous experience in water quality monitoring, so it is necessary to establish a link between branches and the central laboratory.

Based on the results of the survey, the following initiatives were promoted to promote collaboration and relationship building among departments related to water quality control.

(1) Building collaboration among departments related to water treatment plant operation

The JICA Expert Team proposed the establishment of a partnership among the Water Treatment Plants, the Electromechanical Department for the maintenance of mechanical and electrical facilities, and the Central Water Quality Laboratory that plays a leading role in water quality analysis, as described below, and obtained a common understanding within the Action Team.

Under the current KUKL organization, the Production Division does not have command authority over each branch office. Therefore, in order to formally establish the interdepartmental collaboration proposed here, the reorganization must proceed with the approval of the CEO and Board of Directors.

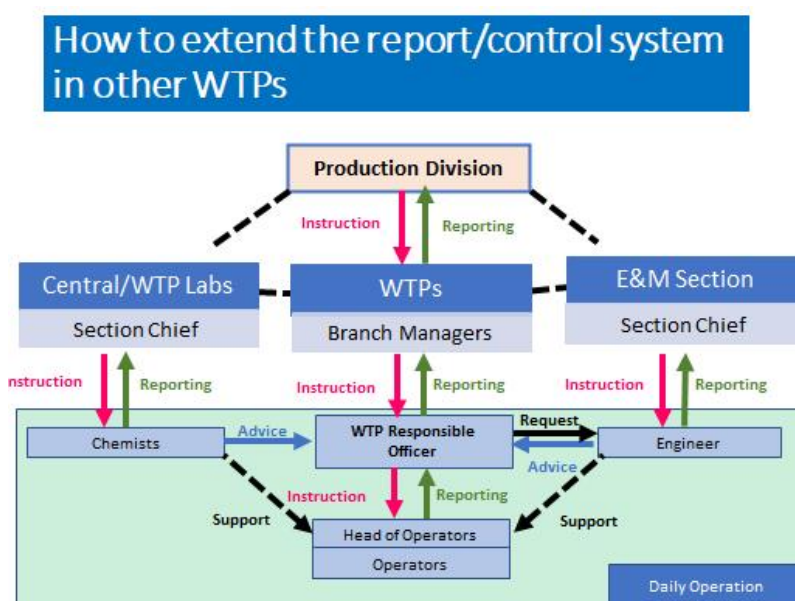


Figure 3.3.2 Collaboration among departments related to water treatment plant operation

In order to promote communication between different departments, it was agreed that monthly reporting meetings on water treatment plant operation would be held every month, and that a Water Treatment Plant Operation Monitoring Committee would be established, with meetings to be held quarterly as shown in the table below.

Table 3.3.3 Meeting and Committee for improvement of O&M of WTPs

Meeting	Items	Contents
WTP Operation Monthly Meeting	Participants	Support Division Chief, Production Division Chief, Branch Managers, Chief of WTPs, Chief of the Central Lab, Staffs of WTPs, Staffs of the Electromechanical Dept.
	Frequency	Monthly
	Theme	Report of O&M status of each WTP, Report of water quality of raw water, settled water and treated water
WTP Operation Monitoring Committee	Participants	Support Division Chief, Production Division Chief, Branch Managers, Chief of WTPs, Chief of the Central, Chief of Electromechanical Dept.
	Frequency	Quarterly
	Theme	Discussion about issues on WTP operation, Discussion about necessary support to resolve problems, Scheduling for support work

(2) Capacity building of water treatment plant operating staff

Basic technical guidance on water treatment was provided to improve the knowledge of water quality of staff involved in the operation and management of water treatment plants and to promote cooperation between water quality analysis staff and water treatment plant staff.

Water quality analysis staff and water treatment plant staff were invited to the central water quality laboratory to conduct demonstration experiments of jar tests and chlorine demand measurements, which provide important information for water treatment plant operation and management.

Subsequently, on-the-job training was provided to water treatment plant operation and management staff with the aim of improving their practical skills in water treatment plant operation based on the acquired basic knowledge of water treatment.

(3) Strengthening Cooperation with KUKL Branch Offices

In preparation for the start of water quality monitoring of water taps by the 9 KUKL branches, the JICA Expert Team provided practical training in water quality analysis to branch staff who had no previous experience with water quality analysis. In parallel with these activities, the JICA Expert Team led technical seminars on a regular basis to enhance the knowledge capacity of the staff.

The original technical seminar is now led by the C/P and is held monthly as a water quality monitoring debriefing meeting facilitated by the Central Laboratory Chief (Ms. Shailaja Adhikari) and attended by branch managers, water quality analysts, and Central Laboratory staff. Through these ongoing meetings, they have strengthened cooperation between each branch office and the central laboratory, and deepened common understanding of issues in water quality control.

3.3.4 [Activity 3-2] Conduct trainings on water treatment and water quality control.

(1) Technical seminar for O&M of WTP and Water Quality Control

Given that the travel restrictions on the Covid-19 pandemic continued after the project began, online technical seminars on the basics of operation and maintenance of water treatment plant and water quality control were held from August to December 2021.

Table 3.3.4 Objective and target staff of the technical seminar

	Seminar for Water Treatment	Seminar for Water Quality Control
Target	Chief, Supervisors and Operators of WTPs	Leaders of each water quality lab and staffs
Objective	<ul style="list-style-type: none"> ➤ Understand that the water purification process is necessary to obtain drinking water. ➤ Learn key water treatment techniques. ➤ Obtain an understanding of the main facilities and equipment of a water treatment plant. ➤ Understand the operation and maintenance of water treatment plants. 	<ul style="list-style-type: none"> ➤ Understand the meaning of each water quality indicator and the relationship between them. ➤ Understand how water quality standards are established. ➤ Understand the basic theory behind water quality analysis methods. ➤ Understand how to properly use water analysis equipment. ➤ Understand how to control the accuracy of analytical data.

Table 3.3.5 Contents of Online Technical Seminar

Time	Date	Water Treatment	Water Quality Control
1 st	4/Aug/2021	-	<ul style="list-style-type: none"> ➤ Meanings of water quality parameters ➤ Relationships between each water quality parameter (items currently tested)
2 nd	18/Aug.2021	<ul style="list-style-type: none"> ➤ Characteristics of raw water quality and required water treatment processes 	-
3 rd	25.Aug/2021	-	<ul style="list-style-type: none"> ➤ Meanings of water quality parameters ➤ Relationships between each water quality parameter (items currently tested) ➤ Relationship between water quality and water treatment plant operations and management
4 th	1/Sep/2021	<ul style="list-style-type: none"> ➤ Presentation of Operation and Maintenance Status in Water Treatment Plant by C/P 	-
5 th	8/Sep/2021	-	<ul style="list-style-type: none"> ➤ Meanings of water quality parameters ➤ Relationships between each water quality parameter (items currently tested) ➤ Relationship between water quality and water treatment plant operations and management
6 th	15/Sep/2021	<ul style="list-style-type: none"> ➤ Understanding Disinfection Facilities 	-
7 th	22/Sep/2021	<ul style="list-style-type: none"> ➤ Understandings Coagulation Facilities 	-
8 th	29/Sep/2021	<ul style="list-style-type: none"> ➤ Understandings Sedimentation Facilities 	-
9 th	11/Nov/2021	-	<ul style="list-style-type: none"> ➤ Background on determining water quality standards. ➤ Understanding WHO drinking water quality standards.
10 th	17/Nov/2021	<ul style="list-style-type: none"> ➤ Principal water treatment system, Principles of filtration, Basics of 	<ul style="list-style-type: none"> ➤ Check the draft SOP prepared by KUKL. ➤ Exchange of opinions on improvements

Time	Date	Water Treatment	Water Quality Control
		operation of facilities	to SOPs.
11 th	24/Nov/2021	-	➤ Management system of SOP ➤ Significance of SOP management and its relationship to quality control
12 th	24/Nov/2021	➤ Principal water treatment system, Principles of filtration, Basics of operation of facilities	-
13 th	1/Dec/2021	-	➤ Quality control of water quality data
14 th	16/Dec/2021	-	➤ Working schedule for revision of SOP. ➤ Quality Control of Water Quality Data (Introduction to the CAPA Process)
15 th	23/Dec/2021	-	➤ Confirmation of SOP creation schedule

(2) Various training programs conducted till date

In January 2022, after the travel restriction was lifted, various training sessions began, mainly at the Mahankalchaur WTP and the Central Water Quality Laboratory. The training consists of lectures by JICA experts and on-the-job training (OJT).

1) Training on water treatment

The training related to water treatment was divided into two sessions, depending on the duties and technical level of the target participants. The first training session is for managerial and technical staff of water treatment plants, and the second session is for operators of water treatment plants. In both training sessions, participants were divided into two groups, one for the existing water treatment plant and the other for the New Sundarijal WTP.

Since the majority of the participants in the first training session were engineers, on-the-job training was provided through actual operation at a water treatment plant, in addition to various experiments on the theory of water treatment, jar tests, chlorine consumption, etc. After the first training, candidates for future training instructors were selected from among the KUKL staff.

The second training was for water treatment plant operators, and was held at the water treatment plants to which the participants belong. This training also served as a training of trainers (TOT), with KUKL staff selected after the first training as instructors, and was conducted entirely in Nepali.

[The first session]

Comprehensive training on the following four items of water treatment was provided to managerial and technical staff of existing water treatment plants to promote capacity building of management and technical staff.

- ① Understanding water treatment process
- ② Understanding drinking water quality
- ③ Understanding several facilities of WTPs
- ④ Understanding operation method of facilities

Table 3.3.6 Program of training on operation of water treatment plant

Day	Time	Location	Contents	Training Material
1	10:00 - 11:00	Conference Room in Mahankalchaur Branch	Outline of Water Treatment Plant	PTT of WTP
	11:00 - 13:00	Central Lab	Practice of Jar test	SOP for Jar Test
	13:00 - 14:00		Lunch	
	14:00 - 15:00	Conference Room	Preparation of chemicals	SOP for PAC/Lime/ Bleaching Powder
	15:00 - 17:00	WTP	Flow measurement and preparation of chemicals	Flow/Weir, SOP for PAC/Lime/Bl. Powder
2	10:00 - 11:00	Conference Room	Review of Day 1 / Coagulation Process	PTT of WTP, WTP SOP
	11:00 - 13:00	Central Lab	Chlorine Demand Test	SOP for Chlorine Demand Test
	13:00 - 14:00		Lunch	
	14:00 - 17:00	WTP	Sedimentation Basin (Check of accumulated sludge)	WTP SOP
3	10:00 - 11:00	Conference Room	Review of Day 2 / Rapid Filtration Process	PTT of WTP, WTP SOP
	11:00 - 12:00	Central Lab	Variation of turbidity in each stage of treatment process (Measurement of turbidity value)	
	12:00 - 13:00	WTP	Sand filtration process	WTP SOP
	13:00 - 14:00		Lunch	
	14:00 - 16:00	WTP	Sand filtration process (Backwash)	WTP SOP
	16:00 - 17:00	Conference Room	Final review of OJT	

Table 3.3.7 Schedule of the 1st session of training

Date	Target of OJT	Location	Number of trainees
14-16 /Jul/2022	Chief and Engineers of Mahankalchaur WTP	Mahankalchaur WTP	7
21-23/Jul/2022	Chief and operators of Bansbari WTP	Mahankalchaur WTP	7
28-30 /Jul/2022	Chief and operators of Bode WTP	Mahankalchaur WTP	7
7-10/Jul/2023	Operator of New Sundarijal WTP (Group 1)	New Sundarijal WTP	7
14-17/Jul/2023	Operator of New Sundarijal WTP (Group 2)	New Sundarijal WTP	8
20, 23, 24, 26/Jul/2023	Managerial staffs in Head Office and Branch Offices	New Sundarijal WTP	8

Training materials for chief and engineers of water treatment plant were prepared in four areas: water treatment processes, water quality control in water treatment plants, water treatment plant facilities, and water treatment plant operation.

The training materials are still being updated, and in Term-3, video materials on water quality management, water treatment plant facilities, and water treatment plant operation and management will be created.

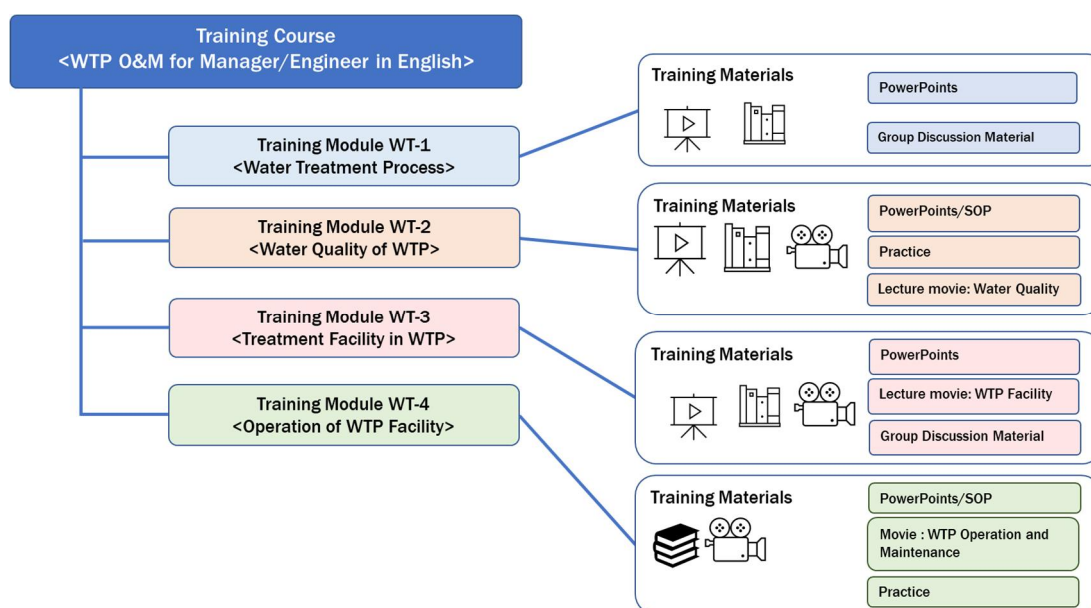








Figure 3.3.3 Composition of internal training module in the field of water treatment targeting managerial staff and engineer

[Photograph] The 1st session of training for water treatment

		
[Mahankalchaur Branch] Lecture on water treatment process	[Mahankalchaur Central Lab] Lecture on theory of jar test	Confirmation of optimal PAC dosing rate by jar test
		
[Mahankalchaur WTP] Operation of rapid sand filter	[Mahankalchaur WTP] Surface wash of rapid sand filter	[Mahankalchaur Branch] Diploma

[The second session]

In order to improve the skills of water treatment plant operators, training was conducted in Nepali language with Training of Trainers (TOT) on two important items directly related to water treatment plant operation.

- ① Understanding each facility of WTP

② Understanding operating method of each facility of WTP

Table 3.3.8 Schedule of the 2nd session of training

Date	Target of OJT	Location	Potential Trainer of KUKL staff	Trainees
4/Jul/2023	Operators of Mahankalchaur WTP	Mahankalchaur WTP	2	7
5/Jul/2023	Operators of Bansbari WTP	Bansbari WTP	2	10
6/Jul/2023	Operators of Bode WTP	Bode WTP	2	7
18/Jul/2023	Operators of New Sundarijal WTP (Group 1)	New Sundarijal WTP	1	7
19/Jul/2023	Operators of New Sundarijal WTP (Group 2)	New Sundarijal WTP	1	12

For training materials for operators of water treatment plants, "W-3 Water Treatment Plant Facilities" and "W-4 Operation of Water Treatment Plant" were prepared in Nepali, respectively (W-5 and W-6). Since the materials for operators were prepared in Nepali and lectures by KUKL staff were given in Nepali, the understanding of water treatment plant operators was highly enhanced.

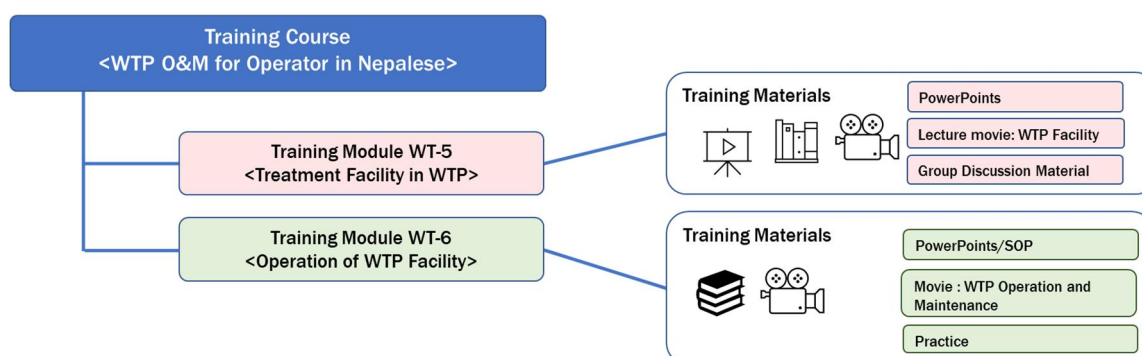
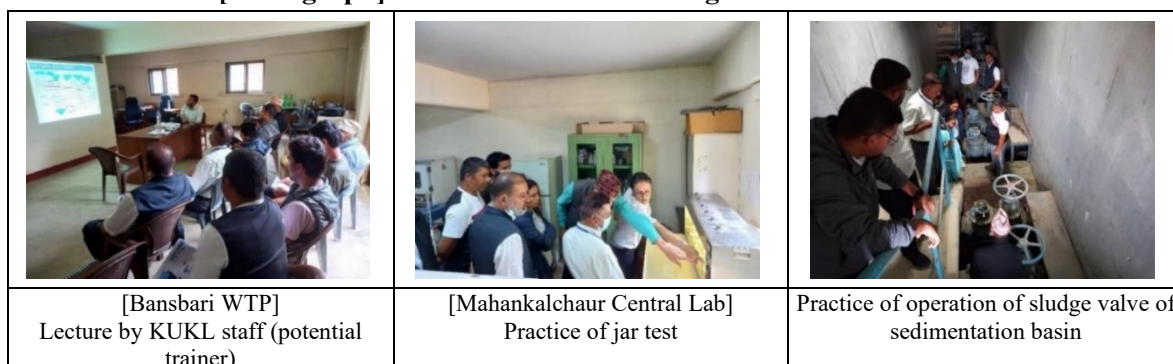


Figure 3.3.4 Composition of internal training module in the field of water treatment targeting operators and technicians

[Photograph] The 2nd session of training for water treatment



2) Training on water quality control

The main target group for training related to water quality control is laboratory staff at water treatment plants.

Basic matters related to water quality control were reviewed in the technical seminar conducted in 2021 (see previous section), and the educational materials prepared for that seminar continue to be used in this training program.

The training material is divided into four areas: "Water Quality Monitoring and WTP Operation", "Data Quality Control and SOP Systems", "Utilization of Monitoring Data" and "Operation of Monitoring Equipment". Of these, SOPs are used as teaching materials for the use of measuring instruments.

SOPs are revised as measurement methods and equipment are updated. Therefore, it is necessary to use the latest revised SOPs as teaching materials, and to continue to provide guidance to ensure that internal training is conducted each time SOPs are updated.

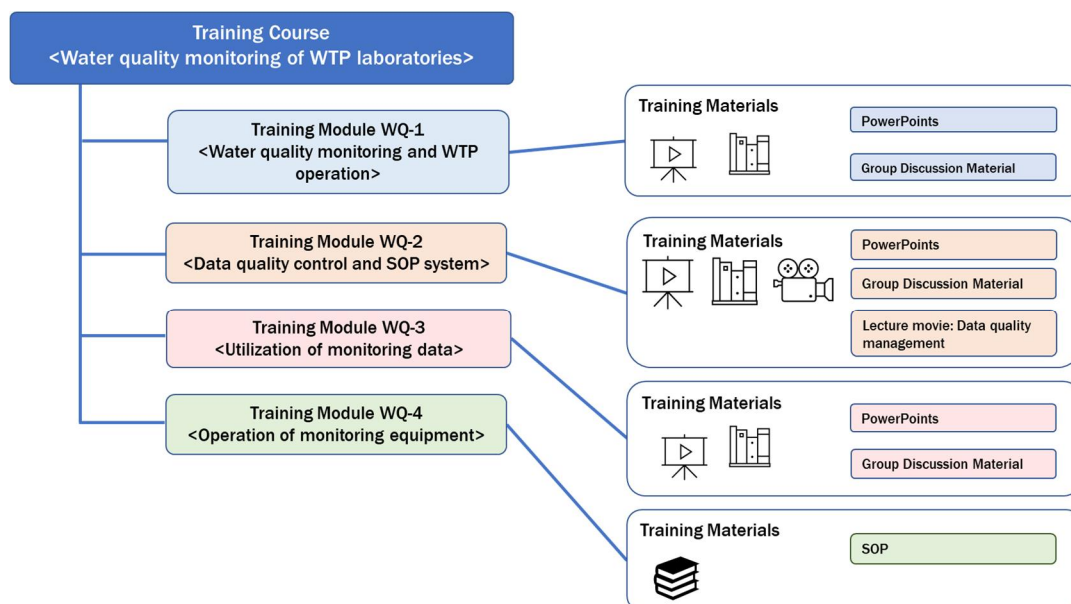


Figure 3.3.5 Composition of internal training module in the field of water quality control targeting laboratory staffs

Apart from a series of technical seminars, practical training in jar testing and chlorine consumption/requirement measurement necessary for water quality control was conducted in the central laboratory. This exercise was also positioned as a TOT and was jointly supervised by the JICA Expert Team and two potential trainers of water quality analysis.

Table 3.3.9 Schedule of training on water quality control targeting laboratory staffs

Date	Target of OJT	Location	Number of trainees
1 /Feb/2022	Staffs of Central Laboratory	Mahankalchaur Central Laboratory	3
3/Feb/2022	Staffs of Central Laboratory, Chief of Mahankalchaur WTP, Chief of Bode WTP, Chief of Bansbari WTP and other laboratory staffs	Mahankalchaur Central Laboratory	5
4/Feb/2022	Staffs of Central Laboratory, Laboratory Staffs of New Sundarijal WTP	Mahankalchaur Central Laboratory	2
7/Feb/2022	Staffs of Central Laboratory, Chief of Old Sundarijal WTP, Laboratory Staffs of New Sundarijal WTP	Mahankalchaur Central Laboratory	7
8/Feb/2022	Staffs of Central Laboratory, Laboratory Staffs of Bansbari WTP.	Mahankalchaur Central Laboratory	5
9/Feb/2022	Chief of New Sundarijal WTP and other laboratory staffs	Mahankalchaur Central Laboratory	3

Table 3.3.10 Water quality analysis experiments/training content for laboratory staffs

Date	Time	Contents	Educational Material
1/Feb/2022	10:00 - 16:00	Jar test and data analysis using Raw Water of Mahankalchaur WTP (artificially adjusted turbidity 470 NTU)	SOP for Jar Test
3/Feb/2022	10:00 - 16:00	Jar test and data analysis using Raw Water of Mahankalchaur WTP (artificially adjusted turbidity 288 NTU)	SOP for Jar Test
4/Feb/2022	10:00 - 16:00	Jar test and data analysis using Raw Water of Mahankalchaur WTP (artificially adjusted turbidity 251 NTU)	SOP for Jar Test
7/Feb/2022	10:00 - 16:00	Chlorine consumption/requirement test and data analysis using sand filtered water of Mahankalchaur WTP.	*1
8/Feb/2022	10:00 - 16:00	Chlorine consumption/requirement test and data analysis using sand filtered water of Bode WTP.	*1
9/Feb/2022	10:00 - 16:00	Chlorine consumption/requirement test and data analysis using sand filtered water of Bansbari WTP.	*1

Note *1: Since the method of chlorine consumption/requirement measurement that has been used at KUKL so far was different from the general method, the project instructed a test method referring to the Japanese Water Supply Test Method.

[Photograph] Training on water quality control targeting laboratory staffs

		
[Mahankalchaur Central Lab] Instruction by a laboratory staff	[Mahankalchaur Central Lab] Jar test	[Mahankalchaur Central Lab] Discussion about jar testing result
		
[Mahankalchaur Central Lab] Chloring consumption/requirement test	[Mahankalchaur Central Lab] Experiments by trainees	[Mahankalchaur Central Lab] Discussion about chloring consumption

For the New Sundarijal WTP, training on water treatment has continued in the form of on-the-job training since it started operation in March 2023, and there are no major problems in operation and management at the end of Term-2.

On the other hand, the staff of the laboratory adjacent to the water treatment plant had few opportunities to receive training since they were assigned to the plant, so the training was planned and conducted as a TOT in December 2023.

Table 3.3.11 Training of Trainers (TOT) for laboratory staff in the New Sundarijal WTP

Date	Time	Contents
11/Dec/2023	10:30 - 15:30	<ul style="list-style-type: none"> • Understanding of Water Quality Control and Nepal's National Water Quality Standards • Understanding of SOPs created by the project • Roles and responsibilities of laboratory staff • Visit to the laboratory and plant
12/Dec/2023	10:30 - 15:30	<ul style="list-style-type: none"> • Lecture (Physic-chemical parameters) • Lecture (Microbiological parameters) • Practice (Biochemical media and microbiological tests) • Practice (Titration: Hardness, Alkalinity, Chlorine)
13/Dec/2023	10:30 - 15:30	<ul style="list-style-type: none"> • Chlorine demand test (Lecture and practice) • Practice (Analysis of iron and manganese with spectrophotometer)
14/Dec/2023	10:30 – 13:00	<ul style="list-style-type: none"> • Microbiological parameters (Measurement and analysis) • Wrap-up review of training

3) Training for water quality monitoring personnel at branch offices

a) Technical guidance on water quality analysis

JICA experts provided guidance to KUKL branch staff who had no previous experience in water quality measurement on how to handle measurement equipment and acquire data for the monitoring of water quality at city taps by the nine KUKL branches.

Table 3.3.12 Training on water quality control for the staff of branch offices

Date	Target of OJT	Location	Number of trainees
22/Feb/2022	5 branch office (Mahankalchaur, Maharajgunj, Tripureshwor, Baneshwor and Chhetrapati)	Mahankalchaur Central Laboratory	11
23/Feb/2022	4 branch offices (Lalitpur, Madhyapur-Thimi, Bhaktapur and Kirtipur)	Mahankalchaur Central Laboratory	7

Table 3.3.13 Contents of training on water quality control for the staff of branch offices

Date	Time	Contents	Educational Material
22-23/Feb/2022	10:00 - 16:00	Measurement of turbidity and residual chlorine Leaning of working cycle: Sampling → Calibration of equipment → Measurement → Data collection	SOP for Turbidity SOP for Residual chlorine

The SOPs developed for the training focused on the handling of water quality analysis equipment and the accuracy control of monitoring data, and were used as teaching materials.

Since it takes time to establish the habit of conducting water quality analysis while referring to SOPs, field visits and guidance are continued after the training is completed.

The personnel in the KUKL branch offices regarding water quality analysis do not have basic training in water quality analysis, so the SOP descriptions alone are often not sufficient for their understanding.

Therefore, in preparation for future internal training, JICA Expert Team decided to prepare video materials on water quality analysis equipment operation, water quality analysis workflow, and data accuracy control in Term-3.

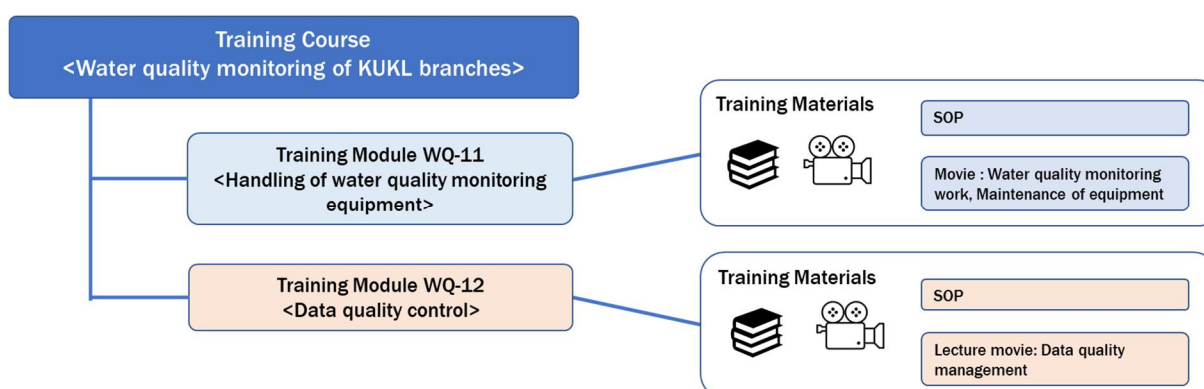


Figure 3.3.6 Composition of internal training module in the field of water quality control targeting staffs of branch offices

[Photograph] Training on water quality control targeting staffs of branch offices

		
[Mahankalchaur WTP] Water sampling guidance at taps	[Mahankalchaur WTP] Water sampling guidance at reservoirs	[Mahankalchaur Central Lab] Operation guidance of turbidity/residual chlorine measurement

b) Follow-up meeting on water quality analysis at KUKL branch offices

Discussions and practical training were provided to water quality analysts at the KUKL branch offices to help them handle the measuring equipment and solve the challenges they face in their monitoring work. In order to enhance communication between the branch office staff and the central laboratory, lectures were moderated and practical instruction was provided by the central water quality laboratory staff.

Date: January 17, 2023

Location: Mahankalchaur Central Laboratory

Participants: Total 15 (Persons in charge of water quality monitoring at branch

offices, Central laboratory staffs)

Table 3.3.14 Outline of follow-up meeting

Time	Contents	Trainer
11:15-12:15	[Lecture] Review of water quality data collected by different branches	Ms. Shailaja Adhikari
12:15-12:45	Q&A and group discussion	Ms. Shailaja Adhikari and JICA Expert
12:45-13:45	Lunch	
13:45-14:15	Presentation by the branch offices (Part 1) : Problem faced in sampling, testing and solution	5 minutes presentation by each branch office
14:15-15:00	Presentation by the branch offices (Part 2) : Problem faced in sampling, testing and solution	5 minutes presentation by each branch office
15:00-16:00	Practice of water quality analysis	Ms. Shailaja Adhikari and JICA Expert

[Photograph] Follow-up meeting for the staff of branch offices

		
Lecture by the chief of central laboratory	Presentation by a branch office	Discussion about result of residual chlorine measurement

c) Follow-up guidance at KUKL branch offices

In order to understand the status of water quality monitoring being conducted by each branch office and the challenges they are facing, the JICA expert visited all 9 branches, the schedule of which is as follows.

Table 3.3.15 Follow-up guidance schedule at KUKL branch offices

Date	Target
18/Au/.2023	Tripureshwor
20/Aug/2023	Lalitpur
21/Aug/2023	Chhetrapati, Maharajguni
22/Aug/2023	Baneshwor, Mahankalchaur, Kirtipur
23/Aug/2023	Madhapur-Thimi, Bhaktapur

During the visit, the following items were interviewed:

- Quality of water quality test data
- Number of personnel in charge of water quality test
- Location of the sampling points
- Status of water quality test device

The common challenges faced by the branches were as follows:

Table 3.3.16 Problems on water quality monitoring by the branch offices

No	Problems
1	All branches have had 2-3 staff members conducting water quality analysis. However, the number of staff in charge of water quality analysis has been decreasing due to transfers of staffs to the New Sundarijal WTP or other water treatment plants and prioritization of maintenance work of existing water distribution network. The challenge is to resolve the manpower shortage and to monitor water quality as planned.
2	Several branches (Bhaktapur, Madhyapur, and Kirtipur) have requested guidance because they have not be able to calibrate their turbidity meters for long time.
3	The residual chlorine measurement cell is still dirty. Abrasions on the cell surface are expected to have affected the measured value.
4	The amount of DPD reagent powder in the residual chlorine measurement appears to be insufficient. Also, a required reaction time is not ensured.

The staffing shortages mentioned above are expected to be resolved by appointing new personnel at each branch office and by hiring new personnel after November 2023. While confirming the status of this improvement in Term-3, it will be necessary to take action, including a review of monitoring points.

Based on the results of the on-site survey at each branch office, the JICA expert accompanied the staff in their water sampling surveys to confirm that water sampling and water quality analysis were conducted as previously instructed and in accordance with SOPs. The survey was conducted according to the following schedule in accordance with the water quality monitoring schedule of each branch.

Table 3.3.17 Inspection schedule of water quality monitoring work

Date	Target	Time	Location
4/Sep/2023	Chhetrapati	5:00	Naradevi (CP2)
	Kritipur	11:00	Bhajangal SRT (KP4)、 Kalo Tanki (KP6)
	Maharajgunj	16:00	Maharajgunj office (MG2)
5/Sep/2023	Baneshwor	6:00	Buddah Nagar (BS2)
	Lalitpur	11:00	Saibu reservoir (LP1)
	Mahankalchaur	16:00	Siphal (MK3)
7/Sep/2023	Tripureshwor	10:00	Kastamandap public tap (TP5)
	Bhaktapur	12:00	Janaswashte medical shop (BP2)
	Madhyapur-Thimi	16:00	Dhunche Pakha (MP4)
26/Sep/2023	Lalitpur(再訪)	11:00	Saibu reservoir (LP1)
28/Sep/2023	Tripureshwor(再訪)	10:00	Kastamandap public tap (TP5)

The status of water quality monitoring implementation at each branch office and the details of the field guidance provided in response to this monitoring are shown below:

Table 3.3.18 Inspection results of water quality monitoring work

Branch	Status	Field guidance
Chhetrapati	<ul style="list-style-type: none"> ➤ Staff did not bring SOPs or manuals with them. (those documents were mixed in amongst other documents.) ➤ The procedure of making multiple measurements on one sample and determining the average value is not well established. 	<ul style="list-style-type: none"> ➤ The staffs were instructed to keep SOPs and manuals available at all times. ➤ The staffs were instructed to measure both turbidity and residual chlorine three times each to get a feel for the data discrepancies and how to calculate the average by selecting the closest values.

Branch	Status	Field guidanc
	<ul style="list-style-type: none"> ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Kirtipur	<ul style="list-style-type: none"> ➤ Staff did not bring SOPs or manuals with them. ➤ Staff rarely calibrate the turbidity meter. ➤ The procedure of making multiple measurements on one sample and determining the average value is not well established. ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs were instructed to keep SOPs and manuals available at all times. ➤ The staffs were instructed to calibrate a turbidity meter daily. ➤ The staffs were instructed to measure both turbidity and residual chlorine three times each to get a feel for the data discrepancies and how to calculate the average by selecting the closest values. ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Maharajgunj	<ul style="list-style-type: none"> ➤ DPD dispenser was clogged due to dirt, but no corresponding action was taken. ➤ The procedure of making multiple measurements on one sample and determining the average value is not well established. ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs were instructed to clean DPD dispensers regularly with water. ➤ The staffs were instructed to measure both turbidity and residual chlorine three times each to get a feel for the data discrepancies and how to calculate the average by selecting the closest values. ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Baneshwor	<ul style="list-style-type: none"> ➤ DPD dispenser was clogged due to dirt, but no corresponding action was taken. ➤ The procedure of making multiple measurements on one sample and determining the average value is not well established. ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs were instructed to clean DPD dispensers regularly with water. ➤ The staffs were instructed to measure both turbidity and residual chlorine three times each to get a feel for the data discrepancies and how to calculate the average by selecting the closest values. ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Mahankalchaur	<ul style="list-style-type: none"> ➤ The procedure of making multiple measurements on one sample and determining the average value is not well established. ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs were instructed to measure both turbidity and residual chlorine three times each to get a feel for the data discrepancies and how to calculate the average by selecting the closest values. ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Bhaktapur	<ul style="list-style-type: none"> ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Madhyapur-Thimi	<ul style="list-style-type: none"> ➤ The procedure of making multiple measurements on one sample and determining the average value is not well established. 	<ul style="list-style-type: none"> ➤ The staffs were instructed to measure both turbidity and residual chlorine three times each to get a feel for the data discrepancies and how to calculate the average by selecting the closest values.
Lalitpur	<ul style="list-style-type: none"> ➤ Confirmed degradation of turbidity standard solution during initial visit (Sept. 5). ➤ The turbidity meter calibrated only once a month. ➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it. 	<ul style="list-style-type: none"> ➤ The staffs were directed to replace turbidity standard solution, including other branches. ➤ The staffs were instructed to calibrate a turbidity meter daily. ➤ The staffs are instructed to clean and keep the measuring cell clear and not to touch the light surface (transparent side) of the cell.
Tripureswor	<ul style="list-style-type: none"> ➤ Confirmed degradation of turbidity standard solution during initial visit (Sept. 7). ➤ It is customary to make multiple measurements on one sample, but the raw data is reported as is. 	<ul style="list-style-type: none"> ➤ The staffs were directed to replace turbidity standard solution, including other branches. ➤ The staffs were instructed to calculate the average by selecting the closest values. ➤ The staffs are instructed to clean and keep the

Branch	Status	Field guidance
	➤ Chlorine residual measurement cell is not properly cleaned and is being used with dirt on it.	measuring cell clear and not to touch the light surface (transparent side) of the cell.

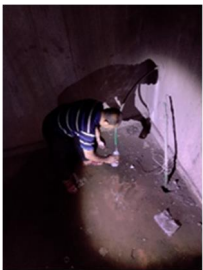

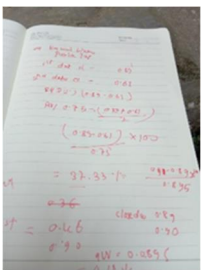



The issues observed through such inspection were largely the same, and are listed below:

- The habit of referring to SOPs and manuals has not taken hold.
- Equipment is rarely calibrated. Improper handling of equipment, e.g., leaving cells dirty, etc.
- The staff do not understand that measured data always contain variation.

Although all of these issues were pointed out and instructed in late 2022 and early 2023, there were differences in the understanding of water quality monitoring personnel at the branch offices. Therefore still they need to be trained by the internal training.

In addition, the field guidance instructs them to prepare a field notebook separate from the data sheet to keep a record of the raw data and the process of checking the accuracy of the analysis. In Term-3, in addition to having internal training conducted appropriately by the central laboratory, the JICA Expert Team will support the implementation of effective internal training by improving the level of understanding of basic operations through the use of video materials.

[Photograph] Inspection of water quality monitoring work

		
[Chhetrapati Branch] Sampling	[Baneshwor Branch] Measuring cell for residual chlorine	[Bhaktapur Branch] Field note (after instruction by JICA Expert Team)
		
[Mahankalchaur Branch] Sampling	[Tripreshwor Branch] Measuring cell for residual chlorine	[Madhyapur-Thimi Branch] Field note (after instruction by JICA Expert Team)

Online follow-up meetings continue to be held for water quality monitoring at the branch offices. Through the meetings to date, the management of residual chlorine has been identified as a major issue.

In Kathmandu, bleaching powder is used as a chlorinating agent, which causes dysfunction due to blockage of pipelines and valves caused by deposition of insoluble components (calcium hydroxide). In addition, with gravity-type injection systems, the dosing volume can only be adjusted by operating a ball valve. This makes it difficult to maintain an appropriate dosing rate because the valve must be constantly adjusted as the water level in the sludge dissolution tank drops.

In Lalitpur, additional chlorine is being injected into the Sainbu reservoir, but the area is located outside the ring lead and intermittent water supply is the norm, making it difficult to stabilize the chlorine dosing rate due to inconsistent water distribution.

[Common theme in every meeting]

- Presentation of water quality analysis data by Branch Manager
- Q&A and discussion with branch directors, central lab, and experts

Table 3.3.19 List of meetings conducted till date

Date	Discussion
16/Oct/2022	<ul style="list-style-type: none"> ➤ Measurement points at each branch office have been determined, and regular measurement has become a routine part of the daily work. ➤ There are challenges in managing residual chlorine. Recognition was shared that the management of residual chlorine is a long-term issue related not only to the management of chlorine dosing rates, but also to the removal of turbidity in the treated water and the replacement of aging and contaminated pipelines.
25/Nov/2022	<ul style="list-style-type: none"> ➤ When turbidity was high, the concentration of residual chlorine tended to be low (residual chlorine was consumed by turbidity). It was understood that turbidity must be kept low to maintain residual chlorine. ➤ Approximately 90% of faucet turbidity data was less than 5 NTU. ➤ The standard value for residual chlorine is 0.1-0.5 mg/L. About 60% of the data fell within this range (10% were below 0.1 mg/L and 30% were above 0.5 mg/L).
17/Feb/2023	<ul style="list-style-type: none"> ➤ Only 3 branches (Kirtipur, Lalitpur, and Tripureshwor) submitted measured data after January 19. (The branches that have not yet submitted their data will be asked to report at the next meeting.) ➤ Turbidity 5-8.5 NTUs about 40% of total data (more high turbidity) ➤ Residual chlorine 1.4-1.7 mg/L is about 60% of all data (excessive residual chlorine concentration). ➤ The increase in turbidity was presumed to be due to the occurrence of leaks (pipe breakage) and the impact of repair work to address the leakage. ➤ The abnormal value of residual chlorine was considered to be caused by excessive dosing of chlorine in Lalitpur (Shainbu water reservoir).
24/Mar/2023	<ul style="list-style-type: none"> ➤ A common data format has been created for the 9 branches to use for reporting. ➤ Currently, Kathmandu uses chlorine injectors that use a solution of bleaching powder, but there are problems such as blockage of the injection pipe, constraints of the gravity system, and the fact that the system can only be manually controlled. ➤ It was again confirmed that when the water level in the storage tank fluctuates, it is difficult to set and maintain an appropriate dosing rate with gravity flow and to keep the residual chlorine value within the standard value range (0.1-0.5 mg/L)
26/Apr/2023	<ul style="list-style-type: none"> ➤ High turbidity levels were reported, presumably due to pipe breaks and leakage work caused by the Power Authority. The experts pointed out the need to ensure that the contractors take such measures as closing the gate valves during pipe work in principle and thoroughly cleaning the inside of the pipes after the work is completed before resuming water supply, as well as to improve KUKL's supervision and guidance capabilities. ➤ Approximately 57% of all data fell within the range of 0.1-0.5 mg/L, which is the range specified in the drinking water quality standard for residual chlorine. It was noted that the dosing facilities of the bleached powder solution was manual and gravity type, making it difficult to control the amount of dosing solution.

Date	Discussion
26/May/2023	<ul style="list-style-type: none"> ➤ When water is pumped from Melamchi, turbidity also tends to increase due to changes in water pressure in the existing water distribution pipes. ➤ For Melamchi water supply, we monitor turbidity tails in 10-12 service reservoirs daily. ➤ Lack of water quality monitoring personnel and inability to monitor as planned. ➤ Uncontrolled coagulant injection at the Bode WTP can cause treated water turbidity to soar. Direct the Bhaktapur Branch Manager to submit a request for improvement of the chemical dosing system.

4) Internal training instructors trained to date

Through the training till date, the following candidates were selected as instructors for internal training on water treatment and water quality control.

Table 3.3.20 Candidate trainers for internal training on Water Treatment and Water Quality Control

Module	Name	Organization ^(*1)	Position
Water Treatment	Hem Bahadur Budhathoki	Manager of Bhaktapur Branch	Engineer (Level 7)
	Pravin Bhurtel	Madhapur-Thimi Branch	Overseer (Level 5)
	Bashanta Kumar Pal	Old Sundarijal WTP	Plant Officer (Level 5)
	Suresh Pradhananga	Bhaktapur Branch	Overseer (Level 5)
	Dipesh Dhakal	Chief of New Sundarijal WTP	Engineer (Level 7)
	Dipak Thapa	Electro-mechanical Section, Head Office	Overseer (Level 5)
Water Quality Control	Niru Burlakoti	Water & Wastewater Quality Assurance Division	Microbiologist (Level 7)
	Ratna Kumari Bhatt	Water & Wastewater Quality Assurance Division	Senior Lab Technician (Level 5)

Note *1: Organization as of December 2023

3.3.5 [Activity 3-3] Prepare SOPs of water treatment and water quality control.

(1) Development of SOPs for water treatment

This activity is to compile a Standard Operating Procedure for the operation and maintenance of the main water treatment plants in the Kathmandu Valley to ensure the stable provision of adequate drinking water quality.

In Term-1, JICA experts led the preparation of a draft SOP (English version) for the Mahankalchaur WTP, the base facility for the training.

In Term-2, an SOP development committee was established with the members of the Output 3 Action Team, and the SOP (draft in English) for the Mahankalchaur WTP was finalized after identifying areas for improvement after operation and receiving feedback from KUKL staff. In addition, KUKL and JICA experts collaborated to develop SOPs for the existing water treatment plants in Bode and Bansbari using these SOPs as a model.

Since none of the personnel actually engaged in the daily operation of the water treatment plant have the higher education necessary to understand advanced water treatment principle, and their understanding of English is insufficient, a simplified SOP for operators was prepared in a Nepali language version. The instructions for using the Nepali version of the SOP are as follows.

- The Nepali SOP is a simplified version for current and newly hired operators to get an


overview of the water treatment plant and the basic knowledge required for its operation.

- Nepali SOP consists of 1) Water Treatment Plant Overview, 2) Flocculation and Sedimentation Basin, 3) Rapid Filtration Basin, 4) Chemical Dosing Facility, and 5) How to proceed with daily operation.

The SOPs were revised by fully reflecting the opinions of KUKL staff, and two types of practical reference materials, "simplified SOPs" and "SOPs for operators," were prepared in English and Nepali versions for each of the four water treatment plants.

At the end of Term-2, the existing water treatment plants (Mahankalchaur, Bansbari, and Bode) are working on improving coagulant and chlorine injection facilities, and the SOPs should be revised after the chemical dosing facilities are improved.

Table 3.3.21 Composition of SOP for water treatment

No.	Type/Use	Current Statut	Photo : SOP Nepali version for operators
1	Main SOP (English) For Engineer and Chief of WTP Whole Integrated Version	In preparation To be finalized by December 2023	
2-1	Simplified SOP (English version) Reference document for daily operating work and internal training	Already prepared but to be revised in 2024 and 2025	
2-2	Simplified SOP (Nepali version) Reference document for daily operating work and internal training	Already prepared but to be revised in 2024 and 2025	
3-1	SOP for operators (English version) Reference document for daily operating work and internal training	Already prepared but to be revised in 2024 and 2025	
3-2	SOP for operators (Nepali version) Reference document for daily operating work and internal training	Already prepared but to be revised in 2024 and 2025	

(2) Development of SOPs for water quality control

1) Development of SOP

In Term-1, the Output 3 Action Team began to develop SOPs for water quality control while providing basic training through online technical seminars.

Unlike in the case of water treatment field, KUKL laboratories are staffed with highly educated specialists. The capacity assessment confirmed that these staff had a sufficient level of knowledge and experience in water quality analysis, so the SOP preparation could be done by KUKL staff themselves, with advice from JICA experts.

On the other hand, although the technical level of the staff is sufficient, there is a high need for support from JICA experts in establishing a system to utilize SOPs in daily operations and to maintain the accuracy of water quality analysis, as well as in improving the quality of work for the branch offices.

Table 3.3.22 Composition of SOP for water quality analysis

No.	Parameters	Current Status
1	Sampling and preservation	The 1st draft was already prepared but to be revised in 2024 and 2025. ^(*)
2	pH	
3	Turbidity	
4	EC	
5	Color	
6	Total hardness	
7	Total alkalinity	
8	Total iron	
9	Total ammonia	
10	Total chloride	
11	Residual chlorine	
12	MPN (coliform group and fecal coliforms)	
13	Data collection and accuracy control	
14	Turbidity for branch for branch water quality monitoring	
15	Residual chlorine for branch water quality monitoring	

*1: Revision of SOPs will be done together with the establishment of a system for SOP text management.

2) Confirmation of SOP utilization status and guidance for improvement

In July 2022, a visit to the water quality laboratories attached adjacent to the existing water treatment plants was conducted to ascertain the utilization status of the SOPs created in Term-1 and the implementation status of the laboratory's daily operations.

Table 3.3.23 Survey of SOP utilization status

Laboratory	Issues
Bode	<ul style="list-style-type: none"> ➤ SOPs are not referenced in daily analytical work. Although the technical level of the staff is high to some extent, the level of precision and accuracy seems to need improvement. There is a risk that work may be carried out based on individual judgment even when there are unclear points in analysis work, so it is necessary to establish the habit of constantly referring to SOPs. ➤ Turbidity, pH, and EC instruments had been updated, but no SOPs were created for the equipment. ➤ Only one measurement was performed for each sample. ➤ Measurement data are reported by sending photos of handwritten data sheets to the central lab via SNS from personal smartphones.
Bansbari	<ul style="list-style-type: none"> ➤ SOPs are not referenced in daily analytical work. ➤ Turbidity, pH, and EC instruments had been updated, but no SOPs were created for the equipment.
Mahankalchaur	<ul style="list-style-type: none"> ➤ SOPs are not referenced in daily analytical work. ➤ Only one measurement was performed for each sample.

In Bode and Bansbari, where analytical equipment was updated in 2023, SOPs had not yet been developed for the updated equipment. JICA Expert Team explained that the SOPs need to be revised to accommodate the updated equipment and confirmed with the central laboratory staff that the applicable SOPs will be revised.

In addition, the SOPs were still stored on the bookshelves in all the laboratories, and were not in a state where they were readily available when needed. After guidance by JICA experts, each laboratory has made some improvements, such as binding SOPs in a file and placing them permanently on the lab bench.

[Photograph] Status of laboratories adjacent to WTPs

		
<p>Laboratory in Bode WTP</p>	<p>Laboratory in Bansbari WTP</p>	<p>Laboratory in Mahankalchaur WTP</p>

Note that there were differences in the handling of measured data between Bode and Bansbari laboratories due to differences in the availability of the Internet and PCs at each water treatment plant. While the Bansbari water treatment plant sent data to the central lab via e-mail after organizing them in Excel, the Bode water treatment plant sent photo files of handwritten data sheets to the central lab via SMS due to the lack of Internet access and PCs.

From the perspective of unifying data management procedures, the water quality lab of Bode water treatment plant, as well as that of Bansbari, should prepare files in Excel format on a PC and send them to the central lab via e-mail.

The inclusion of such data reporting rules in the SOP will be discussed with KUKL in the future, but the issue of data management in water quality labs needs to be addressed in Term-3.

3.3.6 [Activity 3-4] Prepare monitoring plan of water treatment and water quality control.

Based on the water quality monitoring previously conducted by KUKL, water quality monitoring is being implemented to reflect improvements incorporated in the project activities. The status of this implementation will be periodically checked and evaluated to update the final water quality monitoring plan.

(1) Water quality monitoring at water treatment plant

Water quality monitoring of the water treatment process (raw water, after coagulation and sedimentation treatment, after sand filtration, and after purification) is conducted at the Mahankalchaur, Bansbari, Bode, and New Sundarijal WTPs. The monitoring procedures for each water plant are as follows.

Table 3.3.24 Water quality monitoring for water treatment

Plant	Monitoring point	Frequency	Items to be monitored
Mahankalchaur	Raw water, Settled water, Filtered water and Tanker station	3 times per day	Appearance, Color, Temperature, Turbidity, pH, Electro Conductivity, Alkalinity, Hardness, Calcium, Magnesium, Iron, Ammonia, Chloride, Residual Chlorine, Escherichia coli
Bansbari	Raw water, Settled water, Filtered water and Tanker station	Same as above	Appearance, Color, Temperature, Turbidity, pH, Electro Conductivity, Residual Chlorine
Bode	Raw water, Settled water and Filtered water	Same as above	Same as above
New Sundarijal	Raw water, Settled water and Filtered water	Same as above	Same as above

(2) Water quality monitoring at water taps

Water quality monitoring at water taps to be conducted by the KUKL Branch Office covers turbidity and residual chlorine. Since the water supply is severely constrained during periods when the water supply from the Melamchi River is shut down, the specific dates of monitoring implementation change frequently to accommodate the city's water transmission and distribution schedule.

Monitoring points will be controlled with GIS data, and information on changes and additions to monitoring points will be managed with GIS data as well in the future.

Table 3.3.25 Water quality monitoring plan for each branch office

Branch	Monitoring Points	Frequency
Baneshwor	Total 5 points Minbhawan SRT, Pabitra chowk, Bharosha Hospital, Maitidevi Chowk, Gyaneshwor quarters Now, only Minbhawan SRT is under monitoring.	Once per week
Bhaktapur	Total 5 points Bansbari public tap, Janaswasthe medical shop, Khauma citizen bank, Bansagopal, Sallaghari	Once per week
Chhetrapati	Total 3 points Newroad Bata Company Public tap, Naradevi, Dhalko	Once per week
Kirtipur	Total 8 points Jakha SRT, Panga public tap, Adinath Chobhar SRT, Bhajangal SRT, KUKL office, Kalo tanki, Samal Dhoka Public water tap, Devdhoka SRT Now, only 3 points (Panga public tap, Bhajangal SRT and Kalo tanki) are under monitoring.	Once per week
Lalitpur	Total 3 points Saibu SRT, Nakhu Bull tap, Jawarakhel tap	Once per day at Saibu SRT Once per week or Once per month at other points.
Madhapur – Thimi	Total 4 points Lokanthali new reservoir, Bhattarai Niwas Sinti Tar, Dhunche Pakha, Sankhadhar chowk	Once per week or Once per month
Maharajgunj	Total 4 points Jaldhunga, Mahapur Manga, Lhosal, Pipalbot Now only 3 points (Jaldhunga, Lhosal, Pipalbot Mahapur) are under monitoring	[Rainy season] Once per 5-6 days [Dry season] Once per 9-10 days
Mahankalchaur	Total 5 points Guheshwori, Majjubahal, Siphel, Handigaun, Maligaun	Once per week
Tripureshwor	Total 6 points Kuleshwor area, Soltimod area, Lagan, Jaisideval, Kastamandap public tap, Tahachal campus Now only 1 point of Sundarighat WTP is under monitoring.	Once per week in the original plan, but now only once per day at Sundarighat WTP

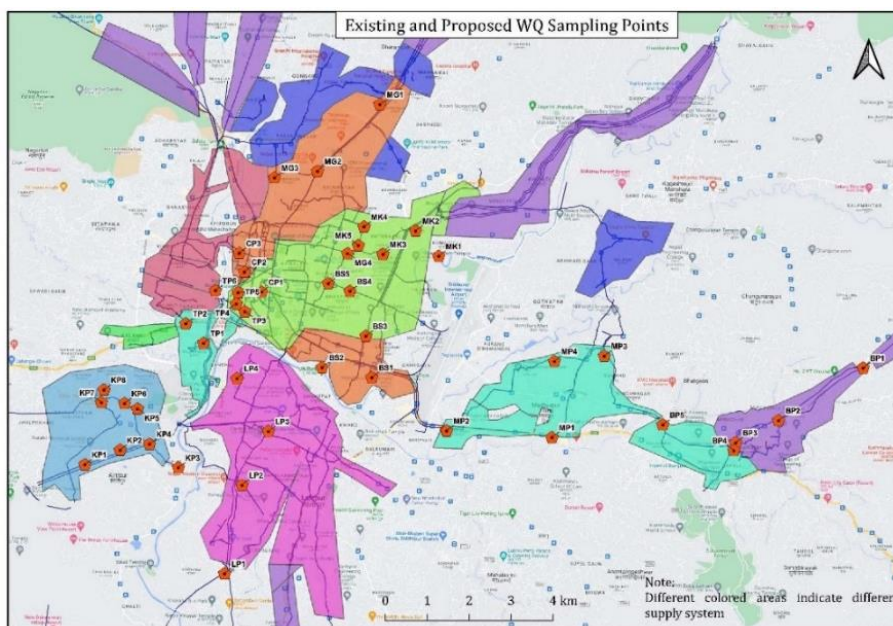


Figure 3.3.7 Water Quality Monitoring Points by Branches

3.3.7 [Activity 3-5] Monitor water quality based on the monitoring plan prepared in Activity 3-4.

(1) Status of operation and water quality monitoring for drinking water treatment

In order to ensure that the staffs of the branch offices and the head office are accurately aware of the daily water treatment plant operation status, monthly reporting meetings are held to confirm water quality data and problems that need to be improved at the four water treatment plants.

The following is an example of the water quality and operational status of the Mahankalchaur WTP among the monitoring details reported at the monthly water treatment plant operation report meetings.

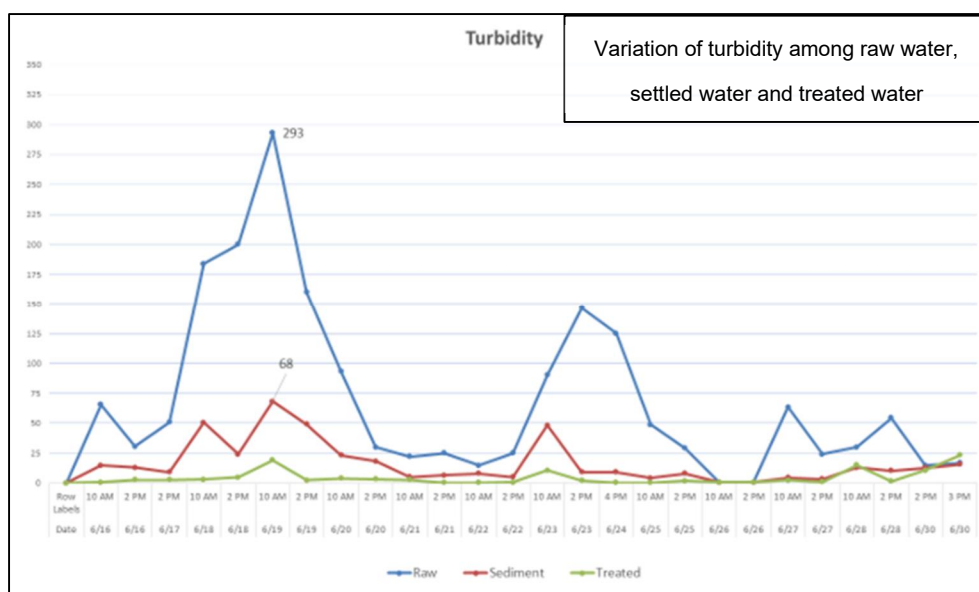


Figure 3.3.8 Result of water quality monitoring at Mahankalchaur WTP

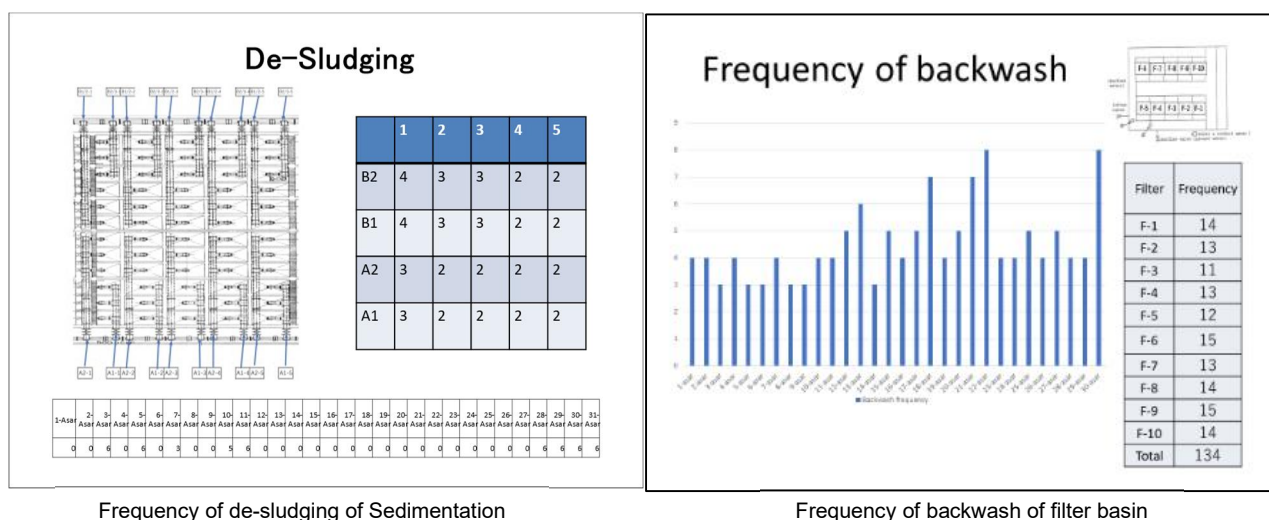


Figure 3.3.9 Operation Status of Mahankalchaur WTP

Water quality monitoring at the water treatment plants is conducted by laboratory staff, but monitoring is not conducted on Saturdays and holidays because the laboratory staff is not available. On the other hand, the automatic water quality measuring device introduced by the Electromechanical Department targets raw water and is effective for monitoring of water treatment process. However, there is no equipment capable of monitoring treated water, and a constant water quality monitoring system has not been established.

(2) Monitoring result at water taps in the city

Water quality monitoring (turbidity and residual chlorine) of city taps is continuously conducted by branch staff; an assessment of tap water quality as of December 2023 is presented below. The detailed data are shown in "(5) Assessment of Water Quality Improvement at Water Taps".

Among Nepal's water quality standards, turbidity has almost achieved the standard of 5 NTU or less in all branches except Bhaktapur and Tripureshwor.

However, for residual chlorine, the percentage of samples satisfying the range of drinking water quality standards (0.1-0.5 mg/L) did not reach 95% in all branches.

The JICA Expert Team has proposed and implemented improvements to the chlorine dosing facilities (controlling the dosing rate by installing rotameters, renewing blocked pipelines, and adopting advanced breaching powder), and the team expects improvements in Term-3.

Table 3.3.26 Outline of water quality data provided by branches

Evaluation	Good	Fair	Poor
Requirement	At least 95% of the data satisfy the following ranges. Turbidity < 1 NTU 0.1 < FRC < 0.2mg/L	At least 95% of the data satisfy the following ranges. Turbidity < 5 NTU 0.1 < FRC < 0.5mg/L * In accordance with NWQS	Does not satisfy Good and Fair conditions. Percentage of samples meeting Turbidity <5 NTUs less than 95%. FRC concentration range is not consistent, and concentrations outside the range of water quality standards are detected.
Turbidity	Maharajguni, Chetrapati, Baneshwor	Mahankalchaur, Madhyapur-Thimi, Lalitpur, Kirtipur	Bhaktapur, Tripreshwor
Residual chlorine	---	---	All the branches

By the end of Term-2, many of the branches were short of water quality monitoring personnel. This was mainly due to personnel transfers following the start of operations at the New Sundarijal WTP, which resulted in the withdrawal of personnel who had been responsible for water quality analysis at each branch office. This has resulted in situations where the planned monitoring points cannot be covered and the monitoring points are reduced or changed to only water treatment plants and reservoirs.

Since KUKL is not able to make decisions on matters related to personnel matters such as staff recruitment alone, for the time being, KUKL will take action by reviewing the monitoring plan in accordance with the manpower of the branch offices.

Note that recruiting, which had been suspended since November 2023, has resumed, and the number of newly hired staff has begun to increase. Several engineers or technicians will be assigned to the branch offices, which is expected to eliminate bottlenecks in future activities.

(3) Assessment of water quality improvement at water treatment plants

Comparison of the quality of water treatment (water quality in the clear water reservoirs) at the three existing water treatment plants and the New Sundarijal WTP was conducted at the beginning of the project and at the end of Term-2. The items compared were water turbidity and residual chlorine.

A summary of the water quality data for the source of the water treatment plant and the water quality data to be assessed is provided below:

[Water quality data in the existing water treatment plants]

Start of the project: Data from April 2020 to March 2021

End of Term-2 (2023): Data from July 2022 to October 2023

Table 3.3.27 Main water source of the water treatment plants

WTP	Rainy season	Dry season
Mahankalchaur	Surface water (Bagmati River) Surface water (Bishnumati River)	Surface water (Bagmati River) Surface water (Bishnumati River)
Bode	Underground water (Manohara River) Groundwater (Deep wells)	Underground water (Manohara River) Groundwater (Deep wells)
Bansbari	Surface water (Shivapuri River) Surface water (Bishnumati River)	Surface water (Shivapuri River) Surface water (Bishnumati River)
New Sundarijal	Surface water (Bagmati River)	Surface water (Melamchi River)

Table 3.3.28 Outline of water quality in the clear water reservoirs

Mahankalchaur WTP		Start of the project (2021)	End of Term-2 (2923)
Turbidity (NTU)	Maximum	28.8	174
	Average	4.9	3.5
	Minimum	0.8	0.1
Residual Chlorine (mg/L)	Maximum	2.10	4.3
	Average	0.63	0.8
	Minimum	0.04	<0.1
Bansbari WTP		Start of the project (2021)	End of Term-2 (2923)
Turbidity (NTU)	Maximum	6.4	7.7
	Average	2.1	0.3
	Minimum	0.6	0.1
Residual Chlorine (mg/L)	Maximum	1.0	2.0
	Average	0.6	0.6
	Minimum	0.2	0.1
Bode WTP		Start of the project (2021)	End of Term-2 (2923)
Turbidity (NTU)	Maximum	6.1	33.2
	Average	2.1	1.7
	Minimum	0.5	0.5
Residual Chlorine (mg/L)	Maximum	1.4	3.6
	Average	0.4	0.7
	Minimum	<0.1	0.1
New Sundarijal WTP		Start of the project (2021)	End of Term-2 (2923)
Turbidity (NTU)	Maximum		12.4
	Average		1.5
	Minimum		0.1
Residual Chlorine (mg/L)	Maximum		10.0
	Average		0.5
	Minimum		<0.1

Turbidity is evaluated based on the occurrence rate of data below 5 NTU, the drinking water quality standard of Nepal.

Residual chlorine is evaluated based on the rate of occurrence of data that is above 0.5 mg/L, the upper limit of the drinking water quality standard, taking into account the loss in the distribution network. Note that the drinking water quality standards of Nepal set the residual chlorine at the tap in the range of 0.1-0.5 mg/L. The target control concentration of residual chlorine at the outlet of the water treatment plant continues to be discussed in consultation with the Output 3 Action Team.

Table 3.3.29 Achievement status of water quality indicator

Mahankalchaur WTP			
Parameters	Indicator	Start of the project (2021)	End of Term-2 (2023)
Turbidity	≤ 5NTU	Achievement rate: 67.4%	Achievement rate: 88.8%
Residual Chlorine	0.5 mg/L ≤	Achievement rate: 52.8%	Achievement rate: 61.4%
Bansbari WTP			
Parameters	Indicator	Start of the project (2021)	End of Term-2 (2023)
Turbidity	≤ 5NTU	Achievement rate: 99.5%	Achievement rate: 99.9%
Residual Chlorine	0.5 mg/L ≤	Achievement rate: 48.0%	Achievement rate: 59.3%
Bode WTP			
Parameters	Indicator	Start of the project (2021)	End of Term-2 (2023)
Turbidity	≤ 5NTU	Achievement rate: 97.2%	Achievement rate: 99.9%
Residual Chlorine	0.5 mg/L ≤	Achievement rate: 28.1%	Achievement rate: 61.3%
New Sundarijal WTP			
Parameters	Indicator	Start of the project (2021)	End of Term-2 (2023)
Turbidity	≤ 5NTU	-	Achievement rate: 95.9%
Residual Chlorine	0.5 mg/L ≤	-	Achievement rate: 31.9%

Table 3.3.30 Assessment results of the Mahankalchaur WTP

Parameters	Assessment results
Turbidity	<ul style="list-style-type: none"> ➤ The achievement rate of turbidity has improved from 67.4% to 88.8%. However, since the project requires that the percentage of 5 NTUs be greater than 95 %, the capacity of the water treatment operation and management needs to be further improved. ➤ Comparing the distribution of data here, the peak shifts to the range below 1.5 NTU at the end of Term-2. Therefore, some improvement in the ability to operate and manage the water treatment process can be observed. ➤ However, even at the end of Term-3, approximately 10% of the turbidity of treated water still exceeds 5 NTU. It is necessary to further improve the ability to respond to changes in raw water turbidity and to maintain and manage the sedimentation basin and sand filtration basin.
Residual Chlorine	<ul style="list-style-type: none"> ➤ The frequency of residual chlorine of 0.5 mg/L or higher increased from 52.8% to 61.4%, but the number of occurrences of 0.1 mg/L or lower and 1.0 mg/L or higher increased at the end of Term-2. This may be due to the fact that the chlorine injection rate was not properly controlled, and the injection rate was often over- or under-applied. ➤ The Mahankartur WTP is in the process of improving its chlorine dosing system, and has finally installed a rotameter and is ready to control the dosing volume. ➤ Data acquisition and organization should continue to clarify the distribution of residual chlorine concentrations when the chlorine dosing rate is controlled.

Table 3.3.31 Assessment results of the Bansbari WTP

Parameters	Assessment results
Turbidity	<ul style="list-style-type: none"> ➤ Turbidity control has shown its achievement rate at 95% or higher since the beginning of the project. ➤ However, the distribution of the data shows that 95% of the samples had 3 NTU or less at the beginning of the project, while more than 95% had 1 NTU or less at the end of Term-2. This can be evaluated as a reflection of the improvement in capacity through this project.
Residual Chlorine	<ul style="list-style-type: none"> ➤ The frequency of residual chlorine greater than 0.5 mg/L ranged from 48.0% to 59.3%, but by the end of Term-2, the distribution of data had widened. ➤ At the Bansbari WTP, the chlorine dosing rate is controlled based on raw water flow rate only, but the method of controlling the injection rate needs to be verified based on water quality data to further improve the control capability. ➤ It is possible that the raw water flow rate at the Bansbari WTP is not accurately measured. It is necessary to reiterate that knowing the accurate raw water flow rate is necessary for proper dosing rate management.

Table 3.3.32 Assessment results of the Bode WTP

Parameters	Assessment results
Turbidity	<ul style="list-style-type: none"> ➤ Turbidity control has shown its achievement rate at 95% or higher since the beginning of the project. ➤ However, the distribution of the data shows that 95% of the samples had 3.5 NTU or less at the beginning of the project, while more than 95% had 2.5 NTU or less at the end of Term-2. This can be evaluated as a reflection of the improvement in capacity through this project.
Residual Chlorine	<ul style="list-style-type: none"> ➤ The frequency of residual chlorine above 0.5 mg/L ranged from 28.1% to 61.3%, but the chlorine injection facility at the Bode water treatment plant is in need of repair. Therefore, controlled chlorine injection is not taking place.

Table 3.3.33 Assessment results of the New Sundarrijal WTP

Parameters	Assessment results
Turbidity	<ul style="list-style-type: none"> ➤ The percentage of water with a turbidity of 5 NTU or less is 95.9%, which means that the project goal has been achieved. ➤ The New Sundarrijal WTP is a new facility and has not experienced sludge accumulation in the sedimentation basins or deterioration of sand filter as the existing water treatment plants. ➤ Therefore, it is expected to achieve higher quality water treatment, i.e. lower turbidity ➤ It was decided in consultation with the central laboratory that water purification plant operators will measure pH and turbidity in order to respond to changes in water quality during nights and holidays when the water quality laboratory is not in operation. By operating the water treatment plant according to water quality even during nighttime and holidays, it is expected that water quality will be improved in the future.
Residual Chlorine	<p>The percentage of residual chlorine above 0.5 mg/L is 31.9%.</p> <p>Since the New Sundarrijal WTP uses chlorine gas, the residual chlorine can be controlled more easily and appropriately compared to the existing water treatment plant that uses a rusted powder solution.</p> <p>However, the residual chlorine data were widely distributed, suggesting that the chlorine injection rate was not properly controlled.</p> <p>Capacity enhancement of the water quality laboratory at the new Sundarrijal water treatment plant began in December 2023. This is expected to enhance the ability to monitor turbidity and residual chlorine concentrations, as well as the ability to make improvements related to chemical dosing rates based on the results of chlorine demand tests and other experiments.</p> <p>In addition, from Term-3, it is necessary to focus on the optimization of the water treatment process and to work on achieving higher quality of treated water.</p>

(4) Ammonia control measures at the Bode WTP

The Bode WTP has high ammonia in the raw water (8-10 mg/L), making it difficult to keep free residual chlorine.

Therefore, it is necessary to consider a different method for residual chlorine management at the Bode WTP than at other water treatment plants, and the JICA Expert Team proposes disinfection using combined residual chlorine.

To improve the technical skills of lab personnel, the JICA Expert Team would like to consider conducting future experiments to determine the relationship between the formation of combined residual chlorine and residual ammonia.

The results of measuring ammonia and related nitrite and nitric acid concentrations in raw water from the Bode water treatment plant are summarized below.

1) Study of ammonia, nitrate and nitrite

On August 27 and 28, 2023, water taps in the area under the jurisdiction of the Madhyapur-Thimi branch, which receives water from the Bode WTP, were selected to measure ammonia in drinking water. The data on August 27 is the result of an independent survey conducted by the Madhyapur-Thimi Branch.

Although there was a decrease in ammonia at the tap in the area of Madhyapur-Thimi, the water quality still exceeded the water quality standard of 1.5 mg/L. Both the central lab and the Madhyapur-Thimi branch office recognized from this data that some action was needed.

On the other hand, the ammonia concentration in the treated water at the Bode WTP is extremely high at 8.5 g/L. Attempting to remove this ammonia with pre-chlorination treatment would require a chlorine injection rate of 80-90 mg/L, which is not practical.

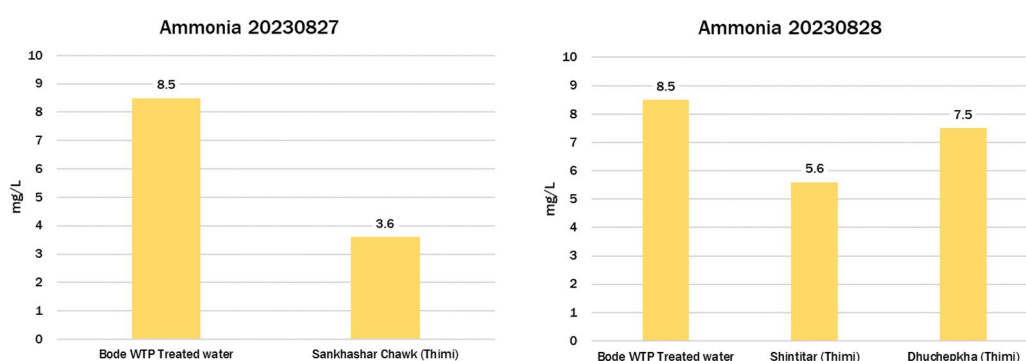


Figure 3.3.10 Ammonia concentration test results in drinking water

The Bode WTP uses the following four water sources, and a comparison of ammonia loadings by source is shown below:

- Raw water : Undergound water of the Manohara River (probably connected to dug wells nearby)
- New well: Deep well constructed in the site of WTP
- Labo well : Deep well constructed in the site of WTP
- PID well: Deep well constructed near the site of WTP

Of these, New wells and PID well were found to have higher ammonia loadings (65% in total).

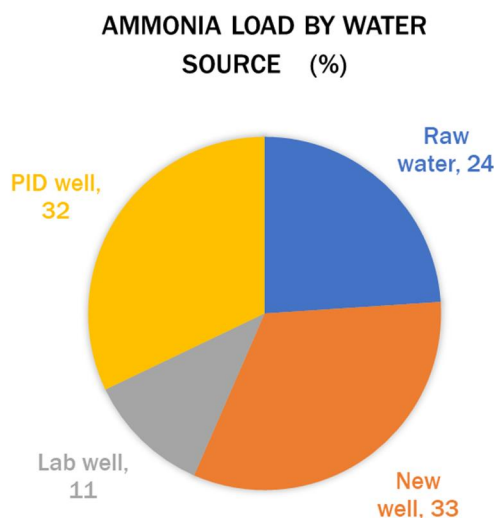


Figure 3.3.11 Balance of ammonia load by water source at Bode WTP

Subsequently, on September 26, 2023, a study of ammonia, nitrite, and nitrate in the treatment process of the Bode WTP and at the tap in the Madhyapur-Thimi area was conducted. The concentrations (nitrogen equivalents) of ammonia, nitrite, and nitrate in the bode raw water and the percentages of each are shown below. All of the water sources had more than 90% ammonia. Note that ammonia exceeded the drinking water quality standard, but the concentrations of nitrite and nitrate were very low.

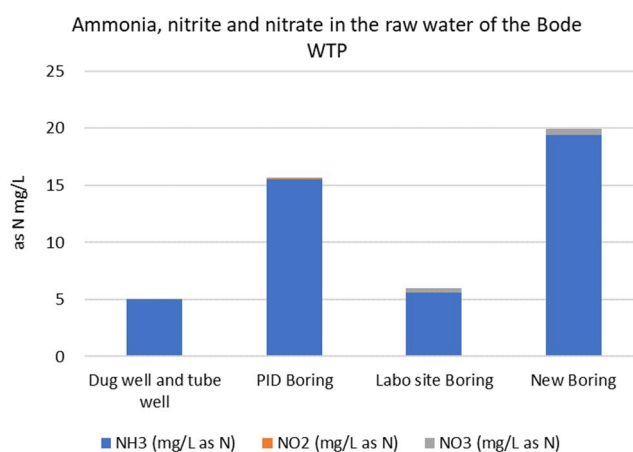


Figure 3.3.12 Ammonia, nitrite and nitrate in the raw water of the Bode WTP

Table 3.3.34 Ammonia, nitrite and nitrate in the raw water of the Bode WTP

Location	NH ₃ (mg/L as N)	Nitrite NO ₂ (mg/L as N)	Nitrate NO ₃ (mg/L as N)
Dug well and tube well	5.0 (98.5%)	0.009 (0.2%)	0.07 (1.3%)
PID Boring	15.6 (99.5%)	0.008 (0.1%)	0.07 (0.4%)
Labo site Boring	5.6 (93.9%)	0.002 (0.03%)	0.36 (6.1%)
New Boring	19.4 (97.6%)	0.002 (0.01%)	0.47 (2.4%)

The following table shows the changes in concentrations of ammonia, nitrite, and nitric acid in the water purification process and hydrants (in the Thimi branch). “Sedimented water” is the water after four types of raw water (Dug well and tube well, PID Well, Labo Site Well, and New Well) are mixed at the Bode WTP.

Although the concentration decreased after sand filtration, it was thought to be due to the consumption of ammonia by the biological film on the surface of the water treatment plant body, since the Bode WTP does not provide ammonia treatment under controlled conditions.

After sand filtration, nitrite and nitrate gradually increase as they move toward the clear water reservoir and water tap, but this is thought to be due to the biological oxidation action of microorganisms to produce nitrite and nitrate from ammonia.

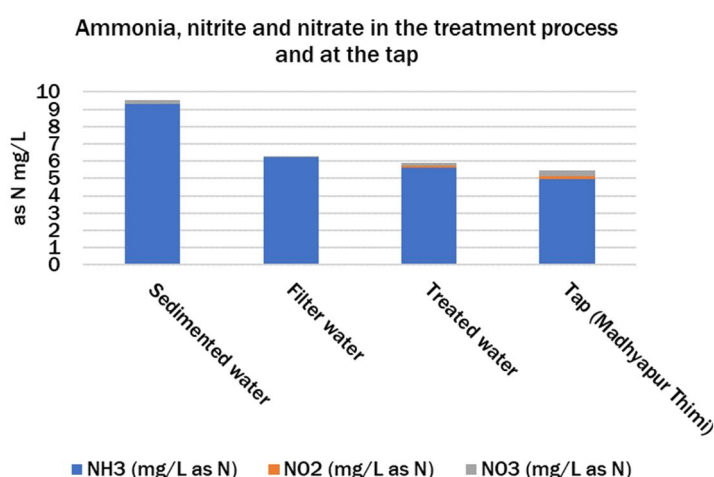


Figure 3.3.13 Ammonia, nitrite and nitrate in the treatment process and at the tap

Table 3.3.35 Ammonia, nitrite and nitrate in the treatment process and at the tap

Location	NH ₃ (mg/L as N)	Nitrite NO ₂ (mg/L as N)	Nitrate NO ₃ (mg/L as N)
Sedimented water	9.3 (98.1%)	0.004 (0.04%)	0.18 (1.9%)
Filter water	6.2 (99.1%)	0.010 (0.16%)	0.05 (0.7%)
Treated water	5.6 (95.2%)	0.144 (2.5%)	0.14 (2.3%)
Tap water (Thimi branch)	5.0 (91.6%)	0.161 (3.0%)	0.29 (5.4%)

Table 3.3.36 Comparison between NWQS and Japanese standard

Parameters	Nepal		Japan
	Ion mg/L	as N mg/L	as N mg/L
Ammonia	1.5	1.2	-*
Nitrate	50	11.3	
Nitrite			0.04
Nitrite + Nitrate	-	-	10.0

At the meeting for water treatment plant operation and monitoring held on September 24, 2023, the JICA Expert Team and C/P discussed measures for ammonia treatment of raw water from the Bode WTP. It was confirmed that redevelopment of the Manohara well field or drilling of additional wells would be very difficult, and that implementation of ammonia treatment would be difficult due to the lack of technology, so a practical solution would be to rely on dilution by new water delivered from the Melamchi water source.

(5) Assessment of Water Quality Improvement at Water Taps

The following is a summary of tap water quality data at the end of Term-2 (2023).

The Kirtipur branch monitors three sites, two of which are water distribution reservoirs, so the number of tap data is small.

Tables 3.3.38 and 3.3.39 show the percentage of samples meeting drinking water quality standards (turbidity: ≤ 5 NTU, residual chlorine: 0.1-0.5 mg/L).

Figures 3.3.15 and 3.3.16 show the distribution range (box-and-whisker diagram) of water quality data for each branch.

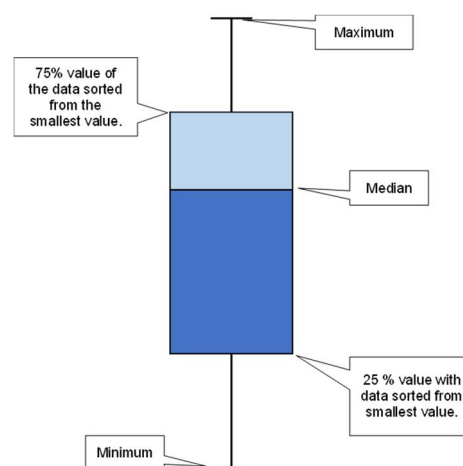


Figure 3.3.14 box-and-whisker diagram

Table 3.3.37 Assessment results of water quality at the taps

Parameters	Assessment results
Turbidity	<p>About 95% or more of the data in the seven branches, except for Tripureswor and Bhaktapur branches, conform to the standard values.</p> <p>As described in section “(3) Assessment of water quality improvement at water treatment plants”, this may be because turbidity is well controlled at the water purification plants. However, it is necessary to further verify the soundness of the pipeline management by checking against the water quality data of the water service reservoirs.</p> <p>The data distribution shows that most of the data is less than 5 NTU, except for the Bhaktapur branch, which has less than 5 NTU.</p> <p>The Baneshwor branch, however, had the largest data with 20.5 NTUs. The branch manager of Bhaktapur explained that there is a water supply Lalitpur, but this is due to construction work being done upstream of the water source.</p> <p>However, the Bhaktapur branch has a median value of 4.3 NTU and a 75th percentile value of 8.0 NTU, indicating a high turbidity level compared to other branches. Therefore, it is necessary to consider improvement measures, including maintenance of water service reservoirs and pipelines.</p>
Residual Chlorine	<p>The compliance rate with water quality standards ranged from 38.9% to 89.1%. However, as described in section “(3) Assessment of water quality improvement at water treatment plants”, the dosing rate control of residual chlorine has not yet been fully implemented.</p>

Parameters	Assessment results
	<p>Therefore, the residual chlorine data obtained in this study cannot be considered results obtained under controlled conditions.</p> <p>The Lalitpur branch had a residual chlorine concentration of more than 0.9 mg/L at the taps due to the application of an additional chlorinating agent (bleaching powder) at the Saibu water distribution reservoir.</p> <p>However, the chlorine dosage is not strictly controlled, and one or two bags (45 kg) of bleaching powder are put into the water distribution reservoir every morning (interviewed by Lalitpur branch manager).</p> <p>The residual chlorine at the Mahankalchaur branch was also relatively high, with a maximum value of 4.0 g/L (it may be possible that they forgot to close the valve on the chlorine injector at this time: Ms. Shailaja Adhikari).</p> <p>Thus, there is still a need to monitor and provide guidance on how to implement chlorination.</p>

Table 3.3.38 Outline of turbidity of the water taps in different branches

Branch	Data collection period	Number of data	Maximum (NTU)	Average (NTU)	Median (NTU)	Minimum (NTU)	Achievement rate to NWQS
Maharajguni	2023/2/15 – 2023/9/21	47	0.85	0.41	0.37	0.10	100%
Chhetrapati	2023/2/16 – 2023/9/15	45	0.54	0.28	0.24	0.06	100%
Baneshwor	2023/3/16 – 2023/9/30	47	20.5	1.79	1.29	0.21	97.9%
Mahankalchaur	2023/1/4 – 2023/10/4	107	6.45	1.93	2.74	0.17	97.2%
Lalitpur	2023/2/12 – 2023/8/18	38	2.80	1.49	1.43	1.10	100%
Kirtipur	2023/2/17 – 2023/9/3	19	7.25	1.83	1.50	0.04	94.7%
Tripureshwor	2023/1/19 – 2023/5/24	47	8.60	4.09	3.59	2.27	76.6%
Madhapur - Thimi	2023/1/2 – 2023/9/10	87	4.50	1.49	1.21	1.00	100%
Bhaktapur	2023/2/3 – 2023/9/29	133	16.5	5.56	4.26	1.15	64.7%

Table 3.3.39 Outline of residual chlorine of the water taps in different branches

Branch	Data collection period	Number of data	Maximum (NTU)	Average (NTU)	Median (NTU)	Minimum (NTU)	Achievement rate to NWQS
Maharajguni	2023/2/15 – 2023/9/21	47	0.82	0.28	0.24	0.12	85.1%
Chhetrapati	2023/2/16 – 2023/9/15	45	1.45	0.43	0.27	0.06	73.1%
Baneshwor	2023/3/16 – 2023/9/30	47	1.05	0.45	0.36	0.19	63.3%
Mahankalchaur	2023/1/4 – 2023/10/4	107	4.03	0.88	0.26	0.06	42.1%
Lalitpur	2023/2/12 – 2023/8/18	38	1.52	1.21	1.20	0.91	0%*1
Kirtipur	2023/2/17 – 2023/9/3	19	0.36	0.12	0.10	0.01	38.9%
Tripureshwor	2023/1/19 – 2023/5/24	47	0.61	0.32	0.29	0.16	89.4%
Madhapur - Thimi	2023/1/2 – 2023/9/10	87	0.69	0.20	0.18	0.03	66.5%
Bhaktapur	2023/2/3 – 2023/9/29	133	1.36	0.54	0.51	0.05	48.1%

Note *1: Lalitpur's residual chlorine concentration was greater than 0.9 g/L, exceeding the standard range.

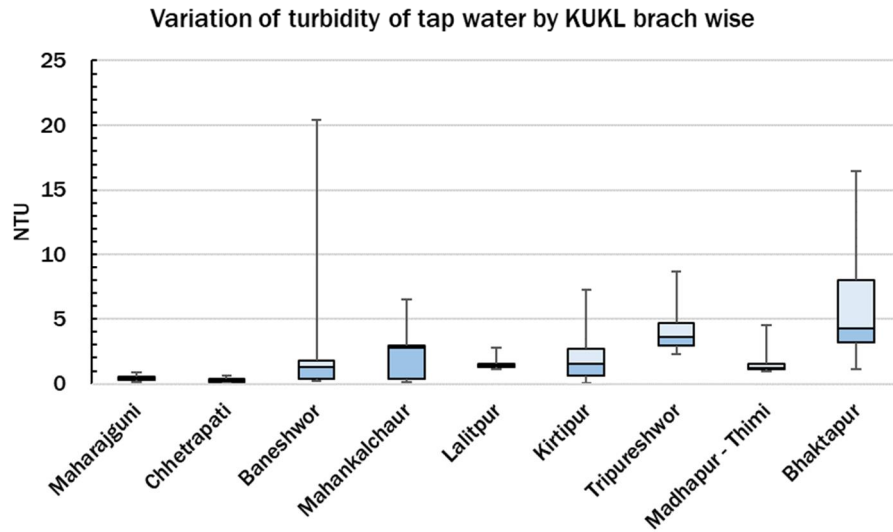


Figure 3.3.15 Outline of turbidity at the taps

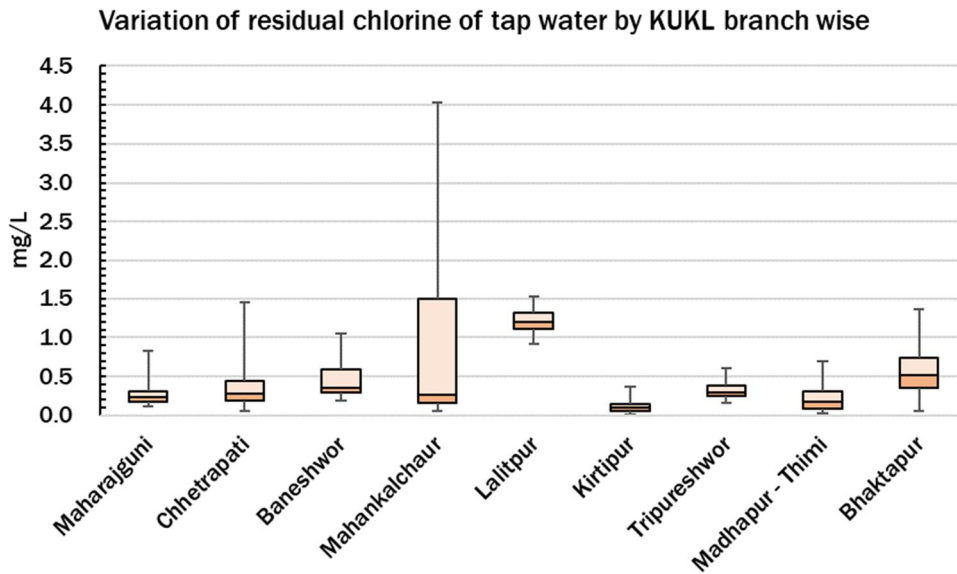


Figure 3.3.16 Outline of residual chlorine at the taps

3.3.8 [Activity 3-6] Reflect the monitoring results to water quality improvement and effective water treatment.

Currently, water quality monitoring is underway at the target water treatment plants (Mahankalchaur, Bansbari and Bode) and New Sundarijal WTP.

Water quality monitoring data from the water treatment plant is reported at the monthly water treatment plant operation meeting attended by personnel from the water treatment plants, the water quality laboratories, and the Electromechanical Department, where issues related to water treatment plant operation and water quality improvement, solutions, and requests to the electrical machinery department for facility improvements are discussed.

Table 3.3.40 WTP Operation Meeting

Date	Discussed Items
19/Oct/2022	<ul style="list-style-type: none"> ➤ Explanation of analytical results of turbidity fluctuations in raw water, settled water and treated water using the Mahankalchaur WTP operation record in Sep 2023 as an example. ➤ Report on the completion of the installation and adjustment of the PAC and Lime dosing pumps at the Mahankalchaur WTP and plans to conduct an orientation for operators.
18/Nov/2022	<ul style="list-style-type: none"> ➤ Report on the operation of existing WTPs, operating conditions and their analysis ➤ Status of instruction to operators after improvement of chemical dosing facilities (PAC/Lime). ➤ Prospects for resumption of operation of New Sundarijal WTP.
12/Feb/2023 日	<ul style="list-style-type: none"> ➤ Report on operation of three existing WTPs. ➤ Brief description of simplified Nepali SOP for Mahankalchaur WTP. ➤ Upcoming activities.
23/Mar/2023	<ul style="list-style-type: none"> ➤ Report on operation of three existing WTPs. ➤ Hand-over of New Sundarijal WTP.
19/Apr/2023	<ul style="list-style-type: none"> ➤ Report on operation of three existing WTPs and New Sundarijal WTP. ➤ Situation of water diversion from the Melamchi River. ➤ Chlorine Dosing at Mahankalchaur WTP.
16/May/2023	<ul style="list-style-type: none"> ➤ Report on operation of three existing WTPs and New Sundarijal WTP. ➤ Operating methods of treatment plant and precautions against high turbidity of raw water in rainy season.
14/Jun/2023	<ul style="list-style-type: none"> ➤ Report on operation of three existing WTPs and New Sundarijal WTP. ➤ On-the-Job Training in water treatment field.
17/Jul/2023 日	<ul style="list-style-type: none"> ➤ Report on operation of three existing WTPs and New Sundarijal WTP. ➤ Agreement of establishment of the monitoring committee of WTP operation.
1/Sep/2023	<ul style="list-style-type: none"> ➤ Change the date of the monthly report meeting according to the Nepalese calendar of driving records. ➤ Improvement of actions against high turbidity of raw water at the Mahankartur WTP, Bansbari WTP and Bode WTP.
5/Nov/2023	<ul style="list-style-type: none"> ➤ Check the inflow of water at each water treatment plant at the beginning of the dry season. ➤ The Bode WTP and Bansbari WTP have switched to using Alum on an interim basis due to running out of PAC stock. The current facility is unable to control the proper injection volume of Alum, so the company requests the procurement of PAC as soon as possible. ➤ Rotameter for injecting breaching powder solution has been installed in Mahankalchaur WTP, and the JICA Expert Team requests that it be installed in Bansbari and Bode as soon as possible.

3.4 Record of activities related to Output 4

Output 4 The capacity of customer service management is enhanced.

3.4.1 Direction of activities

Traditionally, the major source of dissatisfaction among KUKL's customers has been the lack of water supply volume, but it is expected that the complaints received from customers will become more diverse after the water supply from the Melamchi River is realized and the New Sundarijal WTP start its full operation. Therefore, KUKL is focusing on improving customer satisfaction in order to improve water supply services in the future.

The project will ensure that the results of the project will be disseminated among water users by making them realize the improvement of water service. JICA Expert Team will then actively support public relations activities that lead to improved water service, such as the start of billing and tariff collection based on accurate meter reading and the gradual expansion of water supply hours.

These activities will be expanded in stages after confirming customers' recognition and trust in KUKL based on the results of the customer satisfaction survey, aiming for a virtuous cycle as shown below.

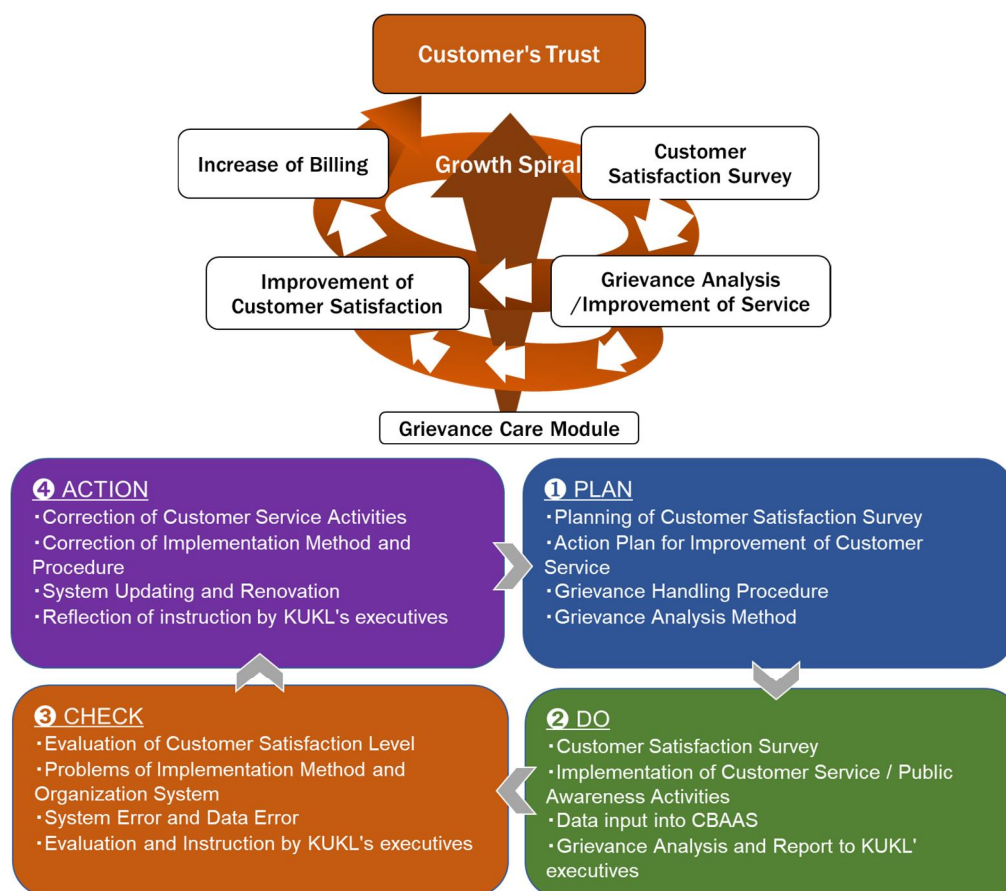


Figure 3.4.1 PDCA Cycle for Improvement of Customer Service

3.4.2 [Activity 4-1] Prepare a plan of customer satisfaction survey including survey design and TOR for survey company.

(1) Overall plan

The customer satisfaction survey was designed and conducted to determine customer perceptions of water supply service improvements. The points to be considered in the activities are as follows.

- The 1st customer satisfaction survey was conducted during the Term-1 of activities to identify the current status of customer satisfaction and issues to be addressed to improve it. The results of this survey will serve as a baseline and will be used as the basis for evaluation indicators for this project.
- The study area was divided into about 10 survey plots so that the status of related infrastructure development projects within the Kathmandu Valley and the expression of the results of this project could be identified and analyzed.
- The size of the customer satisfaction survey was set at 100 customer per survey plots, which is a statistically reasonable sample size from each compartment, for a total sample size of 1000.
- The customer satisfaction survey was outsourced to an external consultant, but its supervision was conducted by a team of JICA experts in collaboration with KUKL.
- In order to implement the PDCA cycle of water utility management, it is desirable for KUKL to continue conducting customer satisfaction surveys at its own resource after the project is completed. For this reason, the JICA Expert Team actively involved KUKL staff in the survey to be conducted under local re-commissioning to enhance their capacity to plan and conduct the survey.
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Table 3.4.1 Overall plan of the customer satisfaction survey

Items	Contents
Timing of on-site interview	The first study: October 2021 The second study: June 2023 The third study: planned around the middle of 2025
Target area	13 areas including 11 DNI areas within the ring road
Number of sample	1000 customers of KUKL water supply service
Survey method	On-site Interview with KoBo Collect and KoBo Toolbox
Analytical policy	Detailed analysis of crosstabulations, year-to-year comparisons, satisfaction levels, etc. <ul style="list-style-type: none"> ➤ The survey results will be cross tabulated and analyzed by use category (household/business), water supply system, gender, age (by attribute), region (branch office), and water supply area, depending on the nature of the question. In addition, some questions will be analyzed by year-to-year comparison. ➤ The survey will be conducted on the basis of a 5-point scale ("very satisfied," "a little satisfied," "normal," "a little dissatisfied," and "very dissatisfied") for satisfaction level. Cross-tabulation among potentially relevant questions for detailed analysis of water quality and satisfaction with KUKL's efforts.
Items of questionnaire	<ul style="list-style-type: none"> ➤ Satisfaction with water services provided by KUKL ➤ Question regarding water quality at tap ➤ Question regarding water tariff ➤ Question regarding KUKL's effort for stable water supply ➤ Question regarding water meter ➤ Question regarding communication with customers by KUKL ➤ Questions regarding matters that KUKL should undertake in the future

(2) Determination of the number of survey targets and list of questions

The survey population was defined as 1,000 customers of KUKL within the ring road, and the number of surveys was determined according to the percentage of customers in the water distribution area (DNI numbers) to be constructed by the DNI project.

Table 3.4.2 Distribution of sample size for customer satisfaction survey

No	DNI	Number of Customers in 2020	Percentage	Sample	
				The first survey in 2021	The second survey in 2023
1	DNI 1	10,713	12.2%	122	124
2	DNI 2	6,869	7.8%	78	78
3	DNI 3	11,445	13.0%	130	129
4	DNI 4	5,291	6.0%	60	60
5	DNI 5	6,350	7.2%	72	72
6	DNI 6	5,159	5.9%	59	60
7	DNI 7	15,754	17.9%	179	178
8	DNI 8	5,746	6.5%	65	64
9	DNI 9	3,238	3.7%	36	36
10	DNI 10	1,715	1.9%	19	19
11	DNI 11	4,513	5.1%	51	51
12	OHT Mimbhawan	5,348	6.1%	61	61
13	Gausala	5,971	6.8%	68	68
	Total	88,112	100.0%	1,000	1,000

Table 3.4.3 List of questions

Questions			Added items from the second survey
<p style="text-align: center;"><< PART I >> Water usage</p>			
Q. 0.1	How often do you receive water from KUKL?		✓
Q. 0.2	Do you use water storage tank at home?		✓
Q. 1	How do you drink water from KUKL?		
Q. 2	How do you use KUKL water for cooking?		
Q. 3	How do you feel about the water supplied by KUKL?		
Q. 4	If you are no satisfied, why?		
Q. 5	Is the water supply distribution schedule announced in advance?		
Q. 6	How do you think about the announcement?		
Q. 7	Do you know if you have a water meter?		
Q. 8	Do you know if you have a problem with water service connections owned by customer?		
Q. 9	How much is the water tariff on average?		
Q. 10	Do you think it is expensive for the service?		
Q. 11	How do you obtain water other than water supply by KUKL?		
Q. 12	How much is the water on average? (other than water supply by KUKL)		
Q. 13	How much volume is water by KUKL within the whole water use in your house?		
<p style="text-align: center;"><< PART II >> Awareness</p>			
Q. 14	Do you know the efforts for stable water supply / securing of water sources?		
Q. 15	Have you had any communication with KUKL staff within the last 12 months?		
Q. 16	What was the method of contact?		
Q. 17	What was the purpose of contact?		
Q. 18	How did you feel about the communication services by KUKL?		
Q. 19	How do you want KUKL to communicate?		
Q. 20	Have you got any information on or from KUKL within the last 12 months?		
Q. 21	If yes, how?		
Q. 22	What kind of information do you want KUKL to share?		
Q. 23	Do you know where the nearest KUKL office to communicate is?		

Questions		Added items from the second survey
Q. 23.1	KUKL has a useful homepage, do you know it?	✓
Q. 23.2	Have you used KUKL online system?	✓
Q. 24	How do you hope the services by KUKL to be improved in future?	
Q. 25	How would you rate KUKL service?	
Q. 26	Would you state your opinion, request, or anything, please?	
<< PART III >> Interviewee's information (if possible)		
Q. 27	Name	
Q. 28	Address	
Q. 29	Period of inhabitancy	
Q. 30	Position in the family	
Q. 30.1	Main profession of the family head	✓
Q. 31	Purpose of water use	
Q. 32	Number of people using water	
Q. 33	Landlord or renter	
Q. 34	Ethnic group	
Q. 35	Religion	
Q. 36	Contact number	
Q. 37	Connection Number	
<< PART IV >> Interviewee's information (by surveyor)		
Q. 38	Gender	
Q. 39	Age group	

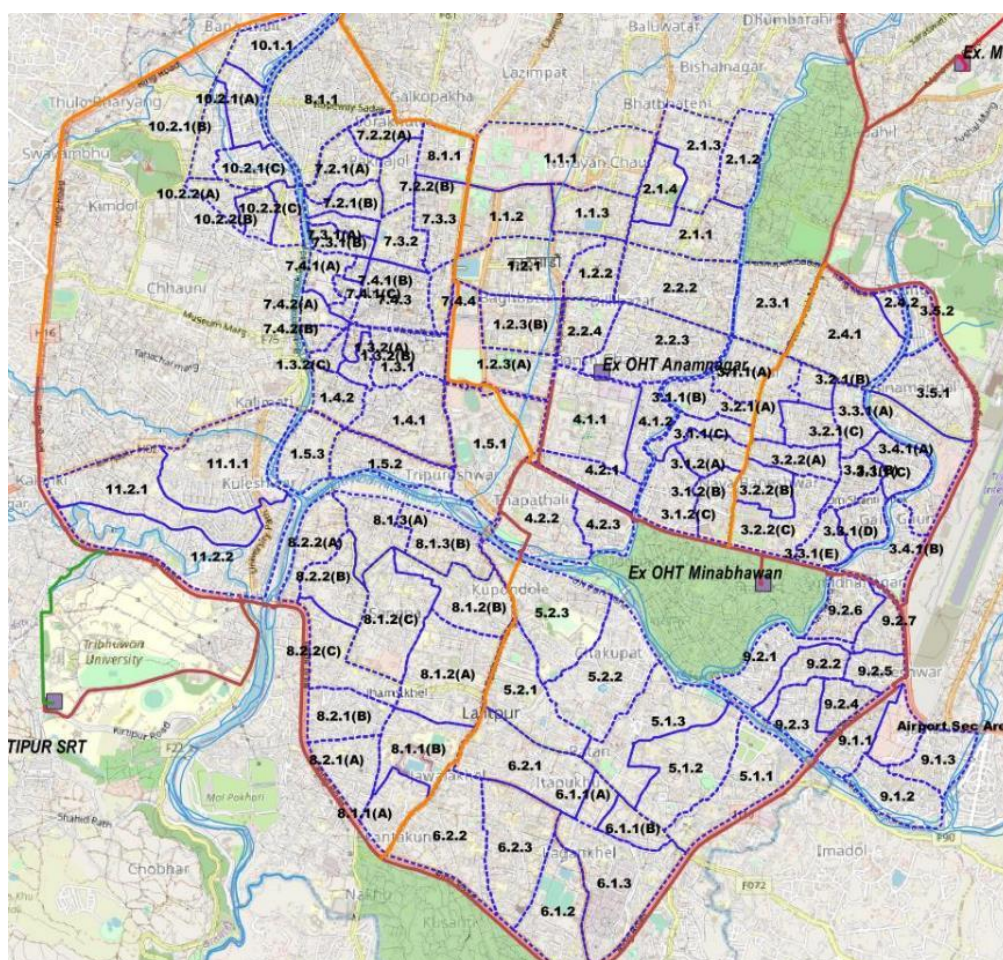


Figure 3.4.2 Target area of the customer satisfaction survey

3.4.3 [Activity 4-2] Conduct customer satisfaction survey at baseline, mid- term and end-line.

(1) Conducting the survey

The first interview was conducted in October-November 2021 as a baseline survey, followed by a second interview in May-June 2023, when the Melamchi Water Supply Project showed its progress. For the second survey, stickers with online payment information and a QR code for the KUKL web page were created and distributed to increase understanding of KUKL among customers.

[Photograph] Customer Satisfaction Survey

		
[The first survey] Orientation for surveyors	[The first survey] Interview to a customer	[The first survey] Interview to a customer
		
[The second survey] Interview to a customer	[The second survey] Interview to a customer	[The second survey] QR Code Sticker

The survey was conducted using "KoBoCollect" that is an open source application developed as a data collection and analysis tool for field surveys of humanitarian aid, emergency disaster surveys, development assistance, etc. This is a system that allows data entry in interviews and other field surveys to be entered online and offline, stored on devices, and shared in the cloud. GPS information was also collected for this survey to help analyze the results.

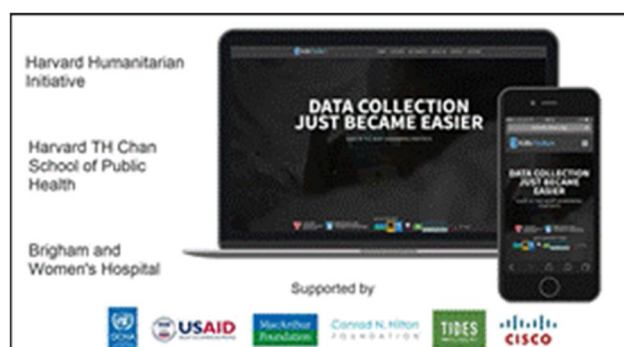


Figure 3.4.3 Application used for the field interview

(2) Aggregate processing of survey results

As a result of the survey, KUKL and JICA Expert Team obtained a great deal of useful information. On the other hand, it is necessary to continue this survey in the future, and it has been an issue from the beginning to be able to accurately and promptly process this enormous amount of data within KUKL as we promote the digitization of complaint-handling information, etc.

The assessment of KUKL staff competencies showed that many of the Output 4 Action Team and Supporting members were inexperienced in the use or operation of spreadsheet software (e.g., Microsoft Excel).

Therefore, in order to reduce dependence on each person's ability and to automate as much as possible, JICA Expert Team proposed the implementation of training for simple and reliable information processing using database software (Microsoft Access), which was discussed with and agreed upon by the Action Team and IT section of KUKL head office. The database software has been installed on the desktop PCs for customer care procured by the project team and provided to KUKL, and deployed at each branch office.

Training on compiling and analyzing customer satisfaction survey results using the database began in May 2022, followed by November-December 2022 and June-July 2023.

Although the C/Ps were initially perplexed by the introduction of the new technology, as they went through each training session, they seemed to realize how interesting it was to be able to process vast amounts of data as they wished, and they became more willing to participate in training sessions, even voluntarily holding training sessions.

At present, not all C/Ps are able to freely use the database, but some C/Ps have reached a level where they can instruct others, and it is expected that they will become more proficient in using the database through future activities.

As of July 2023, the project has certainly enhanced the information processing capacity of KUKL staff and has been able to train 3 TOT candidates and appoint the following responsible persons according to their aptitude from among the C/Ps who are actively engaged in the program.

Reporting Manager (1 person) :	Collect and maintain reports from all KUKL branches.
SOP Manager (2 persons):	Update and maintain SOPs.
PA Sub-Leader (2 persons):	Facilitate external public relations activities

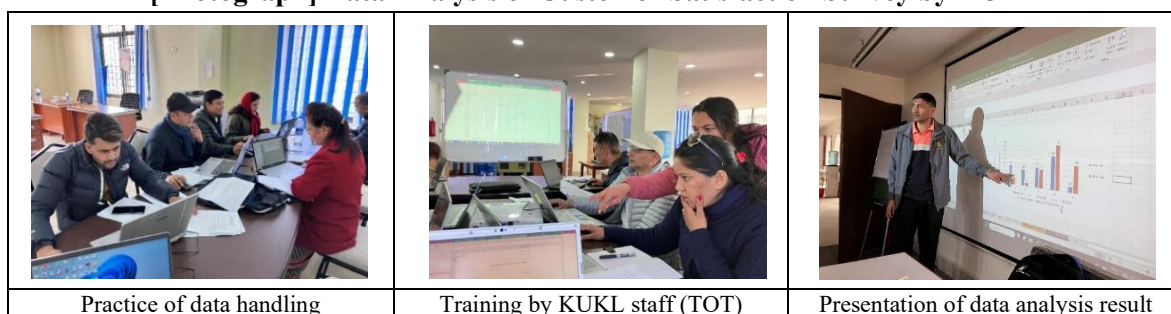
The "PA Sub-Leader" have been selected from the supporting members for public relations activities, and the leader (PA Leader) is Ms. Chapala Dhakal, a member of Output 4 Action Team.

The status of participation in the training and achievement of goals during June and July 2023 is as follows.

Table 3.4.4 Participation and achievement of training

Output-4		Period	June – July, 2023												
Attendance & Certification	Activity	Member	Phase-III Training Attendance /Achievement											☆:You have more to learn ★★: Certified ★★★:Trainer Candidate ★★★★:Certified ★★★★★:Trainer Candidate	
			Regular Training				Focused Training @Ngrkt			Regular Training / Superiority					
No.	Branch		01	02	03	★	04	05	06	★	07	08	★	★	
01	Lalitpur	Ambika	✓	✓	✓	★					✓	✓	★	★	★★★
02	Mahankal.	Pradeep	✓		✓	★	✓	✓	✓	★	✓	✓	★	★	★★★★★
03	Baneshwr.	Chudamani					✓	✓	✓	★	✓	✓	★		★★
04	Kirtipur	Biswajit	✓	✓	✓	★	✓	✓	✓	★	✓	✓	★	R	★★★★-R (Rep. manager)
05	MaharajG.	Geeta	✓	✓	✓	★	✓	✓	✓	★	✓	✓	★	S	★★★★-S (SOP manager)
06	Tripuresh.	Matina	✓	✓	✓	★	✓	✓	✓	★	✓	✓	★	P	★★★★-P (PA sub-leader)
07	Mad. Thimi	Santos			✓	☆	✓	✓	✓	★	✓	✓	★		★★
08	Bhaktapur	Bimala	✓	✓		☆	✓	✓	✓	★	✓	✓	★		★★
09	Chhetrap.	Rajeeb	✓	✓	✓	★	✓	✓	✓	★	✓	✓	★	★	★★★★★
10	Sewarage	Shailendra		✓	✓	☆		✓	✓	★	✓	✓	★		★★
11	W. Quality	Binod						✓	✓	★					★
12	Head Office	Santusha	✓	✓	✓	★					✓	✓	★	P	★★-P (PA sub-leader)
13	Head Office	Kabin	✓	✓	✓	★	✓	✓	✓	★	✓	✓	★	S	★★★★-S (SOP manager)
14	Head Office	Kaushila					✓	✓	✓	★	✓	✓	★		★★
15	Ex. Bhakt.	Rakesh		✓	✓	★	⇒Transferred to another division							★	
16	Head Office	Pramila					✓	✓	✓	★	✓	✓	★		★★

[Photograph] Data Analysis of Customer Satisfaction Survey by KUKL



(3) Analysis of survey result

Examples of outputs obtained through training in data analysis are shown below.

1) Use of water supplied by KUKL

The question asked about the use of the water supplied by KUKL: in the 2021 survey results, about 47% of customers did not use it for drinking, while more than half drank it in some way; in 2023, the number of customers who did not use it for drinking decreased to 39%, while the percentage of customers who drank it increased.

As for whether or not they used it for cooking, the 2021 survey results show that about 67% of the customers used it in some way. On the other hand, about 33% of customers did not use KUKL water for cooking purposes either.

The 2023 survey results showed an improvement in usage, with about 87% using it for cooking

and about 13% not using it for cooking.

In addition, washing, laundry, and bathing are indicated as uses other than the above in the responses to other questions.

In another question, about 47% of the customers indicated that there were "changes related to water quality" compared to before, and many of the details suggest improvements in water quality.

Although the details of the improvement are to be analyzed in the future, it can be inferred that the main factor is the improvement in water quality after the water was distributed from the Melamchi River, rather than improvements in the operation and management of the existing water treatment plant.

Table 3.4.5 Use of water supplied by KUKL

Use	2021		2023	
	Drinking	Cooking	Drinking	Cooking
Direct	4.4%	50.6%	6.0%	72.9%
After boiling	21.2%		17.0%	
After treated by filter etc.	27.1%	16.5%	38.0%	14.3%
No use for drinking/cooking	47.3%	32.9%	39.0%	12.9%

2) Water sources other than water supply by KUKL

Customers were asked about their use of water sources other than KUKL, with "Jar water" being the most common source in both 2021 and 2023, followed by private vendors or self-supplied water sources (wells).

"Jar water" is served in 20L bottles, as shown in the photo below, and is commonly used with servers. The decrease in the total number of respondents is interesting in combination with the increase in the use of KUKL-supplied water as described in the previous section.

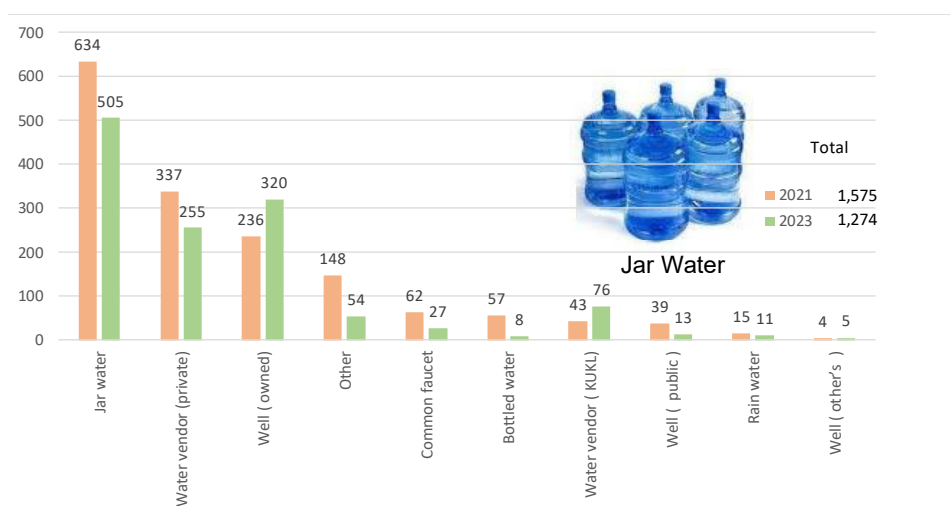


Figure 3.4.4 Water source other than water supply by KUKL

3) Customer satisfaction and sufficiency rate of KUKL supply KUKL water supply in domestic demand

Customer satisfaction is almost perfectly proportional to the average value of the sufficiency rate (rate of KUKL water supply to domestic water demand).

It is clear that when the in-home demand is satisfied by expanding the KUKL water supply, customer satisfaction improves in proportion to this increase.

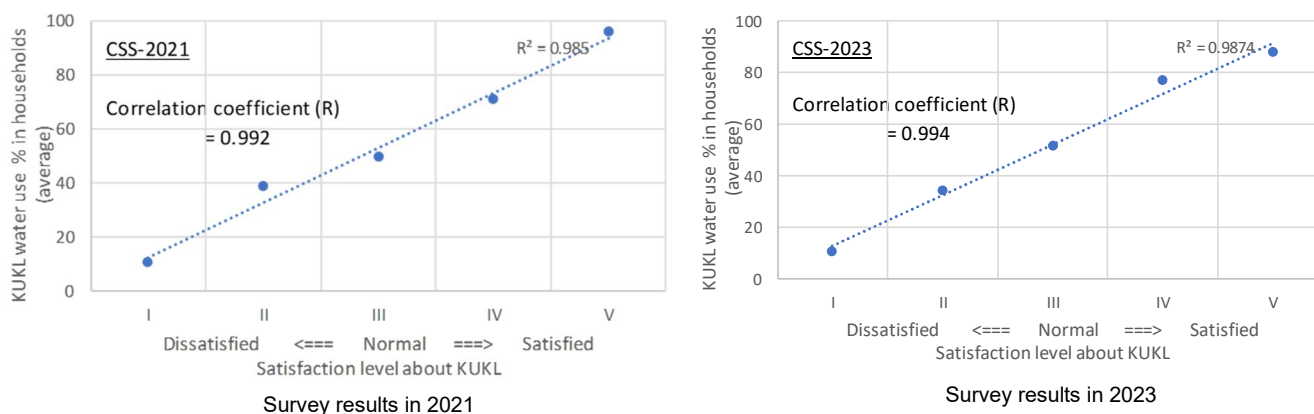


Figure 3.4.5 Relation between customer satisfaction and sufficiency rate of KUKL water supply in domestic demand

4) Satisfaction with KUKL water supply in terms of water quality

In the customer satisfaction survey, GPS location information of the water supply service area is also recorded, allowing cross-analysis with responses to water quality and other questions.

Changes in satisfaction with water quality in the first and second surveys were organized and plotted on a map based on geological information, as shown in the figure below., which provides some understanding of regional characteristics such as water quality. The results of the 2023 survey are still being analyzed.

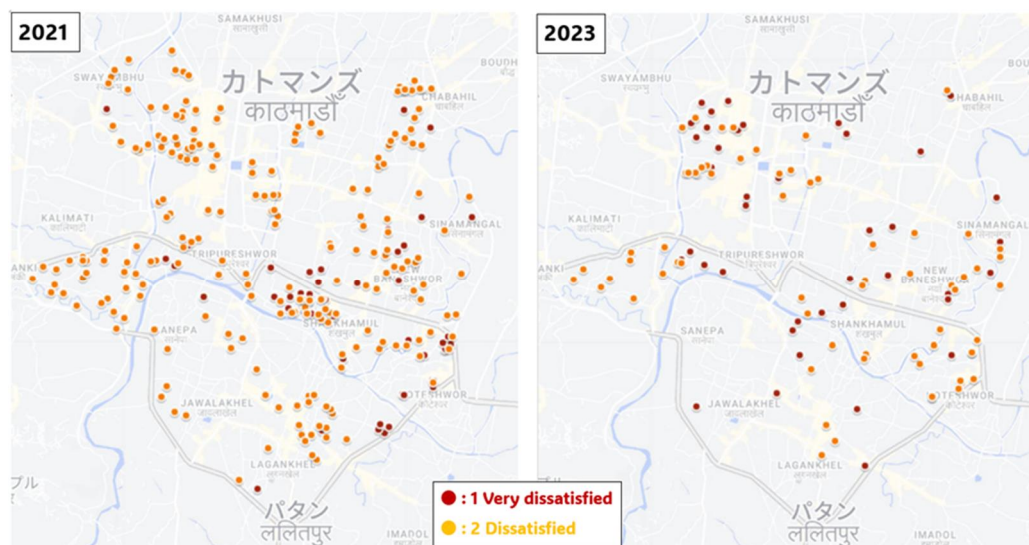


Figure 3.4.6 Distribution of customers who reported dissatisfaction with water quality

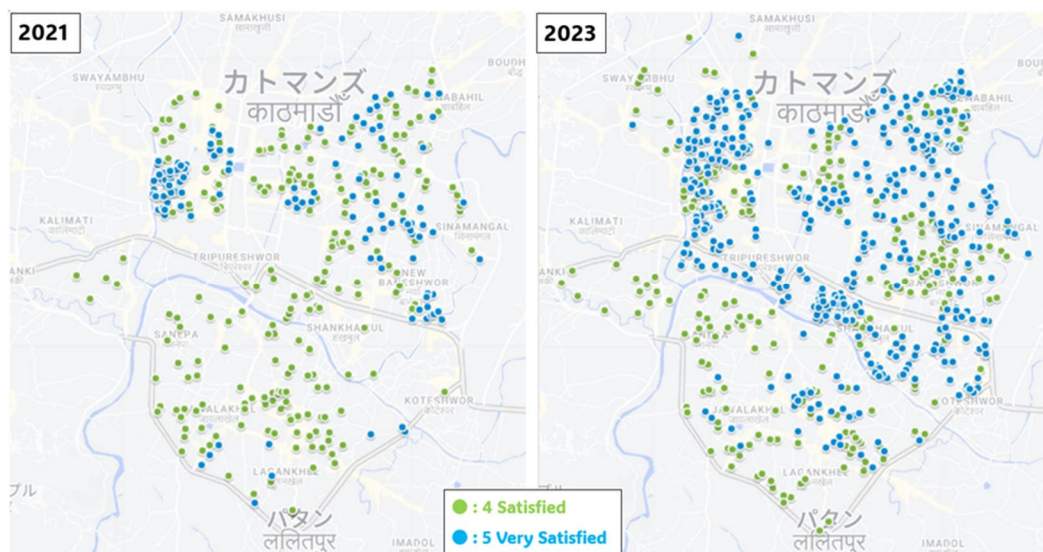


Figure 3.4.7 Distribution of customers who reported satisfaction with water quality

5) Customer satisfaction with overall service of KUKL

The horizontal axis shows I (very dissatisfied) to II (a little dissatisfied), III (normal), IV (a little satisfied), and V (very satisfied), and the vertical axis shows the number of responses from among 1,000 respondents. 2021 and 2023 peaked at IV (a little satisfied) for both years.

On the other hand, the responses seen in I-III in 2021 decreased in 2023, while the responses in IV and V increased markedly, indicating that customer satisfaction is steadily improving.

As mentioned above (Figure 3.4.4), customer satisfaction is strongly correlated with water supply (the percentage of KUKL supply water sufficiency within customer households) (correlation coefficients of 0.992 (2021) and 0.994 (2023)), so the increase in water supply due to the Melamchi Water Supply Project is assumed to be the direct reason.

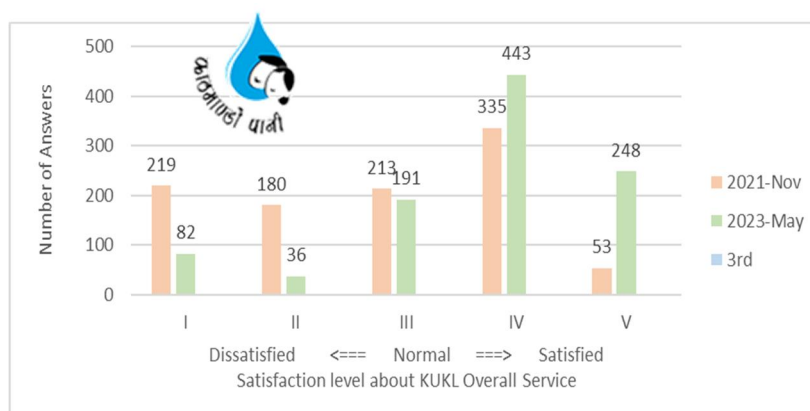


Figure 3.4.8 Customer Satisfaction with overall service of KUKL

6) Customer satisfaction with customer attention (telephone)

The peak of satisfaction with telephone attention moved from III (normal) to IV (a little satisfied), indicating a trend toward improvement in telephone service. In addition, the total number of responses decreased from 113 in 2021 to 48 in 2023.

According to the C/P, this may be due to the fact that "after the water supply from Melamchi started in earnest, the number of complaint calls has definitely decreased."

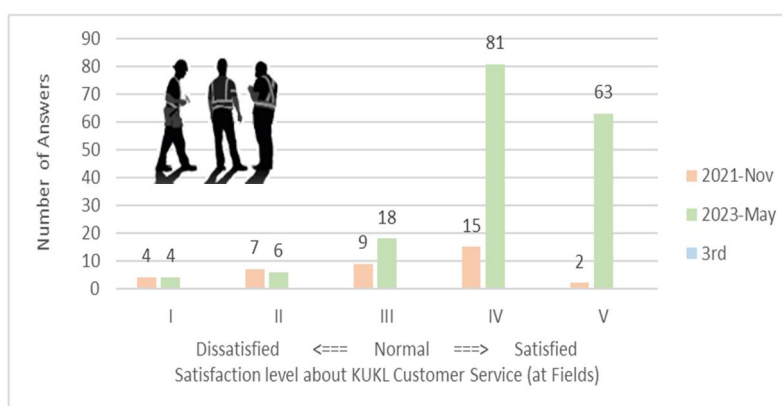


Figure 3.4.9 Customer satisfaction with telephone attention by KUKL

7) Customer satisfaction with customer attention (face-to-face)

According to the C/P, it was noted that communication with customers in the field has increased as water supply from Melamchi has begun in earnest and more work has been done to check water meters, register new customers, etc.

It is also desirable to note that most of the responses to the on-site customer service were IV-V. Based on these results, JICA Expert Team suggested that the Customer Service Report be shared within KUKL and that regular meetings with the PID be established.

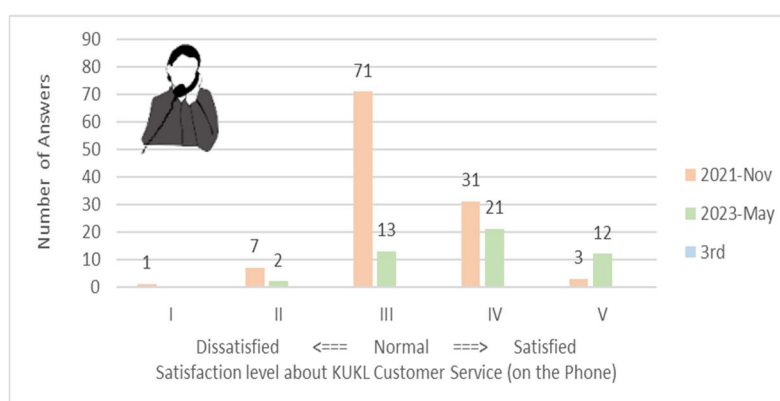


Figure 3.4.10 Customer satisfaction with on-site attention by KUKL

8) Sufficiency of KUKL water supply for domestic demand

As shown in the chart below, the number of customers who reported 100% sufficiency of KUKL water supply doubled. Figure 3.4.11 shows the distribution by water distribution area and Figure 3.4.12 shows the distribution of customers based on GPS information. The realization of the Melamchi Water Supply Project and the results of this JICA technical cooperation project activities can be visually confirmed.

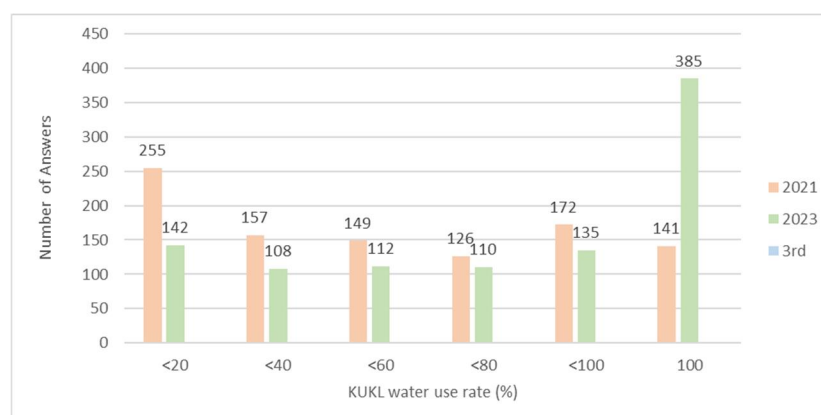


Figure 3.4.11 Sufficiency of KUKL water supply for domestic demand

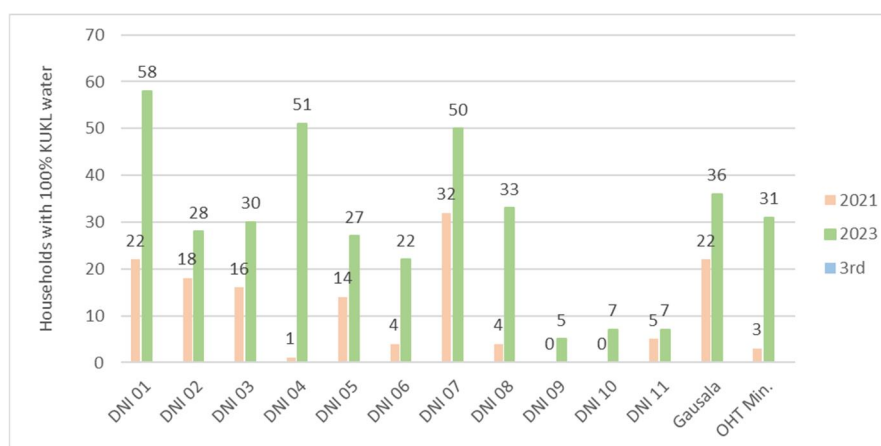


Figure 3.4.12 DNI number to which the customer belongs that responded with 100% sufficiency of KUKL water supply

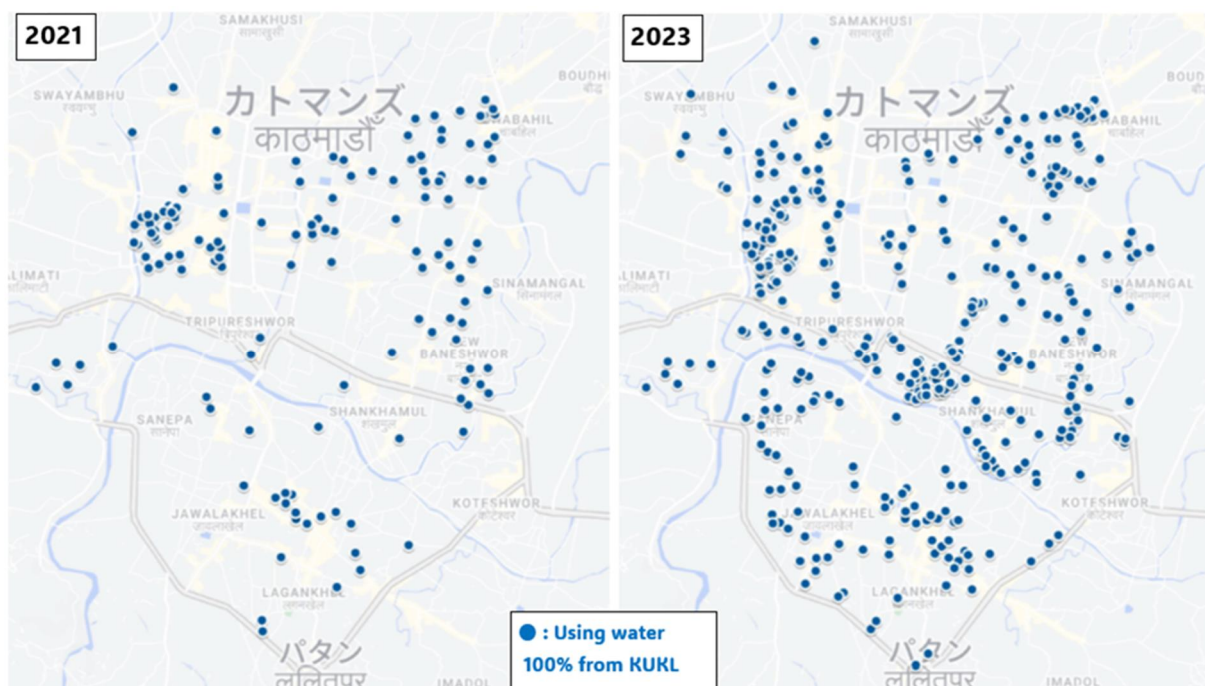


Figure 3.4.13 Distribution of customers who responded with 100% sufficiency of KUKL water supply

9) Level of use of online systems

As shown in the chart below, there are few users of online services other than fee payment. Since a certain number of respondents answered "Yes" to the question about the fee payment system, Figure 3.4.14 shows the breakdown of these respondents by age group. The number of "Yes" responses peaked among those in their 40s, but declined among those in their 50s and above, despite the relatively high number of responses. On the other hand, the number of "Yes, I would like to use it" responses was a constant across generations, and JICA Expert Team and KUKL plan to continue the promotion in the future.

Looking at the responses to the question "Usage of Online Systems," which was added to the question for the first time this time, it can be seen that the number of users is steadily increasing for the rate payment system (to be launched in January 2022). On the other hand, the number of users of the grievance system and the self-metering reading system is low, indicating the need for further discussion on how to improve these systems.

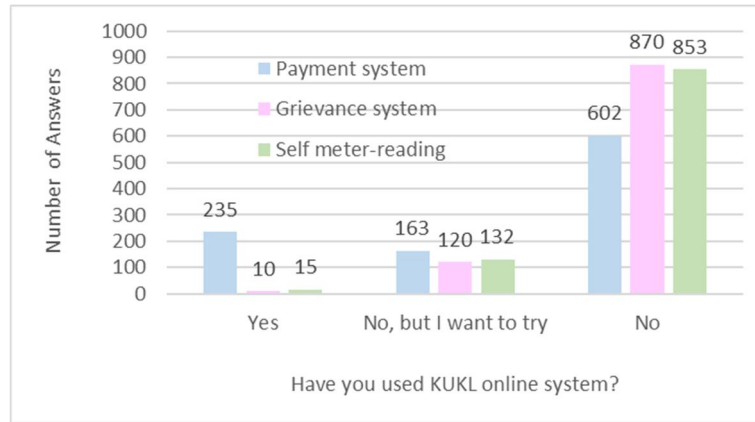


Figure 3.4.14 Experience using KUKL's online system

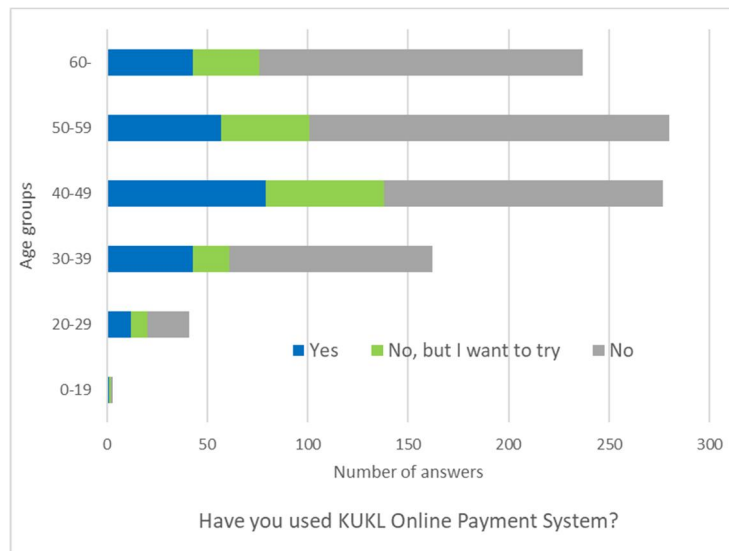


Figure 3.4.15 Breakdown by age of respondents for online payment system

3.4.4 [Activity 4-3] Prepare a plan for measures to improve customer satisfaction.

As of July 2023, work is in progress to compile the analysis results of Activity 4-2 and Activity 4-7 into a report as Activity 4-8. An action plan is being drafted based on this report.

On the other hand, KUKL itself has gradually begun activities to improve customer service, and has improved the posting of information about visiting customers at each branch office. In addition, the introduction of a token system at each branch office counter is also being carried out with KUKL's own budget.

Customers press a button on the machine, receive a number slip, and wait until their number is called. Since the number currently being handled is displayed, there is no longer a need to wait in long lines at the counter, which is a great improvement in terms of customer service.

[Photograph] Measures to improve customer contact at branch offices



3.4.5 [Activity 4-4] Review the Customer Grievance Module's level of functioning on the Computer Billing and Accounting System (CBAAS) and current practice of customer care. (internal arrangements such as internal procedures or staff allocation)

(1) Current Status of Grievance Attention Module

The electronic billing and accounting system (CBAAS), which has been in place since before the project began, facilitates the switch to online payments and includes functions to check the status of billing and payments and to accept customer complaints online.

The web page for grievance application that KUKL has begun using has been in full operation since around December 2021, but the online application for complaints has not been well publicized to customers, and there are still many traditional written complaints applications.

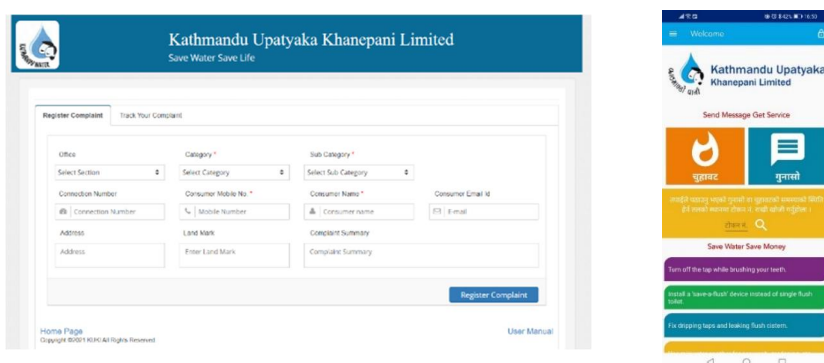


Figure 3.4.16 Grievance application page (left) and mobile application (right)

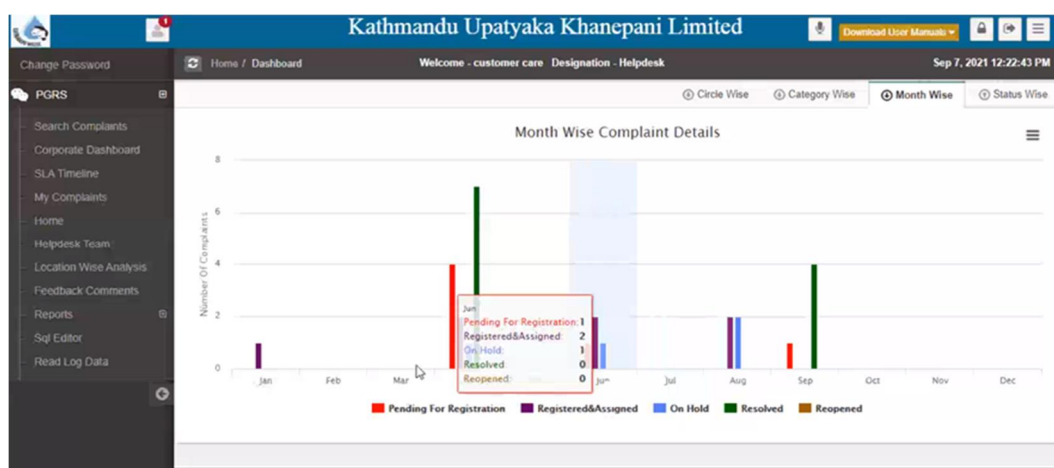


Figure 3.4.17 Example of grievance statistics screen in CBAAS

Grievance handling at KUKL branches is as prompt as manpower allows, and the implementation of customer service is generally adequate. However, all record keeping is done on paper, which does not allow for analysis of grievance information.

[Photograph] Paper-based grievance recording



In January 2022, through visits to each branch office, JICA Expert Team investigated the customer service workflow and staffing at KUKL headquarters and branch offices, including complaint handling. The results are shown in the figure below.

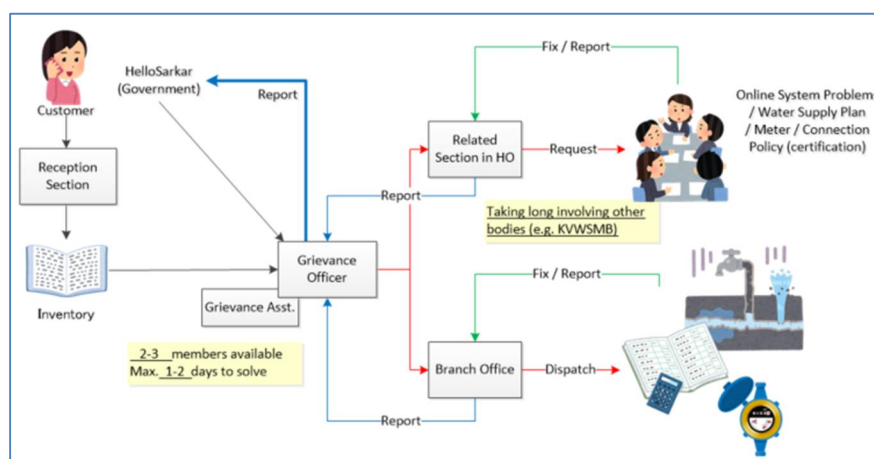


Figure 3.4.18 Workflow of grievance attention in KUKL Head Office

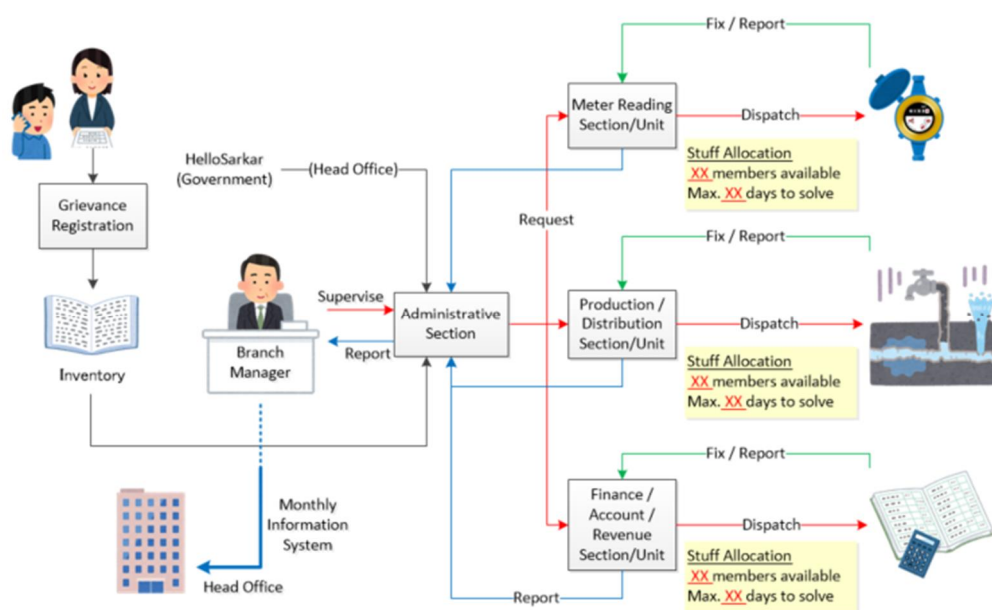


Figure 3.4.19 Workflow of grievance attention in the branch offices

Figure 3.4.6 Current staffing and number of grievances handled at each KUKL branch

Staff allocation		Meter Reading		Production / Distribution		Finance / Account / Revenue	
No.	Branch Office	Manpower (members)	Max. days to solve	Manpower (members)	Max. days to solve	Manpower (members)	Max. days to solve
1	Lalitpur Branch	25 pers	2-4 days	78 pers	5-7 days	15 pers	5-7 days
2	Mahankalchaur Branch	18 pers	1 d	54 pers	2 d	12 pers	1 d
3	Baneshwor Branch	21 pers	3-4 d	24 pers	1 w	7 pers	4-5 d
4	Kirtipur Branch	8 pers	3-4 d	24 pers	1 w	8 pers	1 w
5	Maharajgunj Branch	16 pers	3-5 d	15 pers	3-6 d	15 pers	3-5 d
6	Tripreshwor Branch	14 pers	2-5 d	26 pers	1 w	6 pers	1 w
7	Madhyapur Thimi Branch	6 pers	1-2 w	9 pers	1-2 w	6 pers	2-3 w
8	Bhaktapur Branch	6 pers	4-5 d	22 pers	1-2 w	4 pers	1 w
9	Chhetrapati Branch	6 pers	3-4 d	9 pers	1 w	7 pers	1 w
	Division	Jetting		Technical		Revenue	
10	Wastewater Operation Div.	9 pers	2-3 d	7 pers	1 w	1 pers	-

3.4.6 [Activity 4-5] Identify activities necessary to fully utilize the Customer Grievance Module and improve the customer care management.

Through the activities of Term-1, the contents of the grievance handling system, its operational status, and issues related to customer service were clarified.

In the future, it will be necessary to address issues and improve customer response management while utilizing the complaint handling system in the activities led by Output 4 Action Team. Discussions were held with the Action Team regarding activities for this purpose, and the following items were raised.

Table 3.4.7 Proposed activities for improvement of customer relations management

No.	Activity
1	Analyze the reasons of low access to Grievance Management System (GMS) and consult for improvement
1-1	Review & Update the interface for customers in GMS
1-2	Public Awareness (access promotion)
2	Identify obstruction in internal system and GMS and suggest countermeasures
2-1	Consult on introduction of additional function (e.g. Tracking system)
2-2	Consult on necessity of prompt evaluation (by customer)
3	Improve the PC operation skills for KUKL staff
4	Consult on utilization of provided PC for conventional reception of grievance (at branch front desk & telephone)
5	Reflect the result of Customer Satisfaction Survey
6	Organize, Manage & Analyze accumulated data in GMS
7	Review customer management and revise
8	Systemize internal reporting system
9	Consult on information disclosure
10	Public Awareness (appeals to customers)
11	Check & Action of revised version

Activities No. 1 and No. 2 (above-mentioned) were implemented after January 2022, when the first proposal was discussed. As a result, sub-items No. 1-1, 1-2, 2-1, and 2-2 were proposed as specific proposals and implemented through February of the same year. Other activities were implemented in the second and subsequent term.

3.4.7 [Activity 4-6] Prepare an activity plan for data management utilizing the Customer Grievance Module, analysis of customer complaints and improvement of customer care management.

The online application system for customer’s grievance, which has been in operation since around December 2021, was initially not user-friendly, so the interface was improved as an Output 4 activity, and access promotion to the KUKL web page was also conducted.

The JICA experts provided their impressions of the interface, and then the C/P proposed improvements, which were added, changed, deleted, etc., with the cooperation of the IT Section. The following is an example of the improvement work on some of the files that were actually used.

Table 3.4.8 Example of improvements process to the customer grievance handling system

Table-1* Reorganization of Grievance Module in KUKL HP[↵]

No.	Category	Sub Category	To be clarified (Kimura didn't understand)	↵
1. →	Interruption in supplies [↵]	Due to failure of <u>pump</u> lift [↵]	Lift => Pump? [↵]	↵
2. →	↵	Due to breach of <u>pipeline</u> canal [↵]	Canal => pipeline? [↵]	↵
3. →	↵	<u>Due to damage in valve</u> [↵]	↵	↵
3-4. →	↵	Any other reason [↵]	↵	↵
4-5. →	Quantity <u>in</u> supply [↵]	Interruption <u>leakage</u> due to individual supply/line breakdown [↵]	individual supply => service connection? [↵]	↵
5-6. →	↵	Interruption <u>leakage</u> due to breakdown in the source/mains [↵]	(of KUKL) [↵]	↵
6-7. →	↵	Insufficient quantity <u>viz a viz standards</u> [↵]	Standard? Average? Others nearby? [↵]	↵
8. →	↵	<u>Time of supply</u> [↵]	(Midnight) [↵]	↵
9. →	↵	<u>Intermittence of supply</u> [↵]	↵	↵
7-10.	Quantity and quality [↵]	<u>Deteriorated quality caused by WTP</u> Inadequate supply [↵]	Meaning?? (deteriorated quality caused by WTP??, not contaminated through pipeline) [↵]	↵
8-11.	↵	<u>Deteriorated quality caused by pipelines</u> Contaminated supply [↵]	(quality) [↵]	↵
9-12.	Quantity of supply [↵]	<u>Deteriorated quality of ground water</u> Untreated supply [↵]	Ground water? [↵]	↵
10-13.	↵	<u>Treated supply (Turbid, bad taste, & odour, any other)</u> [↵]	Asking about quality? [↵]	↵
11-14.	Meters [↵]	Damaged [↵]	↵	↵
12-15.	↵	Defective [↵]	↵	↵
16. →	↵	<u>Different from billing</u> [↵]	↵	↵
13-17.	Bills [↵]	For bills where additional information from the field relating to correctness of readings etc is required [↵]	(Different from meter) [↵]	↵
14-18.	↵	For bills where no additional information from field is required [↵]	↵	↵
19. →	↵	<u>Online payment</u> [↵]	↵	↵
15-20.	<u>Grant of permission for use</u>	<u>Grant of permission for use of water from irrigation works</u> [↵]	Personally possible? [↵]	↵

In the July 2023 activity, JICA Expert Team and KUKL examined KUKL internal documents regarding the online system, which still has a slow growth in the number of users.

The figure below shows that the number of users increased in early 2022, when the KUKL web page access promotion was implemented in the activities of Outcome 4, but that access has not been maintained since then.

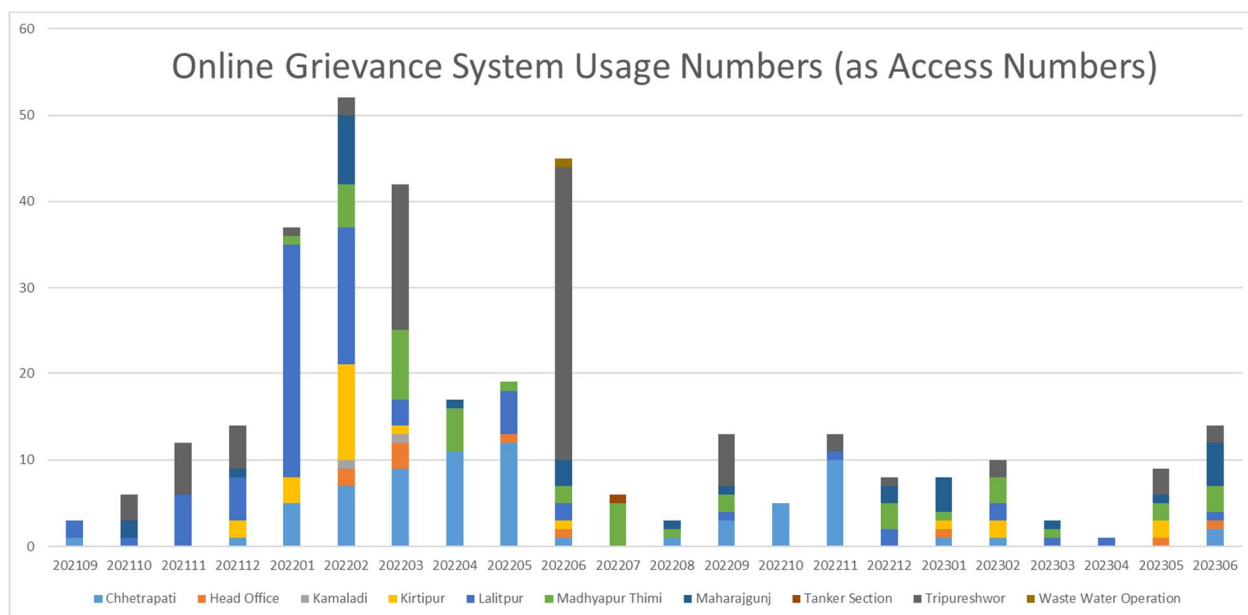
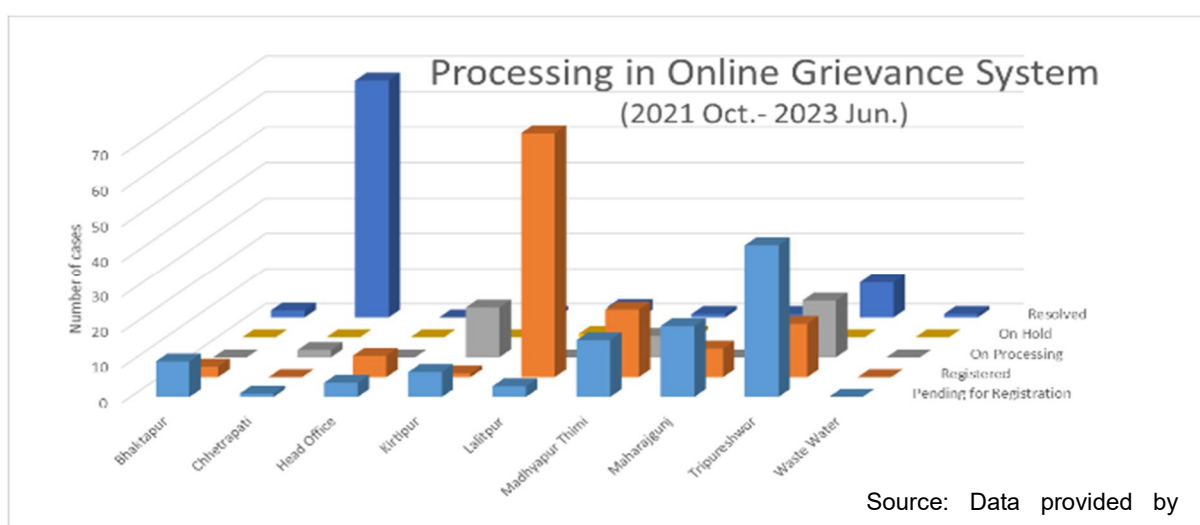


Figure 3.4.20 Level of use of online grievance system

The chart shown below is the status of processing by KUKL in our system. The horizontal line is the branch office, the line to the back is the processing process, and the numbers represent the status stopped at that stage.

The front of the chart shows the reception stage, and the innermost shows the state of resolution. This distribution favors the situation closer to the back, but many branches have been put on hold. The second from the left, Chhetrapati branch office, is in a relatively good condition.

This situation may have led to user dissatisfaction and a decrease in the number of users of the online system, and was addressed at the meeting of Output 4 Action Team, and also in the report in Activity 4-8.



Source: Data provided by

Figure 3.4.21 Status of grievance handling process by branch office

3.4.8 [Activity 4-7] Analyze the customer complaints.

As noted in Activity 4-4, at the start of the project, all record keeping of grievance information was done on paper, which did not allow for analysis of grievance information.

In June 2022, the project started to compile and analyze the results of grievance and requests, using the inputted information, and this activity is still ongoing.

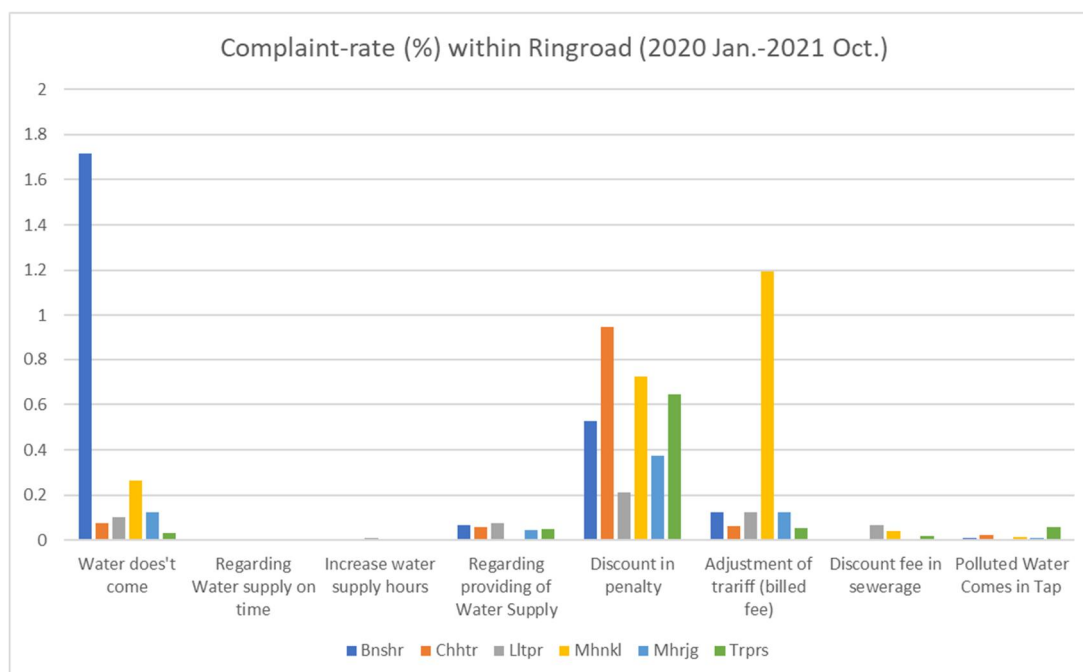


Figure 3.4.22 Percentage of grievance (No of grievance/No of customers in branches within the ring road (%))

3.4.9 [Activity 4-8] Report the results of analysis on customer complaints to KUKL management.

In December 2022, a pilot reporting system was implemented using the results obtained through the training for Output 4. As of July 2023, a customer service report reflecting the results of the second customer satisfaction survey has been prepared and reporting is ongoing using the reporting system.

In this reporting system, each C/P of Output 4 submits a report prepared by the C/P to a higher level within the organization (e.g., branch director), which is then approved (signed) by the branch director and others and reported to KUKL headquarters (currently Mr. Prakash Rai, Output 4 Leader). Currently, the reporting system is used on a voluntary basis at the Head Office, seven branch offices, and the Sewerage Department.

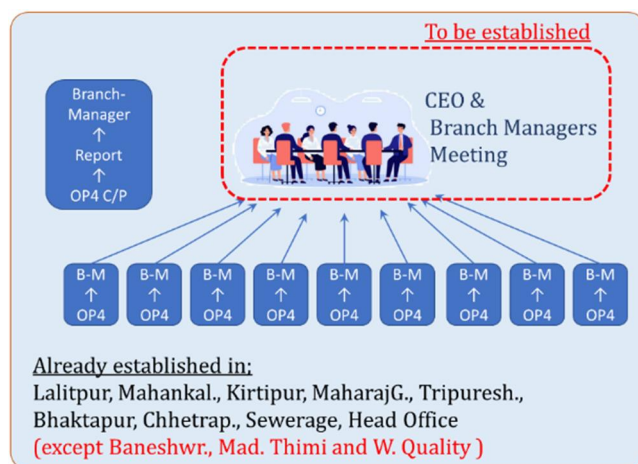


Figure 3.4.23 Reporting system of grievance handling

However, to date, there has been no formal adoption of this reporting process within KUKL, and it has been implemented on an individual basis by C/Ps who are actively involved in the training of Output 4. This improvement has been discussed at Action Team meetings and in discussions with the CEO, and is making progress toward becoming established and institutionalized.

As the next step, based on the reports from each branch, KUKL is planning to hold a plenary meeting at the upper levels of KUKL to create a forum for discussions on matters that require KUKL-wide or external measures.

3.4.10 [Activity 4-9] Conduct trainings on customer care (how to behave to customers) targeting for staff in charge or customer care and meter readers.

In order to begin training related to customer service, a meeting was held in July 2022 to discuss communication problems that have been experienced. The purpose of this meeting was as follows.

- C/Ps from each branch office participating as support members review the status of communication with customers at the branch office level.
- Improvements noticed by C/Ps and experts will be incorporated into future training materials.

The JICA expert team prepared training materials suitable for the current situation in Nepal, referring to training materials utilized by the Tokyo Metropolitan Bureau of Waterworks and materials published by AWWA (American Water Works Association). These materials will be used in future internal training sessions.

The following materials were proposed and presented by the experts as teaching materials.

- Presentation document for Customer Care
- Participatory training materials
 - ① Group Discussion Themes: Good service and Bad service
 - ② Mock Debate Themes: Agree or Disagree about wearing uniforms

- ③ Case Study Themes: Learning from Failures
- ④ Roll Playing Themes: Meter Reader versus Customer at site

➤ Q&A Case Book

In addition, it was confirmed that the training materials need to be updated through repeated exchanges of opinions with C/Ps, as it is most important to make the content in line with Nepalese conditions, taking into consideration the differences in social environment between Nepal and Japan.

In relation to this activity, the parties concerned agreed that Ms. Chapala Dhakal will be the leader of this training-related activity and Mr. Chet Bahadur Ayer, will be the deputy leader, considering the activities after the project is completed or in the absence of Japanese experts.

(1) Preparation for TOT

In Output 4 Action Team Meeting held on June 12, 2023, the TOT course on Customer Care Training was proposed by JICA Expert Team and the contents was agreed by all participants.

The training course for meter readers, which will be required as internal training in the future, will be arranged based on the General Customer Care training course.

As with the GIS training in Output 1, group training at the NWSSTC managed by DWSSM was made possible by borrowing the NWSSTC, so the session of first two days of the training schedule were conducted at the project office, and that of the last two days were conducted at the NWSSTC as group training with overnight stays.

Table 3.4.9 Outline of TOT for Customer Care

Item	Contents	
Objective	Acquire training skills to improve customer satisfaction.	
Period	Training in the Project Office: 20-21 June 2023 Training camp at NWSSTC: 3-4 July 2023	
Type	Lecture and Group Work	
Trainer	Overall supervision and guidance: Mr. Yoji Matsui	
Target	Section in charge of customer service at Head Office and Branches	
Program	Day 1	[14:30~15:30] Review the last year's activities (Customer care training in Tokyo) Understand basic concept of customer care in water utilities and ToT schedule [15:30~16:30] Group discussion: Experience group discussion and learn the process of facilitating it
	Day 2	[14:30~16:40] Group work: Understand some methods of training for customer care. Experience group work and learn the process of facilitating it 1. Group Discussion, 2. Debate, 3. Case Study, 4. Role playing [16:40~17:00] Facilitator's Role: Learn some tips for facilitating group work
	Day 3	Learn and discuss training materials: Understand the contents of training material and modify it suitable for KUKL.
	Day 4	Test, Presentation Practice Certificate

(2) Details of TOT for Customer Care

1) Day 1

JICA Expert and participants first reviewed the discussions at the July 2022 meeting, and then confirmed how to proceed with this TOT based on the training for customer applied in the Tokyo Metropolitan Bureau of Waterworks.

Then, group discussion-type training was conducted as a preparation for the participatory training scheduled for Day 2 onward.

- Discussion of three basic questions about customer care:
 - ① Who is customer ?
 - ② What customer want ?
 - ③ What happen if mishandle ?
- Individual study ⇒ Group discussion ⇒ Group summary ⇒ Presentation by group wise ⇒ Overall discussion

2) Day 2

Support members of Output 2 participated as trainees in four types of participatory training.

- Group Discussion Training

The participants discussed the difference between "good service" and "bad service," referring to examples from supermarkets and restaurants, and reflecting on the actual situation at their own branch office counter.
- Debate Training

Theme: Do you need a uniform?
Uniforms were distributed in KUKL before, those but are rarely worn. The discussion was divided between those in favor and those opposed to this situation.
- Case Study Training

The participants picked up incidents that were likely to occur at the branch office, and discussed and presented the following three points: (1) measures to control the incidents that were occurring, (2) causes of the incidents, and (3) measures to prevent the incidents from occurring.
- Roll Playing Training

Two participants recreated the communication between a meter reader and a customer that occurs at a meter reading site. Based on a scenario prepared in advance, a more realistic exchange was developed by the participants.

After a series of training sessions, the JICA expert explained the points to be noted as Facilitator. The participants' impression of each participatory training program was positive and showed a sense of active participation. The participants were also familiar with the discussions and presentations, and their understanding of the process of each type of training seemed to be high.

3) Day 3

Basic training was completed by Day 2, and on Day 3, the content of the previous training was arranged to suit the actual situation at KUKL. Participants were divided into groups, each group

was assigned a theme, and the training materials (PowerPoint slides) were revised through discussions.

After that, the JICA expert explained the non-verbal expressions required for the instructor role, and the participants were assigned to self-study in their lodgings in preparation for the practice test (for all participants) scheduled for the fourth day of the training.

The practice test focuses on seven points: eye contact, gestures, hand movements, movement around the podium, high and low voice, loud and quiet voice, and slow and fast speech speed.

4) Day 4

On Day 4, as the final stage of preparing training materials for customer care in line with KUKL's operations, the participants prepared Nepali PowerPoint slides for KUKL's internal training, based on the content discussed up to the previous day. Since it takes time to complete the slides in Nepali, the participants will continue working on their own assignments after the training.

Next, a paper test was administered to test their understanding of the content of the training material. Since the questions were asked in English and the answers were written in Nepali (not multiple-choice), the scores ranged from 15.25 to 4.0 points on a 20-point scale, with an average score of 7.88 points, resulting in a wide range of evaluation points.

However, the test questions provided an opportunity to review the content of the training material again, and the participants took the material very seriously, suggesting that the initial objective was achieved.

At the end of the session, as previously announced, a non-verbal expression practice test was conducted. The participants enjoyed themselves and actively participated in the test, which proved to be a good experience for them to check their own ability to express themselves.

[Photograph] TOT for Customer Care

		
Orientation of TOT	Presentation after Group Discussion	Explanation about Roll Playing Training
		
Pseudo-communication with participants playing the roles of meter reader and customer	Closing remarks by Deputy CEO, Bijay Timilsina	Awarding of Certificates

Table 3.4.10 Participants in TOT for Customer Care

No	Name	Organization	Position	Day 1	Day 2	Day 3	Day 4
1	Ms. Geeta Pokhrel	Maharajgunj	Admin. Officer, Level 7, Admin.	✓	✓	✓	✓
2	Ms. Matina Shakya	Tripureshwor	Admin. Officer, Level 7, Admin.	✓	✓	✓	✓
3	Ms. Shantusha Kaspal	Head Office	Asst. Computer Officer, Level 6, Admin.	✓	✓	--	--
4	Mr. Chudamani Luitel	Baneshwor	Asst. Admin. Officer, Level 6, Admin.	--	--	✓	✓
5	Mr. Santos Raj Ojha	Madhyapur-Thimi	Assistant Administration (Level - 4)	(✓)		✓	✓
6	Mr. Binod Kumar Oli	Water Quality	Assistant Administration (Level 4)	--	--	✓	--
7	Mr. Bishowjit Bhandari	Kirtipur	Assistant Administration (Level 4)	✓	✓	✓	✓
8	Mr. Rajeeb Kumar Singh	Chhetrapati	Assistant Administration (Level 4)	✓	✓	✓	✓
9	Mr. Pradeep Chapagain	Mahankalchaur	Assistant Administration (Level 4)	✓	✓	✓	✓
10	Mr. Rakesh Chaudhary	New Sundarijal	Asst. Account, Level -4, Admin.	✓	✓	--	--
11	Mr. Shailendra Shresths	Wastewater	Senior Assistant -5	--	✓	✓	--
12	Ms. Ambika Bogati	Lalitpur	Admin. Assistant - 4	✓	✓	--	--
13	Mr. Kabin Dhewaj Adhikari	Head Office	Senior Assistant -5	✓	✓	✓	✓
14	Ms. Bimala Khadka	Bhaktapur	Senior computer operator	(✓)	✓	✓	✓
15	Ms. Kaushila Bhandari	Head office	Office Assistant	--	--	✓	✓


3.4.11 [Activity 4-10] Prepare a plan of activities for public awareness.


From the beginning of the project activities, publicity activities by KUKL were limited to SNS dissemination and calendar publication, and few other activities were implemented. Therefore, awareness-raising activities were gradually promoted through the activities described in Output 4.






Beginning with the 1st customer satisfaction survey in 2021, the project is developing a broad appeal to KUKL customers and the public through improvements and promotion of the online system, collaborative discussions with the PID, and the creation of project publicity materials.

A partial table summarizing plans and accomplishments from the Action Plan prepared as Activity 4-10 is shown below.

Table 3.4.11 Excerpt from Public Awareness Action Plan

No.	Activity	Content	Time	Status
1	Customer Satisfaction Survey (1 of 3)	The main purpose of the first survey is to determine the current level of customer satisfaction with KUKL. The survey is part of KUKL's service improvement activities, to demonstrate its commitment to its customers and to take their needs seriously.	Sep. 2021 (Preparation) Nov. 2021 (Survey)	Conducted as scheduled. 

No.	Activity	Content	Time	Status
2	SNS	To inform customers JICA Expert Team have begun full-scale activities in Kathmandu, starting with the provision of PCs.	Jan., 2022	Conducted and to be updated regularly 
3	Postering	To inform customers new online system and to promote to use it.	Jan., 2022	Started and to be conducted 
4	Improving customer interface for online grievance system	In this system, which is linked to the KUKL homepage, customers can appeal to KUKL by selecting complaints, etc. by category. However, some customers pointed out that these options were insufficient or difficult to understand. Therefore, during this training, the C/Ps who actually handle complaints suggest improvements.	Jan.- Feb., 2022	Conducted
5	QR code stamp	A QR code that allows direct access to the KUKL website is being utilized. On the other hand, since there is a substantial inventory of conventionally used handouts, a stamp will be created so that existing forms can also be used for advertising purposes.	Jan.- Feb., 2022	Conducted 
6	Confirmation of PID Activities	PID, the supervisory agency of the Melamchi Water Supply Project, has been continuously conducting publicity activities for the project.	May- Jun., 2022	KUKL held discussions with PID to confirm the activities conducted so far and their implementation methods (June 13). KUKL also observed a public relations event held at a junior high school in Kathmandu (June 23).

No.	Activity	Content	Time	Status
7	Promotion materials (shirts & caps)	The project is considering the production of materials to publicize its activities and its achievements. Through the Action Team meetings to date, it is decided to create uniforms for KUKL staff to wear when they are working in the city of Kathmandu. The uniforms will be worn by C/Ps during meter reading, publicity activities, and training sessions conducted by each outcome in the field, etc., to raise awareness and ownership of project participation, as well as to improve their impression on the public.	May- Jun., 2022	<p>Designed (June)</p>  <p>Delivered (July)</p> 
8	Customer Satisfaction Survey (2 of 3)	The main purpose of the second survey is to understand changes in customer satisfaction with KUKL. The survey is also intended to demonstrate to customers KUKL's commitment to improving its services and to take customers' needs seriously.	Mar., 2023 (Preparation) May, 2023 (Survey)	<p>Conducted as scheduled.</p> 
9	Sticker	On the occasion of customer visits for customer satisfaction surveys, stickers are produced and distributed with the main objective of promoting HP access.	May, 2023	<p>Conducted</p> 
10	Policy Revision Meetings	In July 2023, halfway through the second of the three phases of this project, the project will review its past public relations activities and revise its future plans as an Output-4 all member session.	July, 2023	<p>Conducted and the following activity plan was revised.</p>
11	Establishment of Regular Meetings with PID	The following background led to a meeting with PID, as it was felt that working with PID would lead to the continued implementation of PR activities by KUKL in an efficient manner. - The PID has been carrying out PR activities since 2017 and has an ongoing budget. - It would not be efficient for KUKL to plan PR activities from scratch and it has a	July, 2023	<p>Held on July-13th</p> 

No.	Activity	Content	Time	Status
		<p>smaller budget.</p> <ul style="list-style-type: none"> - KUKL has initiated and will continue to conduct regular customer satisfaction surveys and can share post-evaluations including PID activities. - KUKL understands the PID's activities and can participate in regular meetings and events. - At the same time, it will be possible to advise the PID on the results of customer satisfaction surveys, for example, from the KUKL's perspective. <p>Meetings were held between the PID and the consultants who undertake all public relations activities, KUKL and the team of experts to agree on a working level on future collaboration and the establishment of regular meetings. The approval process for management will now take place within PID.</p>		

3.4.12 [Activity 4-11] Conduct public awareness activities based on Activity 4-10.

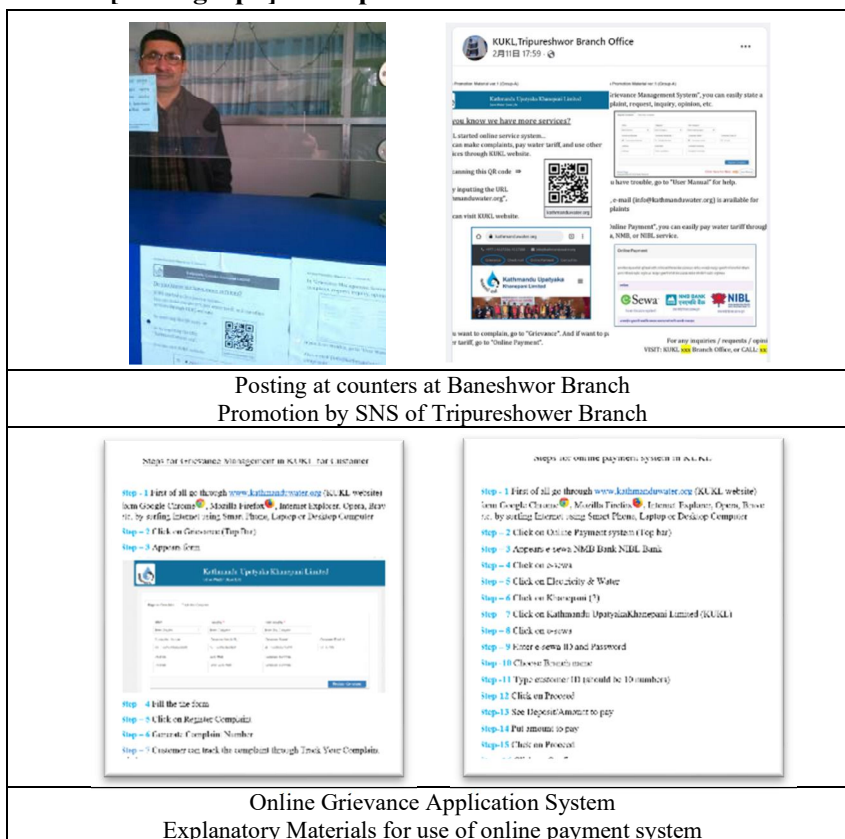
The following is a detailed description of the activities implemented in accordance with the action plan developed in Activity 4-10.

(1) Access Promotion

Since many C/Ps commented that one of the reasons for the low number of users of the online grievance application system was the lack of awareness of the system among customers, JICA expert and KUKL staff prepared useful materials for posting at branch counters and distributing leaflets. The completed materials are now being used at branch counters and on social networking sites, including a QR code that shows direct access to the KUKL web page.

On the other hand, JICA Expert Team created a QR code stamp on a trial basis so that existing materials with a substantial inventory previously used by KUKL could also be used to promote the public awareness activities. Since then, additional stamps have been created with KUKL's budget and distributed to each branch office.

[Photograph] Example of Access Promotion Material

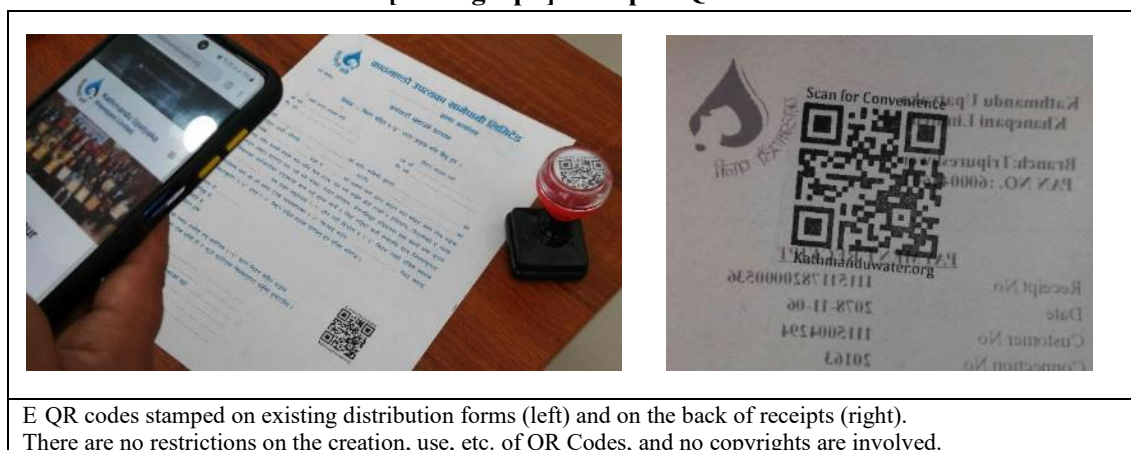


Posting at counters at Baneshwor Branch
Promotion by SNS of Tripureshwar Branch

Online Grievance Application System

Explanatory Materials for use of online payment system

[Photograph] Stamp of QR Code



QR codes stamped on existing distribution forms (left) and on the back of receipts (right).
There are no restrictions on the creation, use, etc. of QR Codes, and no copyrights are involved.

(2) Creation of the project's common name/catchphrase

It was suggested that the official name of the project as determined by R/D was very long and inconvenient for KUKL staff to know and for the impact of the project on the people of Kathmandu. Therefore, the Output 4 Action Team discussed a common name for the project, and a catchphrase and logo were created that was both easy to read and remember.



Figure 3.4.24 Project Logo and Chachphrase

KTM means "Kathmandu," WIP means "Water Supply Improvement Project," and "Water is Life. Save it!" was proposed by one of the C/Ps. This is used in the design of the uniforms, etc.

(3) Creation/distribution of goods

As the first phase of PR materials, polo shirts and caps were created to be worn by staff working in the field. These were worn on a daily basis by employees who have contact with customers at water treatment plants, water quality control, water meter reading, customer service, etc. They were distributed during visits to CEOs and branch offices.

From now on, C/Ps will wear these uniforms in principle when conducting activities in contact with customers, in order to enhance their sense of participation and ownership in the project, as well as to improve their impression on the public.

After the uniform distribution, the Tripureshwor and Mahankalchaur branches publicized the distribution on social networking sites.

In addition, clipboards with the project logo were created and distributed to meter readers. When we observed meter readers reading meters, we observed that they were having difficulty filling out the meter reading results on paper. In the future, it is expected that this will not only make the meter reading process easier, but also improve customer confidence in the project and promote the project.

[Photograph] Materials for Public Relations

<p>Distribution of uniforms with CEO of KUKL</p>	<p>Publication in SNS by Mahankalchaur Branch</p>	<p>Distribution of uniforms at Tripureshwor Branch</p>
<p>Distribution of uniforms at Tripureshwor Branch</p>	<p>Meter reading with recording paper</p>	<p>Clip board</p>

The procurement of PR materials must be determined under discussion with KUKL after the start of Term-2, those that are expected to be effective should be selected and prepared. The differences between the initial plan and the actual PR materials prepared are shown below.

The timing of procurement of mugs with the project logo will be shifted to Term-3, as they are considered effective for publicity and awareness activities in collaboration with the PID in Term-3.

Table 3.4.12 Procurement Plan of PR Materials

[Original Plan]

Materials	Qty	Unit Price (JPY)	Total (JPY)
Banner Screen	2	4,640	9,280
Tri-fold Brochure	2000	5	10,000
Poster	500	16	8,000
Cap for OJT participants	100	680	68,000
Best for OJT participants	100	4,280	428,000
Mag with project logo	500	380	190,000
合計			713,280

[Modified Plan]

Materials	Qty	Unit Price (JPY)	Total (JPY)
Term-2 (2022-2023)			
Cap for OJT participants	220	593.95	130,670 ^(*1)
Best for OJT participants	237	1,377.74	326,524 ^(*2)
Clip Board with project logo	100	344.34	34,434 ^(*3)
QR Code Sticker	2500	24.328	60,820 ^(*4)
Sub total			552,448
Term-3 (2024-2025)			
Mag with project logo	500	380	190,000
Sub total			190,000

*1 : NPR121,814 (JPY 130,670), *2 : NPR303,235.5 (JPY 326,524)

*3 : NPR32,205 (JPY 34,454), *4 : NPR58,760 (JPY 60,820)

(4) Information sharing within KUKL

As the Melamchi Water Supply Project has progressed, opportunities for communication with customers in the field have increased.

In the field, supervisors, meter readers and others have contact with customers as part of their daily work, and it is highly likely that the response of KUKL staff or PID staff, etc., other than those in Output 4, affects customer satisfaction.

Therefore, raising the awareness of the entire KUKL staff beyond the framework of each output has become an issue. In response to this, JICA Expert Team has begun efforts to build a system to share information within KUKL on the output of Output 4.

(5) Cooperative discussions with PID

Discussions with PID began in January 2022 and have resulted in PID members participating in Output 4 Action Team meetings and Output 4 members participating as observers in PID activities.

From these activities, the JICA expert team proposed to hold regular meetings with PID, based on the following findings and the belief that collaboration with PID would lead to the continued implementation of efficient KUKL public relations activities.

- PID has been conducting public relations activities since 2017 and has an ongoing budget.
- It is not efficient or budgetary enough for KUKL to plan public relations activities for water supply projects from scratch.
- KUKL intends to continue to conduct periodic customer satisfaction surveys, not only during this project, but also in the future, so that a post-evaluation including PID activities can be shared within KUKL.
- KUKL's understanding of PID activities and participation in regular meetings and events is meaningful for improving KUKL's activities.
- For example, it would be possible to advise the PID on the results of a customer satisfaction survey from the perspective of KUKL.

The meeting was held between the PID and a team of private consultants, KUKL, and JICA experts who will undertake the PID's public relations activities, and reached a working-level agreement on future collaboration and the establishment of regular meetings. The approval process for management will take place within the PID from July 2023 onwards.

Table 3.4.13 Outline of meeting with PID

Item	Contents
Date	July 13, 2023 11 : 00~12 : 00 (Nepal Time)
Location	PID Office
Theme	<ul style="list-style-type: none"> • Confirmation of public relations activities conducted by PID • Proposal of joint collaborative meeting between KUKL and PID
Participants	[PID] Ms. Bidhya Bhandari / Sociologist, PID Ms. Pramila Adhikari / Sociologist, PID Mr. Chandra Bhakta Bistha / Team leader, PID/CASSC Mr. Anil Belbase / C.M.F, PID/CASSC [KUKL] Ms. Chapala Dhakal / Assistant Manager, Administration, Head Office [JICA Expert Team] Mr. Koji Kimura (Customer Service 1/Awareness Activities) Mr. Tilak Mohan Bhandari (Technical Advisor, JICA Expert Team) Mr. Pankaj Kumar Bhandari (Assistant Engineer, JICA Expert Team)
Summary of discussion	JICA Expert Team proposed and all participants agreed to hold regular meetings for the purpose of collaboration between PID, which conducts ongoing public relations activities, and KUKL, which conducts customer satisfaction surveys.

3.4.13 [Activity 4-12] Summarize and review the results of public awareness activities and utilize it for next plan.

The Awareness Action Plan is being implemented, managed and updated mainly by the Public Awareness Manager (Ms. Chapala Dhakal of the Action Team) and two PA-Sub Managers. As of the end of November 2023, the work is stalled due to the retirement of one PA-Sub Manager, but the position will be filled in December 2023.

3.5 Record of activities related to Output 5

Output 5 The capacity of managing KUKL's internal training is improved.

3.5.1 Direction of activities

In this project, JICA Expert Team and KUKL will work together to improve KUKL's internal training system and implement activities so that KUKL can implement the PDCA cycle for internal training in cooperation with the technical departments/sections. And the project will enhance the organizational structure for human resource development, which is the foundation of waterworks business operation. The Output 5 Action Team and KUKL's Training & Research Section will work together to develop and implement training plans, evaluate and analyze training results, and reflect the results in the next plan, in order to create a system that functions through the PDCA cycle.

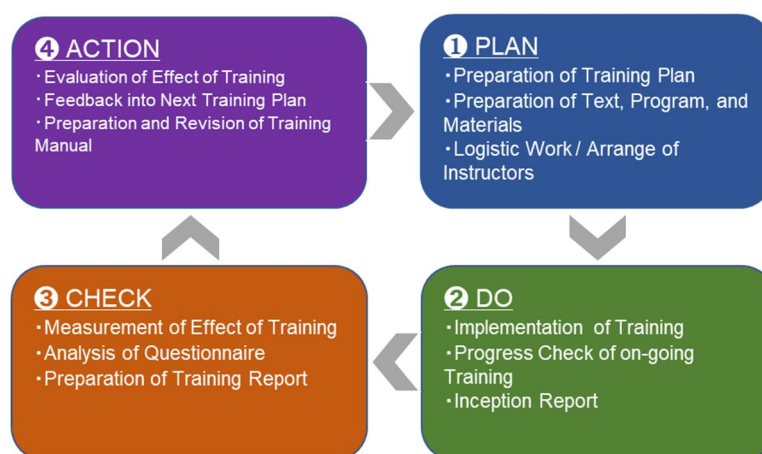


Figure 3.5.1 PDCA Cycle for Internal Training System

3.5.2 [Activity 5-1] Identify the training necessary for KUKL staff, [Activity 5-2] Prepare an overall training program (rough plan) necessary for KUKL staff, and [Activity 5-3] Prepare a database (on Excel basis) on training programs

Output 5 Action Team places a high priority on identifying training needs in the work of formulating training, as described in the Internal Training Supervision Manual described below.

In Term-1, baseline surveys and capacity assessments were conducted by JICA experts in each output group, and training needs were identified after analyzing the results.

Based on this, the Output 5 Action Team shared the baseline survey report with all members in Term-2 to confirm how the training needs were determined after understanding all survey results for each outcome.

Since Term-2, the Output 5 Action Team and the Training & Research Section have been providing lateral support for the baseline survey and capacity assessment update work.

The current overall training program is as follows.

Table 3.5.1 Overall Training Program

Items of training	2024												2025											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
OP1-1: Training for GIS Operation																								
Training of Trainers (TOT)				●					●										●					
Internal Training									●										●					
OP1-2: Training for Hydraulic Analysis and Water Distribution Management																								
Training of Trainers (TOT) for Hydraulic Analysis										●	●													
Internal Training for Hydraulic Analysis											●								●				●	
Training of Trainers (TOT) for Water Distribution Mangement										●	●													
Internal Training for Water Distribution Management											●								●				●	
OP2: Training for Non-Revenue Water Management																								
Internal Training for Meter Accuracy Testing				●																				
Internal Training for Meter Reading															●									
Internal Training for Entry/Check of Customer Data															●									
Internal Training for Illegal Connection Measure																				●				
OP3: Training for Water Treatment and Water Quality Control																								
Operation Training of New Sundarjial WTP				●																				
Training of Trainers (TOT) for Operation of New Sundarjial WTP				●																				
Internal Training for Operation of New Sundarjial WTP				●																				
Operation Training of existing three WTPs							●	●												●				
Training of Trainers (TOT) for Operation of Existing 3 WTPs							●	●												●				
Internal Training for Operation of Existing 3 WTPs							●	●																
Training for Laboratory staffs at New Sundarjial WTP							●																	
Planning of Maintenance Plan of Reservoirs and Follow-up Training							●																	
OP4: Training for Customer Care																								
Training of Trainers (TOT) for Customer Service							●													●				
Preparation of Training Materials for Customer Service							●													●				
Conducting Internal Training for Customer Service								●													●			
OP5: Supporting and Supervising of Trainings			●	●			●	●	●		●	●	●	●	●	●		●	●	●		●		●

Output 5 Action Team and the Training & Research Section will provide lateral support for all trainings scheduled under Outputs 1-4.

The above schedule is tentative, as it is affected by external factors such as the operational status of the New Sundarjial WTP and the completion date of the DNI project.

In Term-3, the overall training program will be updated flexibly while confirming changes in the training schedule due to the results of each project.

A draft of the proposed training database was prepared by the Output 5 Action Team during Term-1. The training database was created in Excel, which KUKL staff are familiar with, and consists of a cover page, a results aggregation section, and a response input sheet. The draft training database is designed to be linked to a feedback survey to be administered after the training. To increase the response rate to the feedback survey, descriptive responses are reduced as much as possible, and most of the questions are in the form of multiple-choice questions.

In Term-2, this training database (draft) has been utilized for each training, and while accumulating data for each training, the results are shared with the Action Teams for each output.

In addition, the database staff of the five results action teams continue to revise the draft's unusable parts in the actual work to make it easier for them to use.

The contents of the database will continue to be reviewed in the PDCA cycle, and revisions and additions will be made as necessary, with the aim of completing the database in the final year of the project.

The structure of the training database (draft) is shown below.

Table 3.5.2 Composition of Training Database (Draft)

Items	Contents
Cover	Name of Training Course, Contents of Training Course, List of Trainers, List of Trainees, etc.
Evaluation Summary	1) Programme Output 2) General 3) Contents and Programme Design 4) Awareness of Programme 5) Trainer & Facilitation 6) Coordination
Answer input	1) Programme Outputs (Multiple-choice + some are descriptive) <ul style="list-style-type: none"> ➤ Was this training related to your present work field? ➤ How much of the objective of the training course was achieved? ➤ How much of the knowledge gained from the training can be used in your practical work? ➤ Which of the course contents did you like the most or was useful for you? ➤ Which of the course contents did you like the least? ➤ Which course content was supposed to be included? (with reasons if any) 2) General (Multiple-choice) <ul style="list-style-type: none"> ➤ How did you feel about the coverage of the training course? ➤ Did you learn from experience of the participants (trainers and trainees)? ➤ Was it possible for you to communicate efficiently with the participants (trainers and trainees)? ➤ Was it possible for you to participate in the discussions and exercise activities? 3) Contents and Programme Design (Multiple-choice) <ul style="list-style-type: none"> ➤ The content will be beneficial and helpful for the better performance of the present work field? ➤ The content was of an appropriate depth and easy to understand. ➤ The content was logically sequenced. ➤ The course was relevant to addressing the problems and issues. ➤ The topics were presented in logical order and its delivery was based on practical approach. ➤ The time allocation was sufficient for the practice and exercise. ➤ What did you think of the training materials? 4) Awareness of the Programme (Multiple-choice) <ul style="list-style-type: none"> ➤ Invitation was informed in a proper timing. ➤ Would you recommend the training to your colleague? 5) Trainer and Facilitation (Multiple-choices) <ul style="list-style-type: none"> ➤ Did the trainer deliver the classes with appropriate example related to the present work field? ➤ Was there enough time allocated for questions and discussions? ➤ Did the trainer have extensive knowledge about the subject matter? ➤ Was the trainer helpful, informative and approachable? ➤ Was the lecture well-prepared? / Were instructions clear and understandable? ➤ Did the trainer have sufficient knowledge about subject matter and efficiently used the time frame? ➤ Did the trainer encourage the participation and interaction of the participants during the session? ➤ What did you think of the training venue? 6) Coordination (Multiple-choices) <ul style="list-style-type: none"> ➤ How would you rate co-ordination between the trainer and trainees?

3.5.3 [Activity 5-4] Prepare a manual for internal training management

After consultation between the Action Team and JICA experts, an internal training supervision manual was developed, and the manual is being used on a pilot basis for training implementation in Term-2.

The internal training supervision manual is positioned in the same way as SOPs for other output activities, and even if the person in charge of training is replaced due to personnel changes, etc., the content of the manual allows the new person to conduct internal training by performing his/her duties in accordance with this manual.

As shown below, the Internal Training Supervision Manual is divided into a "Preparation Phase," an "Implementation Phase," and an "Evaluation Phase."

The content of the manual focuses particularly on the preparation phase, which includes a needs assessment through a baseline survey and capacity assessment, which was also conducted for this project. This is intended to eliminate risk factors at the training formulation stage, as training failures are generally caused by discrepancies between training content and training needs.

In addition, the Internal Training Supervision Manual includes provisions for paying a daily allowance to incentivize internal instructors and rules for catering for long training sessions. However, these are items that are not in the current KUKL bylaws, and the manual is subject to approval by the CEO, which has not been granted at this time.

Like the database, the internal training supervision manual is also in draft form. KUKL will continue to use the manual in actual training sessions, review its contents in the PDCA cycle, and revise and add to it as necessary, aiming to complete it in the final year of the project.

Table 3.5.3 Contents of Internal Training Supervision Manual

Phase	Contents
Preparation Phase	<ol style="list-style-type: none"> 1) Needs Assessment <ul style="list-style-type: none"> ➤ Baseline Survey and Capacity Assessment 2) Plan Formulation <ul style="list-style-type: none"> ➤ Decision of Theme and Contents ➤ Cost Analysis and Budgeting 3) Training Course Outline for Design 4) Selection of Trainer 5) Selection of Trainee 6) Training of Trainer (TOT) 7) Administration <ul style="list-style-type: none"> ➤ Stationery and Equipment ➤ Personal Protective Equipment ➤ Code of Conduct for Trainee ➤ Anti-Covid-19 Measures ➤ Medical Issues, Emergencies and Indemnity ➤ Logistics ➤ Catering ➤ Classroom Booking ➤ Certificate
Implementation Phase	<ol style="list-style-type: none"> 1) Confirmation of classroom and its facilities 2) Orientation 3) Monitoring <ul style="list-style-type: none"> ➤ Note-taking/Recording 4) Mid-term Evaluation (During the Training) 5) Daily Care

Phase	Contents
	<ul style="list-style-type: none"> ➤ Cleaning ➤ Replenishment of Stationery, Water and Learning/Teaching Material ➤ Complaints
Evaluation Phase	<ol style="list-style-type: none"> 1) Preparation of Feedback Sheet and Assessment Guide 2) Analysis of Data and Feedback 3) Evaluation Report 4) Lesson Learned

3.5.4 [Activity 5-5] Conduct trainings on internal training management targeting for the nominated staffs of Output 5 members and Human Resources Development Section.

The following training on training supervision was conducted for the internal training staff in charge of each output. The training was divided into small groups for each output in order to encourage input from the support members, many of whom were younger staff who would be in charge of the actual training. In this training, after lectures aimed at acquiring the basic knowledge necessary to implement internal training, the participants used the Internal Training Supervision Manual as a teaching material, and confirmed questions and unclear points while simulating actual internal training from the preparation phase to the evaluation phase.

In consideration of the sustainability of KUKL, this training was conducted with the main instructor being the person in charge of the internal training supervision manual, assisted by a Japanese expert.

Table 3.5.4 Conducted Training for Internal Training Supervision

	Person in charge of Output 1 Field /Leader of Output 5	Person in charge of Output 2 / Output 4 Field	Person in charge of Output 3 Field	Person in charge of Output 5 Field
Date	9/Feb/2022	11/Feb/2022	20/Feb/2022	2/Mar/2022
Location	Project Office of JICA Expert Team			
Participants from Action Team	Mr. Arjun Babu Dhakal Mr. Shankar Thapa	Mr. Dipendra Bdr. Oli	Ms. Radha Dhakal Ms. Niru Burlakoti	Mr. Bir Bdr, Chand
Participants from Supporting Members	Mr. Sunil Chaudhary	Ms. Neha Adhikari Ms. Manju Manandhar	Mr. Bijaya Bijracharya	Mr. Ramesh Dhungana Mr. Kabin Dhoj Adhikari

Since two permanent staff members were assigned to the Training & Research Section in the middle of Term-2, the same training for internal training personnel as described above was conducted in February, May, and June 2023.

However, these two full-time staff members were replaced in November 2023, and two new staff members were assigned to the Training and Research Section. Therefore, training for these two new staff members was conducted again.

[Photograph] Training for Internal Training Supervision



3.5.5 [Activity 5-6] Prepare training programs (modules) on the fields that the Project targets such as GIS, Hydraulic Analysis, Water Distribution Management, Water Quality Control, Water Treatment, Customer Management) in collaboration with staff in the relevant section

In order to accommodate the various training programs, the Output 5 Action Team formed groups in charge according to the technical areas of each output, as show below. Each group consisted of a combination of core and support members.

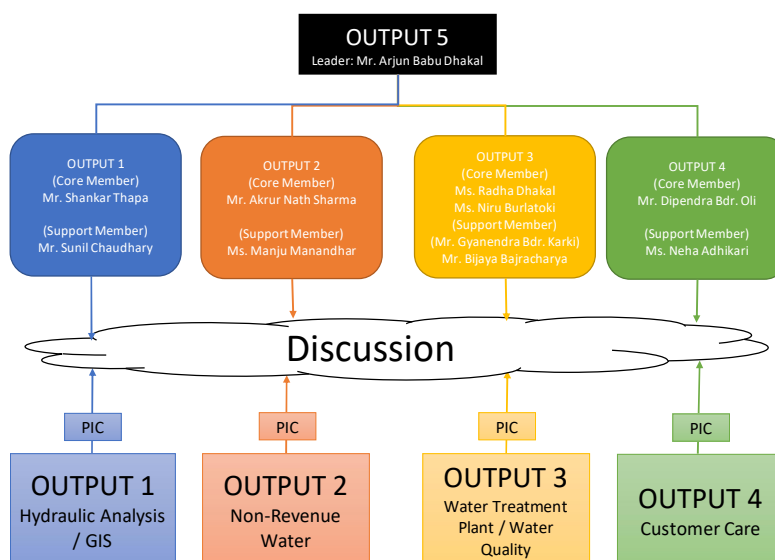


Figure 3.5.2 Formation of groups in charge

In particular, the Action Team members were composed of staff from various departments within KUKL. The team's main task was only to support the implementation of training, and no particular technical expertise was required.

However, since KUKL had no experience in conducting internal training led by themselves, and since each core member also needs some technical knowledge in helping to develop the training plan (training module), the JICA Expert Team and Output 5 Action Team decided to assign each member's expertise to match the training content of each output as closely as possible.

On the other hand, the Action Team members for Output 5 were not originally selected based on their

expertise, and for Outputs 1 and 4, there were differences in the expertise and training content of the core members.

The original plan envisioned that the groups in charge of each of these outputs and representatives of each output group (* assuming internal instructors) would discuss and plan the number of training sessions, etc. However, OJT for each output is ongoing through Term-2, and at this time, we are in process of selection of potential instructors from KUKL staff.

For Output 2 and Output 3, for which the expertise of the members in charge of Output 5 is already aligned with the content of the training, they are advising both groups in the development of their training plans (training modules).

Due to periodic personnel transfer within KUKL, it was necessary to reorganize the group in charge of training at the end of Term-2.

In preparation for the internal training to be fully launched in Term-3, the JICA Expert Team is providing necessary support taking into consideration such issues as ensuring communication with potential lecturers, sustainability after the project, and compatibility of the training content with the expertise of the person in charge of Output 5.

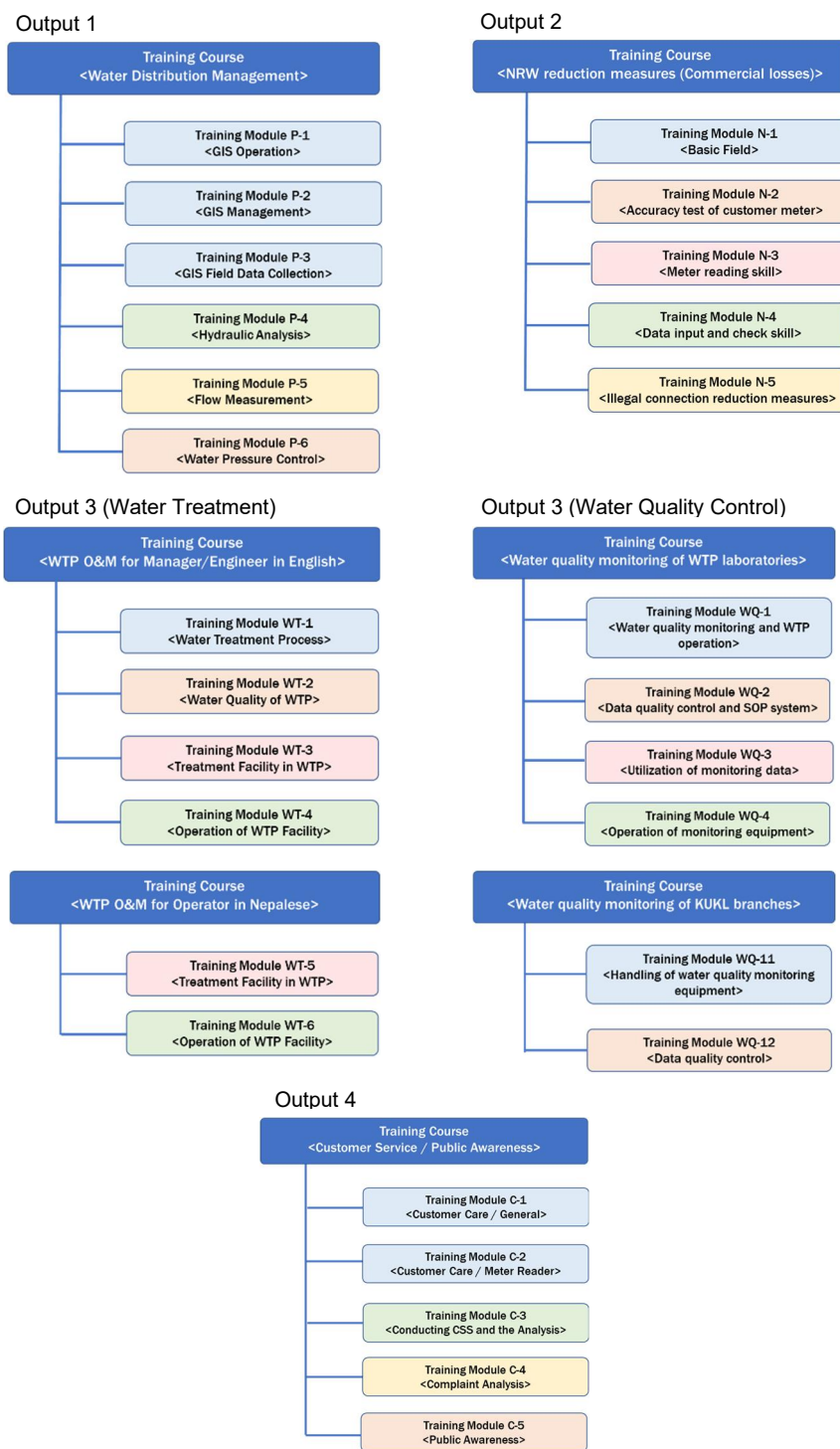


Figure 3.5.3 Internal Training Module

3.5.6 [Activity 5-7] Prepare for trainings such as development of training materials, examination of how to measure the effectiveness of training, etc., in collaboration with staff in the relevant section.

As shown in Figure 3.5.2, a group responsible for each output was formed among the members of the Output 5 Action Team to begin preparations for implementation for each training.

However, during Term-2 and the early phases of Term-2, the spread of the Covid-19 within Nepal required KUKL to refrain from holding meetings of more than 5 people even within the organization, which forced each Output training to be conducted online and in small groups. Therefore, there were few opportunities for the Output 5 Action Team to support those trainings.

On the other hand, despite these restrictions, the members of the Output 5 Action Team also participated in the training conducted in each Output as much as possible to understand how the training was conducted and the participants' reactions, and to prepare for the internal training supervision.

Once it is possible to conduct training in a regular face-to-face format, the training supervisor for each output, in collaboration with the JICA experts from each output and the leaders of each Action Team, provides support for the preparation of the training plan, outline design, and overall operational management in accordance with the Internal Training Supervision Manual.

3.5.7 [Activity 5-8] Conduct training of trainers (TOT) in each area.

As in [Activity 5-7], the implementation of training of trainers (TOT) was also supported in accordance with the internal training supervision manual.

The guidance and evaluation of the TOT will basically be carried out by JICA experts for each Output. The Output 5 Action Team has already appointed a training supervisor for each of Output 1 to Output 4 based on their expertise, and each supervisor will implement the TOT in consultation with the internal trainer for the respective Output.

To date, we have provided lateral support for the implementation of TOT for each of the Outcome 5 activities as described below.

3.5.8 [Activity 5-9] Conduct trainings. (Support training implementation as staff in charge of training management)

As in [Activities 5-7 and 5-8], training is conducted in accordance with the Training Supervision Manual. At this time, not all support items have been implemented because the internal training system has not yet been established, but basically the support tasks described below will be carried out.

Table 3.5.5 Supporting work to be conducted by Output 5 Action Team

Preparation Phase	Implementation Phase	Evaluation Phase
1. Needs survey	1. Confirmation of classroom and its facilities	1. Preparation of feedback sheet and
1.1 Baseline survey	2. Orientation	2. Analysis of data and feedback comments
1.2 Capacity assessment	3. Monitoring	3. Evaluation report
2. Plan formulation	3.1 Note-taking/Recording	4. Lesson learned
2.1 Decision of theme and contents	4. Mid-term evaluation	
2.2 Cost analysis and budgeting	5. Daily care	
3. Training course outline for design	5.1 Cleaning	
4. Selection of trainer	5.2 Replenishment of stationery, water and teaching material	
5. Selection of trainee	5.3 Complains handling	
6. TOT (Training of Trainer)		
7. Administration		
7.1 Stationery and equipment		
7.2 Personal protective equipment		
7.3 Code of conduct for trainee		
7.4 Anti-Covid-19 measures		
7.5 Medical issues, emergency and indemnity		
7.6 Logistics		
7.7 Catering		
7.8 Classroom booking		
7.9 Certification		

In the training programs up to Term-2, lectures have been conducted jointly by JICA experts and potential instructors of KUKL staff. For internal training in Term-3, the involvement of JICA experts will be gradually reduced and the autonomy of internal training instructors will be enlarged.

The ultimate goal is to be able to complete the planning, implementation, and evaluation of lectures solely by KUKL's internal training instructors. Therefore, the involvement of JICA experts will be gradually reduced for the Output 5 Action Teams, training for the Training & Research Section, and support for internal trainers.

The Output 5 Action Team set up the venue and arranged catering for the "Information Sharing Workshop on Training in Japan" related to Output 3 held in January 2023 in the conference room of the Central Lab at the Mahankulture Branch Office.

In preparation for the on-the-job training at New Sundarijal WTP for Output 3, which started on February 7, 2023, the person in charge of the Output 5 Action Team and the chief of the Training & Research Section visited the training site in advance to confirm classrooms and equipment and to select local caterers, since it was the first training outside of Kathmandu.

[Photograph] Supporting for Training related to Output 3

		
[Mahankalchaur Branch] Workshop in the Central Lab	Stationery prepared by KUKL	Conference Room in New Sundarijal WTP

3.5.9 [Activity 5-10] Summarize and review the results of trainings.

At the end of each training program, a feedback survey is administered to all trainees by the training supervisor of Output 5. The survey results are input into a database to quantify and analyze the results as much as possible. The database is divided into the following six areas to evaluate the training results from various perspectives.

- ① Training results
- ② Overview of training
- ③ Training contents and design
- ④ Awareness of training
- ⑤ Trainer and facilitation
- ⑥ Coordination

Although the feedback survey includes some evaluation items for the instructors, the main purpose of the survey is basically to evaluate the implementation of the training itself. The evaluation of technical aspects is conducted jointly by the instructors and JICA experts at the time of each training.

3.5.10 [Activity 5-11] Reflect the training results to next training plans.

The feedback survey after the training, and the training results compiled in the training database, are emailed to the training participants for each output for the part related to each output, and shared within the Output 5 Action Team for the part related to training implementation.

Currently, most of the training is conducted mainly by specialists in each output, and the training is generally highly evaluated by the trainees.

Items that were rated slightly lower than the other evaluation items are communicated to each outcome and reflected in the content as lessons learned for the next training plan.

2. General			
2-1	2-2	2-3	2-4
How did you feel about the coverage of the training course?	Did you learn from experience of the participants(trainers and trainees)?	Was it possible for you to communicate efficiently with the participants (trainers and trainees)?	Was it possible for you to participate in the discussions and exercises actively?
3	3	3	3
2	3	3	3
2	3	3	3
2	3	3	3
1	3	3	1
2	3	3	3
2	3	3	3
2.0	3.0	3.0	2.7

For example, the relatively low evaluation on the "scope of training" will be reported to the training group for the relevant output, and the content will be improved before the next training depending on the need.

The following is a list of the main trainings for which results analysis was conducted by the Output 5 Action Team as part of activities in Term-2.

Overall, the feedback was high, as many of the basic training and TOTs were conducted and led by JICA experts until the end of Term-2. Feedback obtained from the training programs in which training supervision was conducted is shown in the table below.

Only points where improvement was indicated are shown, but all were rated a little lower than the other questions, and 60-70% of the responses were positive.

Table 3.5.7 Major trainings analyzed by the Output 5 Action Team

Output	Date	Training theme	Items to be improved
Output 1	19-23/June/2023	GIS operation (NWSSTC in Nagarkot)	• Poor environment of training venue.
	11, 13, 14/Dec/2023*1	GIS operation (TOT at the Tripureshwor Branch)	-
Output 2	11/Dec/2022	NRW measure (commercial losses) / Meter accuracy test (TOT at the Mahankalchaur Branch)	• Low achievement of training objectives.
	23/May/2023	NRW measure (commercial losses) / Meter accuracy test (TOT at the Mahankalchaur Branch)	• Difficult to understand the content of the training.
	15-16/Aug/2023	Meter accuracy test (TOT at the Mahankalchaur Branch)	• Low achievement of training objectives.
	5/June/2023	Meter reading skill (TOT at the Mahankalchaur Branch)	• Low achievement of training objectives. • Lack of logical sequencing of training.
	20/June/2023	Customer data input/check skill (TOT at the Tripureshwor Branch)	• Low achievement of training objectives.
	5/Dec/2023	Basics of NRW - Commercial Losses (TOT at the Mahankalchaur Branch)	-
Output 3	14-16/June/2022 21-23/June/2022 28-30/June/2022	Water treatment (OJT at the Mahankalchaur WTP)	• Low achievement of training objectives. • Difficult to understand the content of the training materials.
	7-10/Feb/2023 14-17/Feb/2023 20-26/Feb/2023	Operation of WTP (OJT at the New Sundarijal WTP)	• Few similarity between the training content and the regular work. • Difficult to understand the content of the training. • Lack of relevance between the training content and the actual problem in daily work. • Lack of logical sequencing of training.
	11-14/Dec/2023	Water quality control and laboratory test (OJT at the Mahankalchaur Central Lab)	-
Output 4	14/16/June/2023 19-23/June/2023 3-6/July/2023	Customer data handling, Data analysis, Customer service (TOT at the Tripureshwor Branch)	• Low achievement of training objectives. • The training does not cover enough content. • Difficult to understand the content of the training. • Lack of relevance between the training content and the actual problem in daily work.
	12-13/Dec/2023	Communication skill (TOT at the Tripureshwor Branch)	-

*1: The feedback survey is in progress

Overlooking the results to date, there is a tendency for the evaluation of "achievement of training objectives" to be low, but after analyzing the results, it was thought that this was due to the fact that the questions were written and translated into Nepali in a way that was difficult to understand.

When updating the database and revising the questionnaire for the feedback survey, which is currently underway, this part of the questionnaire needs to be improved and changed to text that is easier for respondents to understand.

As for the low evaluation of "ease of understanding the training" and "logical sequencing of the training content," the responses were influenced by the low English proficiency among the trainees, since the lectures and materials were conducted in English when the training was conducted by JICA experts.

From the latter half of Term-2, internal instructors selected through the TOT will increasingly give lectures in Nepali, so the above problem of low evaluation was pointed out less frequently.

As mentioned earlier, the most of training by internal instructors selected for each output will begin in earnest in Term-3, but it is not necessarily that the training will continue to receive high evaluations as in Term-2, when JICA experts took the lead in implementing the training. Therefore, the process of analyzing the results of this training and reflecting them in the next training plan will be important.

Several personnel were recruited by KUKL in November 2023 during the second half of Term-2, and a chief with a background as an engineer was assigned to the Training and Research section as well.

The JICA Expert Team has been discussing the process to date and future issues with the chief of the Training and Research Section. In Term-3, the Training and Research Section is expected to collaborate with all parties and departments concerned to analyze the training results in detail from a technical perspective in cooperation, and reflect the results in improving the content of the next training program.

3.6 Joint Coordination Committee (JCC)

In technical cooperation projects, in addition to monitoring project activities, it is necessary to establish a decision-making body involving a higher agency with command-and-control authority over the implementing agency, KUKL, in order to resolve issues faced by each activity.

At the start of this project, the Joint Coordinating Committee (JCC) was established to approve the activities, results and plans planned for the project, and to make decisions on how to resolve the issues. The JCC meets approximately every six months to review the results of the regular monitoring of the project within the stakeholders, to agree on the overall direction of the plan and to make decisions on how to resolve issues.

[Role of JCC]

- Review and monitoring of the overall project activities according to the PO and the achievement of the project according to the PDM
- Approval of the annual activity plan according to the PO
- Discussion and advice on events occurring during project implementation

Table 3.6.1 Outline of the 1st JCC meeting

Items	Contents
Date and time	July 20 th , 2021 11:10 - 13:00 (Nepal Standard Time)
Type	Web conference of MS Teams
Purpose	Explanation of the Work Plan and confirmation of progress of related projects
Items of discussion	<ol style="list-style-type: none"> 1. Approval of the Work Plan (Term-1) 2. Confirmation of undertakings by Nepalese side 3. Progress of related on-going projects supported by ADB funds 4. Dispatch schedule of Japanese experts 5. Opinion exchange about needs from Nepalese side for project activities
Participants	<p>[Nepalese side: 15]</p> <ul style="list-style-type: none"> •Mr. Sunil Kumar Das (Joint Secretary, Ministry of Water Supply) •Mr. Ram Kumar Shrestha (Executive Director, MWSDB) •Dr. Sanjeev Bickram Rana (Executive Director, KVWSMB) •Mr. Kamal Raj Shrestha (Project Director, PID-KUKL) •Mr. Milan Kumar Shakya (CEO, KUKL) •Mr. Gyanendra Bahadur Karki (Acting Deputy CEO/ Planning and Support Department, KUKL) •Mr. Bijay Timilsina (Acting CEO, KUKL) •Mr. Satish Kumar Dutta (Act. Deputy CEO/ Water Supply Division, KUKL) •Mr. Prakash Kumar Rai (Deputy Manager, Chief of Administration and Human Resources Division) •Mr. Ramesh K.C. (Deputy Manager, Manager of Maharajgunj Branch) •Mr. Umesh Babu Marahatta (Deputy Manager, Manager of Mahankalchaur Branch) •Dr. Dol Prasad Chapagai (Deputy Manager, Manager of Lalitpur Branch) •Mr. Arjun Babu Dhakal (Deputy Manager, Chief of Planning & Monitoring Division) •Ms. Shailaja Adhikari (Assistant Manager, Chief of Water/Wastwater Quality Assurance Division) •Ms. Bina Maharjan (Engineer, Chief of New Sundarijal WTP) <p>[Japanese side: 17]</p> <ul style="list-style-type: none"> •JICA Headquarters: 3 •JICA Nepal Office: 3 •JET: 8 •Local engineer of JET: 3
Comments by JCC	[Mr. Milan Kumar Shakya]

Items	Contents
members	<p>All outputs are appropriate for KUKL and cover important topics, and we look forward to the travel of Japanese experts when the Covid-19 pandemic subsides. We look forward to improving KUKL's overall service through project activities to enhance customer satisfaction.</p> <p>[Mr. Sanjeev Bickram Rana]</p> <p>This project is for the benefit of the people of Kathmandu and we would like to thank JICA, JET and the people of Japan for their support. the five outcomes are crucial for KUKL to improve its water supply services and contribute to an efficient and effective organization of the water sector. If possible, it would be appreciated if training on disaster management and sewage management could be incorporated, as the KVWSMB is willing to assist in making the project a success.</p> <p>[Mr. Sunil Kumar Das]</p> <p>Severe damage to the intake facilities on the Melamchi River is a major concern and restoration work should begin as soon as possible after the rainy season.</p> <p>We urge KUKL to take full advantage of the opportunities presented by this project, and the Government of Nepal is committed to providing the necessary support to ensure its success.</p>

Table 3.6.2 Outline of the 2nd JCC meeting

Items	Contents
Date and time	February 14 th , 2022, 11:20 - 14:00 (Nepal Standard Time)
Type	Seminar room in Mahankalchaur Branch with Web conference of MS Teams
Purpose	Report on project progress, revision of PDM and share progress on related projects
Items of discussion	<ol style="list-style-type: none"> 1. New allocation of counter members 2. Prospects of resumption of water diversion from Melamchi Riever 3. Actions to be taken by KUKL for handing over of O&M of New Sundarijal WTP 4. Prospects of BDS/DNI projects 5. Presentation of activities by Action Team Leaders 6. Implementation policy of technical assistance by JET and estimated schedule
Participants	<p>[Nepalese side: 15]</p> <ul style="list-style-type: none"> • Ms. Meena Shrestha (Joint Secretary, Ministry of Water Supply) • Mr. Gyanendra Bahadur Karki (Acting Deputy CEO/Planning and Support Department, KUKL) • Mr. Arjun Babu Dhakal (Acting Manager) • Mr. Prakash Kumar Rai (Deputy Manager, Chief of Administration and Human Resources Division) • Mr. Ramesh K.C. (Deputy Manager, Manager of Maharajgunj Branch) • Dr. Dol Prasad Chapagai (Deputy Manager, Manager of Lalitpur Branch) • Mr. Umesh Babu Marahatta (Deputy Manager, Manager of Mahankalchaur Branch) • Mr. Ujwal Shrestha (Deputy Manager, Chief of Sewerage Section) • Mr. Yogendra Bahadur Bam (Assistant Manager, Chief of Procurement Section) • Ms. Shailaja Adhikari (Assistant Manager, Chief of Water/Wastewater Quality Assurance Division) • Mr. Purna Bahadur Kuwar (Assistant Manager, Chief of IT Section) • Ms. Chapala Dhakal (Assistant Manager, Chief of General Administration Section) • Mr. Narayan Karna (Assistant Manager, Manager of Baneshwor Branch) • Mr. Krishna Hari Budhathoki (Assistant Manager, Chief of Electromechanical Section) • Mr. Bir Bahadur Chand (Assistant Manager, Chief of Training and Customer Relation Section) • Ms. Bina Maharjan (Engineer, Chief of New Sundarijal WTP) • Ms. Rabindra Pokhrel (Project Manager, PID) • Mr. Surendra Rawal (Engineer, PID) <p>[Japanese side: 16]</p> <ul style="list-style-type: none"> • JICA Headquarters: 2 • JICA Nepal Office: 3 • JET: 8 • Local engineer of JET: 3
Comments by JCC members	<p>[Mr. Gyanendra Bahadur Karki]</p> <p>He spoke on behalf of the CEO, who was unable to attend at short notice.</p> <p>We recognize the importance of working to achieve equitable water distribution when the Melamchi River diversion is resumed. We would like to thank the respective results leaders and project managers for the baseline surveys and progress reports on the Meramchi water supply scheme so far.</p>

Items	Contents
	<p>The project aims to enhance both KUKL's technical and management skills, and the baseline survey identified areas that need to be enhanced and will have a significant impact on the organization.</p> <p>Customer satisfaction surveys can also be of great help in developing strategies for future service improvements.</p> <p>KUKL has already started to implement an online payment system and an online complaints system has just gone live, so the support of this project will be extremely useful.</p> <p>[Ms. Meena Shrestha]</p> <p>We would like to thank JICA and JET for their technical assistance to KUKL and for their comprehensive efforts on the project.</p> <p>In addressing the increasing challenges that KUKL will face following the introduction of water from the Melamchi River, the knowledge and skills gained from each of the project trainings will need to be applied efficiently and effectively to the project.</p> <p>To do this, KUKL has to put the right people in the right places.</p> <p>In particular, it is very important to introduce a GIS-based customer management system for customers who cannot be satisfied by traditional methods.</p> <p>We hope that KUKL will use the results of this project to improve their services.</p> <p>We would like to ask KUKL to prepare a list of trained personnel, since it is possible to continue to strengthen the capacity of new staff even if they have left the organization after receiving training.</p> <p>Although the Corona disaster continues to make things difficult, we hope that the training will be realized in Japan and Sri Lanka.</p> <p>Finally, we would like the PID to work towards the early completion of the BDS/DNI project. The Ministry of Water Supply is also ready to support KUKL to manage the operation of the Melamchi River after the resumption of its water supply.</p>

Table 3.6.3 Outline of the 3rd JCC meeting

Items	Contents
Date and time	September 6 th , 2022, 11:00 - 14:00 (Nepal Standard Time)
Type	Conference Room of KUKL Head Office with Web conference of MS Teams
Purpose	Report on project progress, Preparing for Training in Japan, and enhance participants' understanding of the project activities scheduled after the Dashain/Tihar holidays.
Items of discussion	<ol style="list-style-type: none"> 1. Progress and issues related to each output 2. Report on current situation of Melamchi Water Supply Project 3. Schedule, participants and expected outcome for the 1st training in Japan 4. Schedule and participants for the 2nd training in Japan 5. Activities scheduled after Dashain/Tihar holidays
Participants	<p>[Nepalese side: 12]</p> <ul style="list-style-type: none"> • Ms. Meena Shrestha (Joint Secretary, Ministry of Water Supply) • Dr. Sanjeev Bickram Rana (Executive Director, KVWSMB) • Mr. Rajendra Sapkota (Project Director, PID) • Mr. Gyanendra Bahadur Karki (Acting Deputy CEO/Chief of Planning and Support Department, KUKL) • Mr. Bijay Timilsina (Acting Deputy CEO/Chief of Administration and Finance Department, KUKL) • Mr. Arjun Babu Dhakal (Acting Manager, PID) • Mr. Prakash Kumar Rai (Deputy Manager, Head Office) • Mr. Ramesh K C (Deputy Manager, Chief of Water Operation Division, Head Office) • Dr. Dol Prasad Chapagain (Deputy Manager, Chief of Wastewater Operation Division, Lalitpur) • Mr. Umesh Babu Marahatta (Deputy Manager, Chief of Support Division, Head Office) • Mr. Ujwal Shrestha (Deputy Manager, Chief of Planning and Monitoring Division, Head Office) • Ms. Shailaja Adhikari (Assistant Manager, Chief of Water/Wastewater Quality Assurance Division) <p>[Japanese side: 18]</p> <ul style="list-style-type: none"> • JICA Headquarters: 2 • JICA Nepal Office: 3 • Japanese Embassy: 2 • JICA Expert Team: 8

Items	Contents
	•Local engineer of JICA Expert Team: 3
Comments by JICA Nepal Office	[Mr. Ehara, Senior Representative of JICA Nepal Office] This is a very important project of JICA, to capacitate the water supply service provider of the capital city of Nepal. The project plays a role in achieving the SDG target set by GoN. As it is known among us that the residents of Kathmandu are facing difficulty in getting potable water, this project will help ensure effective and stable water supply system. Since this project targets the human resources of KUKL, active involvement of the counterpart members is much appreciable. To channel the project activities to a better direction, strong guidance is necessary from MoWS and KVWSMB with leadership from the counterpart party.
Comments by JCC members	[Mr. Milan Kumar Shakya] KUKL express an appreciation for the remarkable progress being made on this project activity and the time that all the counterparts involved are spending on the effectiveness of the project. This effectiveness has been achieved by active involvement of all the members, both KUKL members and JICA Expert Team. Though training could not be conducted this time at the New Sundarijal WTP, he expects that necessary procedures will be completed within the end of this year so that the trainings can be conducted from next year. He expressed that the KUKL team going for a visit in Tokyo will have a good experience and will give their input in the managerial activities of KUKL. [Dr. Sanjeev Rana] This meeting was a fruitful session of information sharing and assured his support to facilitate for conducting OJT in the New Sundarijal WTP. Finally, he thanked the project team and the People of Japan for supporting the capacity building project expressing his respect to all the project members for their active involvement. [Ms. Meena Shrestha] MoWS express a thanks for JICA Expert Team supporting KUKL to achieve this progress. Making the manuals available is also very beneficial. She thanked to JICA side for providing equipment as well as technical support for capacity building of KUKL to improve the water supply in Kathmandu Valley. With this, she hopes that KUKL can run the system effectively and smoothly after getting the water from Melamchi. Due to the recurring natural disasters, there is a difficulty in transfer of Melamchi water and the New Sundarijal WTP constructed with the financial support by JICA is not able to be operated smoothly. However, MoWS is making efforts to bring water from the Melamchi River continually to the WTP so that the OJT can be conducted. KUKL trainees who received training from the JET shall apply the knowledge learnt in their job. Receiving training alone is not enough, implementation of the skill is necessary to make an impact and thus to improve the performance of KUKL. Congratulations to the participants receiving their first training in Japan. Hope that this visit will give a chance to gain practical knowledge through exposure visits in Japan. She emphasized the need for prior coordination between MoWS and JICA in the future, as it took more time than expected to select the participants, in order to ensure the utilization of proposed training effectively. She also requested KVWSMB and PID sides to do necessary preparations for handover of WTP and distribution networks for smooth running of the project.

Table 3.6.4 Outline of the 4th JCC meeting

Items	Contents
Date and time	May 30 th , 2023, 11:00 - 15:00 (Nepal Standard Time)
Type	Conference Room of KUKL Head Office with Web conference of MS Teams
Purpose	Report on the project progress, Confirmation of obligations and responsibility related to handover of facilities constructed by Melamchi Water Supply Project, Understanding the necessity of reform of administrative boundary of KUKL branches, Planning of next training in Japan.
Items of discussion	1. Overall progress evaluation by the project manager of KUKL 2. Progress and issues related to each output and issues to be solved 3. Confirmation of works to be performed by KUKL upon handover of BDS and DMA 4. Schedule, participants and expected outcome for the 3 rd training in Japan
Participants	[Nepalese side: 13] • Ms. Meena Shrestha (Joint Secretary, Ministry of Water Supply) • Dr. Sanjeev Bickram Rana (Executive Director, KVWSMB) • Mr. Rajendra Sapkota (Project Director, PID) • Mr. Milan Shakya (CEO, KUKL)

Items	Contents
	<ul style="list-style-type: none"> • Mr. Gyanendra Bahadur Karki (Acting Deputy CEO/Chief of Planning and Support Department, KUKL) • Mr. Bijay Timilsina (Acting Deputy CEO/Chief of Administration and Finance Department, KUKL) • Mr. Arjun Babu Dhakal (Acting Manager, KUKL-PID) • Mr. Prakash Kumar Rai (Manager, Chief of Financial Division, Head Office) • Mr. Ramesh K C (Deputy Manager, Chief of Water Operation Division, Head Office) • Dr. Dol Prasad Chapagain (Deputy Manager, Chief of Wastewater Operation Division, Lalitpur) • Mr. Umesh Babu Marahatta (Deputy Manager, Chief of Support Division, Head Office) • Mr. Ujjwal Shrestha (Deputy Manager, Chief of Planning and Monitoring Division, /Project Manager of PMU , Head Office) • Ms. Shailaja Adhikari (Assistant Manager, Chief of Water/Wastewater Quality Assurance Division) <p>[Japanese side: 14]</p> <ul style="list-style-type: none"> • JICA Headquarters: 2 • JICA Nepal Office: 1 • JICA Expert Team: 8 • Local engineer of JICA Expert Team: 3
<p>Comments by JICA Headquarters</p>	<p>[Mr. Ogata, Senior advisor]</p> <p>JICA appreciate Nepal's cooperation and response to this capacity development project, which aims to improve water supply services in the Kathmandu Valley.</p> <p>When I was in Nepal as an advisor to the Ministry of Water Supply, I had numerous discussions with the people involved in the formation of this project. Since that time, the Nepalese officials had very high expectations for this project.</p> <p>Several years later, the project was initiated at the perfect time when the Melamchi Water Diversion Tunnel and the New Sundarijal WTP were put into operation. Enhancing KUKL's capacity is essential to ensure proper operation and maintenance of existing and new facilities and to improve water supply services in the Kathmandu Valley.</p> <p>Water sources, water treatment plants, and water supply facilities must be utilized to improve customer satisfaction, which is an important responsibility of KUKL as a water utility.</p> <p>I believe that KUKL will serve as a role model for water utilities in Nepal in improving water supply services and building a sustainable organizational structure.</p> <p>When I met with KUKL staff in February 2023, I found a higher level of motivation than before, which may be a sign of confidence among the staff.</p> <p>I have high expectations for the human resource employment plan as well, since a well-resourced organizational management is essential for the project to be effective.</p>
<p>Comments by JCC members</p>	<p>[Mr. Milan Kumar Shakya]</p> <p>He thanked all the collaborators and counterparts for giving time for effectiveness of the project. He stated that in the past, KUKL focused on paper-based activities, but after the implementation of the project, the counterpart's members focused on GIS bases and requested other leaders to reflect such results in the other outputs. The main objective of implementing the project is to satisfy the customer of KUKL.</p> <p>He added, now the Melamchi project plans to operate Melamchi water supply throughout the years through new network. Therefore, main purpose of KUKL is to supply water to customers every day and the result will be reflected in the 2nd customer satisfaction survey.</p> <p>[Mr. Rajendra Sapkota]</p> <p>KUKL has a golden opportunity to learn from the experts and improve the organization. Therefore, he requested KUKL to utilize this opportunity as much as possible to make KUKL change better.</p> <p>He added, regarding Output-1, he suggested to improve the organizational structure as soon as possible. The Project cannot achieve a result of the plan without modifying the organization structure. Further, he mentioned that PID was planning to complete 75% of DNI works by December 2023 and will prioritize to complete DNI branch-wise, so that counterparts can learn in timely manner.</p> <p>Further, Mr. Rajendra Sapkota has suggested on the following areas: -</p> <p>[Output-1]</p> <p>Once the DNI is completed, the extension of new pipe network will be highly demanded, and this is the right time to get training in hydraulic analysis.</p> <p>[Output-2]</p> <p>NRW management in the DNI area newly constructed within ring road is not challenging part. KUKL should approach targeting its new system as a pilot project.</p>

Items	Contents
	<p>[Output-3] KUKL is still focusing on bleaching powder as a chemical for disinfection. Therefore, he suggested to consult with an expert about the usages of chlorine gas or hypochlorite solution. PID has proposed hypochlorite solution in the second phase of the New Sundarijal WTP project.</p> <p>[Output-4] 2nd customer satisfaction is very important for the improvement of KUKL. Therefore, he requested KUKL to share PID with the result of survey.</p> <p>[Output-5] Select the associated employees with the relevant outputs so that he/she can contribute his/her effort to the project.</p> <p>[Dr. Sanjeev Rana] Regarding the issue on main power and reformation of organization structure of KUKL can be resolved through close coordination among all the stakeholders. He requested KUKL to allocate the appropriate employees in the division and branches as well. Further, he requested KUKL to proceed with the recruitment process as soon as possible and assured them a good working environment.</p> <p>[Ms. Meena Shrestha] This meeting of the JCC is organized physically for the first time and the progress of the activities so far has been well presented by the leaders of all parties. The reason for implementing the technical corporation project is to improve the water supply service and to make the sustainable operation and maintenance of the water supply system of KUKL in Kathmandu Valley. KUKL staffs have received many trainings at national and international level so far. Therefore, it is the right time to practically implement the activities by applying the knowledge learned from JICA to their daily job. Before starting the project, there was a big challenge due to the lack of expert and no regular water supply system. Now, we have water from Melamchi and experts are available to enhance the capacity of KUKL. The Public Service Commission (PSC) is responsible for the recruitment of manpower from level 4-11. KUKL should talk with PSC in time and solve the problem of manpower. ADB has also raised a query regarding the restructuring and reform of KUKL with the same opinion. Therefore, MoWS requested KUKL to consider it seriously, to coordinate with the relevant authority, and to allocate sufficient budget for the project. In case that the budget will deficit, then finally MoWS will provide budget with appropriate channel.</p>

Table 3.6.5 Outline of the 5th JCC meeting

Items	Contents
Date and time	December 18 th , 2023, 13:00 - 15:15 (Nepal Standard Time)
Type	Conference Room of KUKL Head Office with Web conference of MS Teams
Purpose	Report on the project progress and commitment of actions to be taken by KUKL toward the start of Term-3
Items of discussion	<ol style="list-style-type: none"> 1. Mid-term evaluation by KUKL managerial section 2. Progress of the project and activities to be conducted in Term-3 3. Changes in Key Performance Indicators of KUKL during the project 4. Actions to be taken by KUKL for Term-3
Participants	<p>[Nepalese side: 11]</p> <ul style="list-style-type: none"> • Ms. Meena Shrestha (Joint Secretary, Ministry of Water Supply) • Mr. Ram Chandara Dhakal (Chief Finance Officer, KVWSMB) • Mr. Rajendra Sapkota (Project Director, PID) • Mr. Gyanendra Bahadur Karki (CEO, KUKL) • Mr. Ramesh K C (Deputy Manager, Chief of Water Operation Division, Head Office) • Dr. Dol Prasad Chapagain (Deputy Manager, Chief of Wastewater Operation Division, Lalitpur) • Mr. Umesh Babu Marahatta (Deputy Manager, Chief of Support Division, Head Office) • Mr. Ujjwal Shrestha (Deputy Manager, Chief of Planning and Monitoring Division, Project Manager of PMU, Head Office) • Ms. Shailaja Adhikari (Assistant Manager, Chief of Water/Wastewater Quality Assurance Division) • Mr. Dipendra Bahadur Oli (Assistant Manager, Company Secretary, Chief of Procurement Section) • Ms. Bina Khanal (Assistant Manager, Chief of Training and Research Section, Head Office) <p>[Japanese side: 14]</p> <ul style="list-style-type: none"> • JICA Headquarters: 1 • JICA Nepal Office: 5 • JICA Expert Team: 9 • Local engineer of JICA Expert Team: 3
Comments by JICA Nepal Office	<p>[Mr. Akimitsu Okubo]</p> <p>He expressed gratitude to all participants and counterparts for providing this opportunity of the 5th JCC meeting.</p> <p>He stated that it was a good opportunity for him to know many activities ongoing under KUKL and issues facing this moment. Water sector is a vigorous sector for the Japanese government providing financial assistance and technical support to the government of Nepal.</p> <p>After completion of the Melamchi project, KUKL will manage all the facilities for water supply in Kathmandu. To support KUKL for management of overall water supply and newly constructed facilities through Melamchi project, JICA has started this technical cooperation project.</p> <p>JICA closely monitors this status and progress of this project and the performance of KUKL. From perspective of the project, we could see several reformative actions, such as human resources recruitment and financial allocation.</p> <p>He would like to express an appreciation to CEO, Mr. Gyanendra Bahadur Karki, and the entire KUKL team for making an effort to this project.</p> <p>We also could see there are several trainings and capacity development program. The key question rises “how to monitor effectiveness of training provided by the project to improve KUKL’s performance”. The training is not a purpose but is just one of the tools to achieve the goal based on PDM.</p> <p>JICA would like to request KUKL and the project team to closely monitor the effectiveness of the trainings and capacity development program in a day-to-date operation and service improvement of KUKL.</p> <p>JICA believes that Mr. Gyanendra Bahadur Karki takes a strong leadership and getting support from MoWS for KUKL to be able to overcome the technical and financial challenges with the wish of successful implementation of the project.</p>
Comments by JCC members	<p>[Mr. Gyanendra Bahadur Karki]</p> <p>He expressed gratitude to all participants and counterparts for their time and productive discussions during the 5th JCC meeting. The main purpose of the project is to enhance the capacity of KUKL employees and deliver improved services to customers. While Term-2 of the project has concluded successfully, and Term-3 is set to commence soon. He congratulated the</p>

Items	Contents
	<p>team for the success of Term-2 and extended best wishes for Term-3.</p> <p>When KUKL start the project, the project faced many problems as like COVID-19 and water scarcity. But until Term-2, KUKL has started the following actions under the guidance of the Japanese Expert Team.</p> <ul style="list-style-type: none"> - Training and Research Section has been reactivated and allocated dedicated staffs. - 10 GIS dedicated persons has been selected to check the PID data before handover of DMAs. - Establishment of grievance handling unit at the Head Office and Branch Offices. <p>The project has provided a good opportunity for KUKL employees to improve the overall system of KUKL. Furthermore, many core members of the output have had the opportunity to visit a third countries to acquire new technologies.</p> <p>Customer satisfaction survey has been conducted twice, which has shown the tendency of improvement on customer satisfaction with KUKL's services, regarding which Output 4 core members are in Japan to expanding their knowledge. He repeatedly expressed gratitude to the project team and the people of Japan for their unwavering support in the capacity building project.</p> <p>[Mr. Rajendra Sapkota]</p> <p>He expressed his thought that this meeting is a good opportunity to all the relevant stakeholder to set in a single platform and discuss the project activities. The project has done a tremendous effort to enhance the overall capacity of KUKL. However, the Japanese Expert Team has diagnosis some problem in each output during implementation of the project activities, which should be address by concerned agencies immediately. He stated that in all the aspect, KUKL should improve and learn a lot of things from the Japanese Expert Team as the largest private organization in Nepal to provide water service to the customer.</p> <p>Further, PID also learned a lot about NRW management, GIS and so on. He stated that all the bodies related to Wash sector in Nepal should consult with the JICA Expert Team and learn a lot from them. Furthermore, he stated that PID had hand over 4 DMAs in the past and learned some problem during handover process. Those lessons learned will be reflected to the next handover process and more than 10 DMAs will be handed over soon after the resumption of Melamchi water.</p> <p>Moreover, he informed that PID is going to implement SCADA system in February 2024. He requested the JICA Expert Team to support during preparation of SCADA module, if possible. Finally, he concludes that, KUKL should implement the suggestion which are pointed out by the JICA Expert Team, and he wishes for the success of Term-3.</p> <p>[Ms. Meena Shrestha]</p> <p>She thanked the JICA Expert Team and others relevant organizations for participating and supporting KUKL in the 5th JCC meeting of this technical cooperation project. She mentioned that Ministry of Water Supply (MoWS) is happy with JICA for continuous support to Nepal in many sectors. She congratulated to the project for the success of Term-2 and wishes to great success in Term-3.</p> <p>She recommended that KUKL promptly address the concern highlighted by the JICA Expert Team in each output.</p> <p>On the other hand, she conveyed information to the meeting that a new secretary of MoWS has been assigned and the new secretary has committed to ensuring the delivery of Melamchi water within three weeks.</p> <p>Furthermore, she strongly requested KUKL to address any issues before the commencement of Melamchi operations, as we agreed to implement all the terms until the project's completion.</p> <p>She expressed gratitude to all the experts for conducting OJT, internal training, and training in third countries to enhance the capacity of KUKL employees and improve the overall organizational system.</p> <p>Furthermore, she suggested KUKL to keep the rooster of TOT members of KUKL, even they are retired or resigned. After this technical cooperation project, KUKL can utilized those retired or resigned TOT members as a resource person.</p> <p>Delays in handing over the DMA by PID may also affect internal training on GIS. If this impact does not allow KUKL staff to gain sufficient GIS experience during the project period, temporary hiring of outside experts should be considered.</p> <p>However, this decision should be discussed internally first. MoWS is always there for any necessary assistance to accelerate project activities.</p>

3.7 Baseline survey

Since technical cooperation projects are intended to improve the organizational and human resource capacity of the implementing agencies, it is necessary to quantitatively evaluate the degree of improvement as much as possible at the beginning, in the middle, and at the end of the project. The following is a list of items and ingenuities that the JICA Expert Team worked on to resolve this issue.

3.7.1 Collection and analysis of baseline data

Baseline data will be monitored to assess project outcomes throughout the project period and will be used to evaluate project accomplishments through comparison with end line data.

The baseline survey has three objectives as indicated below.

- To reconfirm the overall direction of the project through understanding the overall picture of water services in the Kathmandu Valley and the challenges faced by the implementing agency (KUKL).
- To confirm the baseline values at the beginning of the project through the collection of information necessary to monitor and evaluate the results of the project and the achievement of the project goals.
- Based on the results of the baseline survey, initially planned activities and performance indicators should be reviewed and reflected in the revision of the PDM and PO.

After the kick-off meeting on April 21st, 2021, the JICA Expert Team started to collect baseline data to understand the current situation of KUKL. As Japanese experts were not allowed to travel to Nepal until September 2021, the survey was carried out by sending questionnaires by email, Web conference with the Action Teams, and visit to KUKL branches and departments by local engineers.

Table 5.7.1 Items required for baseline survey

Field	Information to be corrected
Organization	Organizational structure of KUKL, Number of staffs, Recruitment plan
	Annual report of KUKL
	Plan for integration of branch offices
	Organization structure of branches
	Organization structure of Training and Research Section
Plan	Business plan of KUKL
	Superior development plan in national level and sectorial level
	Regulation for water supply service
	Relation among different organization in the water sector
Finance	“Financial Statements” and “Profit and Loss Statement”
	Breakdown of operation cost of KUKL
	Budget planning and approval process
	Budget data for the last 5 years
	Payment status of license/lease fee to KVWSMB
	Information about WSTFC and payment status from KUKL to WSTFC
	Water tariff
O&M	Current situation of water supply in Kathmandu Valley
Related projects	Progress of on-going projects related to JICA project
	Roles and responsibilities of PID

Field	Information to be corrected
Output 1	Development of a water distribution plan within KUKL and its implementation process/decision making authority
	Availability of CAD/GIS data of the water distribution network
	Inventory of transmission and distribution pipes, water treatment plants, reservoirs, etc.
	Actual data on the amount of water produced by WTPs and the amount allocated to the branch offices
	Details of the laying of new water distribution pipes carried out under the KUKL budget
	Status of studies on the process of switching existing water supply connections to new connections prepared through DNI project
	Experience of measuring water pressure in the distribution network
	Experience of carrying out hydraulic analysis and the department in charge at KUKL
	Software used if hydraulic analysis is being carried out
	Requests for software to perform hydraulic analysis on JICA project
	Existence of a department in charge of GIS systems at KUKL
	Software requirements for GIS operation in your project
	Possibility for KUKL to pay for the use of fee-based hydraulic analysis and GIS software.
Output 2	Department responsible for counting non-revenue water
	Installation of water meters
	Duties of NRW Division at head office and branch offices
	Selection criteria and standard specifications for water meters and piping materials
	Status of illegal connections
	What to do after discovering an illegal connection
	Information on water meters installed in DNI projects
	Information on meter test benches developed with ADB support
	Status of water meter repairs using a test bench
	History of repairs to water pipes and meter connections
Output 3	Plan for the transfer and O&M of the New Sundarijal WTP
	Information on the operation of existing WTPs, staff and SOPs
	Challenges in operation and maintenance of existing WTPs
	Special note for JICA projects
	Requests and opinions on the selection of target WTPs for OJT
	Current status of flow measurement equipment at Bode WTP
	Information and services of the water quality analysis laboratory
	Organization, staffing and training status of the water quality analysis laboratory
	Equipment list in the water quality analysis laboratory
	Information on the analytical process and rules of the water quality analysis laboratory
	Water quality analysis monitoring plan, standards and analysis records
Existing SOPs in water quality laboratory	
Challenges in the operation of water quality analysis	
Request for JICA project	
Output 4	Information about CBAAS
	Historical record of customer grievance
	Current status of customer service by KUKL
	Current status of public awareness activities by KUKL
	Public awareness promotion plan
Output 5	Current status of tariff collection
	Record of previous training conducted by KUKL
	Availability of an annual training plan by Human Resource Development Division
	Authority/responsible person for selection of target staff of training
	Annual budget for training
	Training room and equipment necessary for training
	Department responsible for conducting internal training
Availability of materials and equipment for use in internal training	

3.7.2 Capacity Assessment of KUKL staffs

As part of the baseline survey, the JICA Expert Team conducted a capacity assessment of individual C/Ps allocated to each output, identifying challenges of KUKL's organization and systems.

The assessment was divided into core capacity and technical capacity perspectives, and the target group was selected from the action team and supporting members of each output, in consultation with KUKL. The capacity assessment form divides the capacities to be measured into a number of broad areas, each of which consists of a number of sub-questions. Based on the self-assessment completed by the target individuals, a Japanese expert reviewed its content by teleconference. From September 2021 onwards, when a trip to the field was possible, the core members of the Action Team were interviewed to reconfirm the content of the assessment, which was then revised and finalized as necessary.

At the end of Term-2, JICA Expert Team interviewed the subject again to confirm the changes in his/her abilities since the start of the project based on his/her self-evaluation, and compiled the results as an interim evaluation.

Table 3.7.2 Type of capacity

Type	Contents	Main Target Group
Core capacity	Proactive management skills, will, attitude, leadership, etc. to improve KUKL's operational management capacity by using technical capacity.	Management Class Branch Manager Division Chief
Technical capacity	Specific knowledge and skills required for the operation and maintenance of water supply facilities, non-revenue water management and customer service, as well as know-how acquired through on-the-job training.	Staff in charge of following works: - GIS Operation - Hydraulic Analysis - O&M of WTPs - Water Quality Analysis - Meter Reading - Other related work

Table 3.7.3 Rating of capacity

Level	Status of capacity
5	Having a deep and thorough understanding of the subject and be able to teach others.
4	Having a general understanding of the subject matter, but being aware that there are parts of my knowledge and experience that are inadequate.
3	Having some understanding of the subject matter but recognizing that their knowledge and experience are at a level that needs to be improved.
2	Recognizing having a partial understanding of the subject, but that overall our knowledge and experience is insufficient.
1	Recognizing that there is a significant lack of knowledge and experience on the subject.

(1) Capacity related to Output 1

A summary of the results of the survey and the distribution of the rating are summarized below:

Table 3.7.4 Target group of capacity assessment related to Output 1

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
Action team (Core members)						
1	Dr. Dol Prasad Chapagain	Chief of Wastewater Operation Division	Deputy Manager (Level 9), Technical	GIS /Hydraulic Analysis	Core	✓
2	Mr. Ujjwal Shrestha	Chief of Planning & Support Dept., Head Office	Deputy Manager (Level 9), Technical	GIS /Hydraulic Analysis	Technical	✓
3	Mr. Krishna Kumar Sah	Manager of Lalitpur Branch	Engineer (Level 7)	Hydraulic Analysis	Core/ Technical	✓
4	Mr. Amardip Kumar Sah	Tripureshwor Branch	Overseer (Level 5)	GIS	Technical	✓
Supporting members						
5	Mr. Hem Bahadur Budhathoki	Manager of Bhaktapur Branch	Engineer (Level 7)	GIS /Hydraulic Analysis	Technical	✓
6	Mr. Pravin Bhurtel	Manager of Madhyapur-Thimi Branch	Overseer (Level 5)	Hydraulic Analysis	Technical	✓
7	Mr. Bijay Bishwakarma	Baneshwor Branch	Engineer (Level 7)	Hydraulic Analysis	Technical	✓
8	Mr. Jitendra Shah	Maharajgunj Branch	Overseer (Level 5)	GIS	Technical	✓
9	Mr. Niwash Guragian	Lalitpur Branch	Asst. Tech. Officer (Level 6)	Hydraulic Analysis	Technical	✓
10	Mr. Aknur Nath Sharma	Planning & Support Dept., Head Office	Engineer (Level 7)	Hydraulic Analysis	Technical	✓
11	Mr. Nrigendra Shrestha	Head Office	Tech. Officer (Level 7)	Hydraulic Analysis	Core/ Technical	✓
12	Mr. Chet Bahadur Ayer	Mahankalchaur Branch	Asst. Technical Officer	Hydraulic Analysis	Technical	✓
-	Mr. Kamal Pun	Lalitpur Branch	Engineer (Level 7)		Technical	*2
-	Mr. Madhav Pandey	Maharajgunj Branch	Asst. Tech. Officer (Level 6)	GIS	Technical	*2
-	Mr. Rabin Khadka	Maharajgunj Branch	Engineer (Level 7)	Hydraulic Analysis	Technical	*2

Note *1: Organization as of December 2023.

Note *2: Retirement or resignation during the project period.

Table 3.7.5 Items of capacity assessment related to Output 1

Question about core capacity	Question about technical capacity
1. Planning/Monitoring	1. Planning/Monitoring
2. Budget Management	2. Operation of GIS
3. Allocation of Staffs	3. Information Security
4. Human Skill (Communication)	4. Basic and Theoretical Knowledge about GIS and /or Hydraulic Analysis
5. Water Distribution Planning	5. Operating skill of Hydraulic Analysis Programme
6. Maintenance Planning	6. Water Distribution Planning
7. Training Planning	7. Maintenance Planning

Table 3.7.6 Change in capacity of members of Output 1



Table 3.7.7 Summary of capacity assessment related to Output 1

Type	Status at the start of the project	Status as of the end of Term-2
Core Capacity	<ul style="list-style-type: none"> ➤ Respondents often need to respond to current issues and do not act in line with medium to long-term plans. ➤ Respondents are aware that the Melamchi Water Supply Project will increase water supply but not enough to meet demand. ➤ KUKL itself has many specific ideas about the distribution management plan but does not have common implementation procedure and SOPs. ➤ KUKL is also interested in ICT system and software application so that the record management for the project management, distribution management and maintenance management system would be addressed. ➤ KUKL has introduced a system of annual performance reviews and evaluations, but in some cases the evaluation of competence tends to be uniform and the results of performance reviews are not fully utilized. 	<ul style="list-style-type: none"> ➤ Shortly after the Melamchi water supply was initiated, the water supply increased but not enough. A feasible water distribution operation plan needs to be developed and implemented by KUKL under the current constraints. ➤ Now that the handover of GIS data has begun, each DMA needs to be proactive in the use of hydraulic analysis and GIS information. ➤ The project has begun to study and prepare training materials for the maintenance of water distribution facilities and training materials, but there is a gap between the content and feasibility due to water supply restrictions. The implementation of internal training is a little behind compared to other outcomes, and efforts need to be accelerated in the third phase. ➤ The budget stacking within KUKL is still done in the traditional way and there are many areas for improvement in terms of necessity and accuracy. In addition, not all budgets applied for are approved, so there is a constant need to consider how to use the distributed budgets. We feel that knowledge, skills, and technology are needed for better management.
Technical Capacity	<ul style="list-style-type: none"> ➤ Many of the respondents are graduates of science universities, such as civil engineering and environment, and some of the staff have completed their master's degree. Therefore, the interview results suggest that the target staff have a basic knowledge of the subject. ➤ Some staff with an understanding of the basic content of hydraulics were found to be willing to teach other staff as lecturers. ➤ Respondents have not actually carried out any hydraulic analysis on the water pipe network managed by KUKL. At the moment they are forced to have very limited water supply times and our only concern is to provide as much water as possible to the users. ➤ There is no management of the distribution network using drawings, and information on new pipelines and repairs is not used. 	<ul style="list-style-type: none"> ➤ Since many resources have been devoted to GIS training in the activities up to Term-2, basic knowledge and skills in GIS have improved significantly. The staff themselves are continuously seeking to improve their GIS knowledge and skills. ➤ Participants in previous GIS training (on-the-job training) have begun to become familiar with GIS. Through internal training, they are highly motivated to pass on GIS technology to other staff members. ➤ In conducting internal training, some participants expressed concerns about the preparation of training programs and teaching methods. Although training materials have been prepared through the project, it will be necessary to revise the content to improve the understanding of training participants as well as to improve their knowledge to make appropriate use of them.
Comments from JICA Expert Team	<ul style="list-style-type: none"> ➤ The number of staff who have used GIS and hydraulic analysis software is limited, and the expectations of this project are high in this area. ➤ In the past, many KUKL staff, not only in this field, have commented that after learning basic knowledge through training, they do not have the opportunity to put it to practical use, and therefore the skills do not stick. ➤ It is necessary to devise ways to establish the technology transfer to be carried out through this project. 	<ul style="list-style-type: none"> ➤ While personnel transfer within KUKL occur on a regular basis, some engineering staff have submitted to the Head Office their wish to concentrate on their area of expertise, and their wishes have been fulfilled in implementation. This flexibility in personnel assignments is desirable in order to establish and expand the knowledge and skills acquired through project activities within the organization. ➤ Only basic knowledge/technology improvement training has been provided on hydraulic analysis. There are high expectations for training on hydraulic analysis and water distribution management in Term-3, when the completion/delivery of GIS data from PID will be accelerated.

(2) Capacity related to Output 2

A summary of the results of the survey and the distribution of the rating are summarized below:

Table 3.7.8 Target group of capacity assessment related to Output 2

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
Action team (Core members)						
1	Mr. Ramesh K C	Chief of Production Division, Head Office	Deputy Manager (Level 9), Technical	NRW Planning	Core	✓
2	Mr. Narayan Karna	Manager of Mahankalchaur Branch	Asst. Manager (Level 8)	NRW Planning	Core	✓
3	Mr. Susil K. C.	KVWSMB	Engineer (Level 7)		Technical	✓
4	Mr. Hem Bahadur Budhathoki	Manager of Bhaktapur Branch	Engineer (Level 7)	NRW Planning	Core	✓
5	Mr. Surya Bdr. Khatri	Wastewater Operation Division	Account Officer		Core	✓
6	Mr. Krishna Kumar Sah	Manager of Lalitpur Branch	Engineer (Level 7)	Pipe repair	Core	✓
7	Mr. Surendra Bahadur Rawal	Manager of Chhetrapati Branch	Engineer (Level 7)	NRW Planning	Technical	✓*4
8	Mr. Ujjwal Shrestha	Chief of Planning and Monitoring Division, Head Office	Deputy Manager (Level 9)	NRW Planning	Core	✓*3
9	Ms. Bina Maharjan	Manager of Kirtipur Branch	Asst. Manager (Level 8)	NRW Planning	Core	✓*3
10	Mr. Aknur Nath Sharma	Planning & Support Dept., Head Office	Engineer (Level 7)	NRW Planning	Technical	✓*3
-	Mr. Rabin Khadka	Maharajgunj Branch	Engineer (Level 7)		Core	*2
Supporting members						
11	Mr. Krishna Hari Bhdhathoki	Chief, Electromechanical Dept.	Asst. Manager (Level 8), Technical	Meter reading /Pipe repair	Technical	✓
12	Mr. Durga Bahadur Basnet	Head Office	Asst. Manager (Level 8), Administrative	Meter reading /Pipe repair	Technical	*5
13	Mr. Pravin Bhurtel	Manager, Madhyapur-Thimi Branch	Overseer (Level 5)	Pipe repair	Technical	✓
14	Mr. Amardip Kumar Sah	Tripureshwor Branch	Overseer (Level 5)	NRW Planning	Technical	✓
15	Mr. Tijendra Jung Karkee	Electromechanical Section, Sundarighat	Asst. Account Officer (Level 6)	Meter reading	Technical	*5
16	Mr. Nabin Neupane	Maharajgunj Branch	Senior Asst. Account Officer (Level 5)	Meter reading	Technical	✓
17	Mr. Buddha Ram Maharjan	Kirtipur Branch	Asst. Tech. Officer (Level 6)	Pipe repair	Technical	✓
18	Ms. Urmila Bhandari	Madhyapur-Thimi Branch	Asst. Account Officer (Level 6)	Meter reading	Technical	✓
19	Mr. Udaya Acharya	Maharajgunj Branch	Overseer (Level 5)	Pipe repair	Technical	✓
20	Mr. Rajendra Bahadur Bam	PID	Adm. Officer (Level 7)	Meter reading	Technical	✓
21	Mr. Sumit Kumar Shah	New Sundarikal WTP	Supervisor (Level 5)	NRW Planning	Technical	✓
22	Mr. Sudarshan Sapkota	Lalitpur Branch	Senior Meter Reader (Level 4)	Meter reading	Technical	✓
23	Mr. Bikaksh Maharjan	Madhyapur-Thimi Branch	Engineer (Level 7)	Pipe repair	Technical	✓

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
24	Mr. Rajendra Deshar	Chhetrapati Branch	Asst. Tech. Officer (Level 6)	NRW Planning	Technical	✓
25	Mr. Kapil Karki	IT Section, Head Office	Overseer (Level 5)		Technical	✓
26	Ms. Sita Kandel	Tripureshwor Branch	Senior Asst. Account Officer (Level 5)		Technical	✓
-	Ms. Rachana Adhikari	Engineer NRW - Head Office	Engineer (Level 7)	NRW Planning	Technical	*3
-	Mr. Krishna Bahadur Shrestha	Chhetrapati Branch	Supervisor (Level 5)	Pipe repair	Technical	*2
-	Mr. Gopi Krishna Khadka	Tripureshwor Branch	Senior Account Asst. (Level 5)	Meter reading	Technical	*2

Note *1: Organization as of December 2023.

Note *2: Retirement or resignation during the project period.

Note *3: Joined from 2022 or 2023.

Note *4: Joined from supporting member.

Note *5: Not subject to mid-term evaluation.

Table 3.7.9 Items of capacity assessment related to Output 2

Question about core capacity	Question about technical capacity
1. Organization and Staffing 2. Management of Budget, Equipment, Material 3. Planning/Monitoring/Evaluation 4. Team Communication 5. Incentive/Motivation 6. Staff training and on-the-job training 7. Availability of data/information and SOPs/manuals	1. Willingness to work and Motivation 2. Team Communication 3. Basic Knowledge 4. Practical Skill and Ability 5. Staff training and OJT

Table 3.7.10 Change in capacity of members of Output 2

Core Capacity (Average)	
Status at the start of the project	Status as of the end of Term-2
Core Capacity (All respondents)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity (Average)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity (All respondents)	
Status at the start of the project	Status as of the end of Term-2

Table 3.7.11 Summary of capacity assessment related to Output 2

Type	Status at the start of the project	Status as of the end of Term-2
Core Capacity	<ul style="list-style-type: none"> ➤ The item with the lowest average score was "7. Availability of data/information and SOPs/manuals" with a score of 1.9. ➤ Following 7 above, the items with the lowest ratings were "6. staff training and on-the-job training", "2. Management of Budget and Equipment", "1. Organization and Staffing" and "5. Incentives and Motivation". ➤ Looking at the distribution of evaluation scores for all respondents, there is relatively little variation in "1. Organization and Staffing", "3. Planning, monitoring and evaluation", and "4. Team communication", suggesting that there is not a great deal of variation between staff in these capacities. ➤ There was a large variation among respondents in the categories of "5. Incentives and motivation" and "6. Staff training and on-the-job training". ➤ The results suggest that there are many organizational challenges in the areas of data and information, availability of SOPs and manuals, staff training and on-the-job training, budget and equipment, and incentives and motivation. On the other hand, there are no major problems in the areas of teamwork and communication. 	<ul style="list-style-type: none"> ➤ "7. Availability of data/information and SOPs/manuals" improved significantly to 2.9 points, and "6. Staff training/OJT" from 2.5 points to 3.7 points. ➤ A certain degree of improvement is also seen in other areas such as "1. organization and staffing" and "4. Team communication". ➤ The distribution of evaluation scores for all respondents shows that "6. Staff training and OJT " is concentrated at a higher evaluation level than in the previous survey. ➤ Respondents varied in "3. Planning/Monitoring/Evaluation", "5. Incentive/Motivation" and "7. Availability of Data/Information and SOP/Manuals." ➤ The results suggest that the manuals that have been developed and the training that has been conducted have resulted in improved evaluations by most respondents. ➤ It is believed that the hiring of new staff, etc. has contributed to the improvement of staff numbers and communication among staff. On the other hand, a small number of respondents recognize that manual development, motivation, etc. are not sufficient, and therefore, actions need to be taken based on individual circumstances.
Technical Capacity	<ul style="list-style-type: none"> ➤ The item with the lowest average score was "5. Staff training and on-the-job training" with a score of 2.1. ➤ The next lowest rating is "3. Knowledge" and "4. Practical skills and abilities", but the average score is relatively high at 3.6. ➤ The significantly low rating of "5. Staff training and on-the-job training" indicates that the challenges are concentrated here. ➤ On the other hand, since the score for "2. Team communication" is high, it is thought that there are few problems in cooperation and collaboration among the staff. ➤ The distribution of the evaluation scores of all respondents shows that "1. Willingness to work and motivation ", "2. Team communication" and "3. Basic knowledge" are concentrated at relatively high levels of evaluation, suggesting that there is no significant difference between staff in these capacities. ➤ On the other hand, "4. Practical skills and abilities" and "5. Staff training and on-the-job training" showed a very large variation in the evaluation scores. ➤ This result suggests that many C/Ps feel relatively strongly about the need to improve their skills through staff training and on-the-job training. 	<ul style="list-style-type: none"> ➤ "5. Staff training and OJT," which had a significantly low rating in the previous survey with an average score of 2.1, improved significantly to 3.9. ➤ Improvements were also seen in the other areas of "1. Willingness to work and Motivation ", "2. Team communication", "3. Basic knowledge", and "4. Practical skill and abilities". ➤ The distribution of evaluation scores for all respondents shows that they generally gave high marks to all items, and the variation in scores is concentrated at the higher rating levels since the previous survey. ➤ The reason for the low evaluation score in "5. Staff training and OJT " for some respondents was that the training content was something they already understood and did not match their own level. ➤ The results suggest that the training conducted so far has improved most respondents' evaluation of the training, and that these improvements have contributed to improvements in their knowledge, skills, and motivation.
Comments from JICA Expert Team	<ul style="list-style-type: none"> ➤ With regard to core capacity, the importance of "allocation of personnel and budget", "development of training and SOPs", "proper evaluation and incentivization of staff", "development of accurate map information" and "improvement of meter accuracy" were pointed out. 	<ul style="list-style-type: none"> ➤ Evaluation scores for training have improved for both core and technical capacity. ➤ The training conducted so far in the project has increased satisfaction with the quantity and quality of training. Furthermore, it can be seen that a virtuous cycle has been created in which knowledge, skills, and motivation have improved as a result of the training.

Type	Status at the start of the project	Status as of the end of Term-2
	<ul style="list-style-type: none">➤ In terms of technical capacity, the importance of regular workshops, seminars and training, improved GIS and non-revenue water reduction techniques, leakage reduction, improved meter reading techniques, on-site rather than online training, etc., was noted.➤ In many of the open-ended comments from the respondents, the perception of the challenges and the needs were concretely expressed, indicating strong expectations for this project.	

(3) Capacity related to Output 3

A summary of the results of the survey and the distribution of the rating are summarized below:

Table 3.7.12 Target group of capacity assessment related to Output 3

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
Action team (Core members)						
1	Ms. Shailaja Adhikari	Chief of Water/Wastewater Quality Assurance Division	Asst. Manager (Tech) (Level 8)	Water quality Control	Core	✓
2	Mr. Krishna Hari Budhathoki	Chief of Electromechanical Dept.	Asst. Manager (Level 8), Technical	Water Treatment	Core	✓
3	Mr. Prem Poudyal	Water/Wastewater Quality Assurance Division	Chemist (Tech) (Level 7)	Water quality Control	Core/Technical	✓
4	Mr. Basanta Kumar Pal	Chief of Sundarijal WTP	Senior Lab Technician (Level 5)	Water Treatment /Water quality Control	Technical	✓
5	Mr. Dipesh Dhakal	Chief of New Sundarijal WTP	Engineer (Level 7)	Water Treatment	Technical	✓
6	Ms. Niru Burlakoti	Water/Wastewater Quality Assurance Division	Microbiologist (Level 7)	Water quality Control	Technical	✓
7	Mr. Pravin Bhurtel	Technical department (Thimi branch)	Observer (Level 5)	Water Treatment	Technical	✓*5
8	Mr. Chandan Kumar Shah *3	Kathmandu Valley Water Supply Management Board (KVWSMB)	Civil engineer (Level 7)	Water Treatment	Core	✓*5
-	Ms. Pratigya Thapa	New Sundarijal WTP	Microbiologist (Level 7)	Water quality Control	Technical	*2
Supporting members						
9	Ms. Bina Maharjan	Manager of Kirtipur Branch	Engineer (Tech) (Level 7)	Water Treatment	Core	✓
10	Mr. Gyanendra Bdr. Karki	CEO	Act. Deputy CEO (Tech) (Level 11)	Water quality Control	Cor	*3
11	Mr. Manish Dhungana	Manager of Maharajgunj Branch	Asst. Manager (Tech) (Level 8)	Water Treatment	Core	✓
12	Mr. Hem Bahadur Budhathoki	Manager of Bhaktapur Branch	Engineer (Level 7)	Water Treatment	Technical	✓
13	Mr. Bhola Dhungana	Maharajgunj Branch	Asst. Technical Officer (Level 5)	Water Treatment	Technical	✓
14	Ms. Sachita Dhital	New Sundarijal WTP	Senior Lab Technician (Level 5)	Water quality Control	Technical	✓
15	Mr. Pundari Nepal	Water/Wastewater Quality Assurance Division (KVWSMB)	Lab Assistant (Level 3)	Water quality Control	Technical	✓
16	Mr. Santosh Kaphle	Water/Wastewater Quality Assurance Division (Bode)	Lab Technician (Level 4)	Water quality Control	Technical	✓
17	Ms. Pranita Tuladhar	Water/Wastewater Quality Assurance Division (Central)	Senior Lab Technician (Level 5)	Water quality Control	Technical	✓
18	Mr. Dinesh Adhikari	New Sundarijal WTP	Lab Technician (Level 4)	Water quality Control	Technical	✓

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
19	Mr. Dipak Thapa	Electromechanical Section, Sundarighat	Overseer (Level 5)	Water Treatment	Technical	✓
20	Mr. Laxman Chaudhary	New Sundarijal WTP	Overseer (Level 5)	Water Treatment	Technical	✓
21	Ms. Puranjan Nepal	New Sundarijal WTP	Lab Assistant (Level 3)	Water quality Control	Technical	✓
22	Mr. Suresh Pradhananga	Bhaktapur Branch	Overseer (Level 5)	Water Treatment	Technical	✓
23	Mr. Bhim Prasad Koirala	Maharajgunj Branch	Supervisor (Level 5)	Water Treatment	Technical	✓*5
24	Mr. Niwash Babu Bhattarai	Water/Wastewater Quality Assurance Division (Bansbari)	Lab Assistant (Level 3)	Water quality Control	Technical	✓*5
-	Ms. Roshani Khatri	Tripureshwor Branch	Overseer (Level 5)	Water Treatment	Technical	*4
-	Mr. Krishna Kumar Sah	Manager of Lalitpur Branch	Engineer (Level 7)	Water Treatment	Technical	*4
-	Mr. Sumit Kumar Shah	New Sundarijal WTP	Supervisor (Level 5)	Water Treatment	Technical	*4
-	Mr. Hariram Rimal	Chief - Bode WTP	Engineer (Level 7)	Water Treatment	Technical	*2
-	Mr. Madhav Pandey	Bansbari WTP	Asst. Technical Officer (Level 6)	Water Treatment	Technical	*2

Note *1: Organization as of December 2023.

Note *2: Retirement or resignation during the project period.

Note *3: Not included in the evaluation due to involvement as CEO.

Note *4: Not subject to mid-term evaluation since not engaged in water purification plant operation and management at the time of project initiation.

Note *5: Persons to be evaluated from mid-term.

Table 3.7.13 Items of capacity assessment related to Output 3 (Water Treatment)

Question about core capacity	Question about technical capacity
1. Organization and Staffing	1. Knowledge about rule and manual
2. Information management	2. Document Control
3. Management system of O&M work	3. Knowledge about water treatment technology
4. Ledger of facility and equipment	4. Knowledge about ability of WTP
5. Outsourcing	5. Handling of water purification chemical
6. O&M manual and SOPs	6. Coagulation process
7. Budget and procurement	7. Sand filtration process
8. Technical capacity of organization	8. Water quality monitoring
9. Understanding of ability of WTP	9. Chlorination
	10. Unusual situation

Table 3.7.14 Items of capacity evaluation related to Output 3 (Water Quality Control)

Question about core capacity	Question about technical capacity
1. Planning	1. Understanding about SOPs and manuals
2. Budget management	2. Analytical operations
3. Staffing	3. Water quality data analysis
4. Communication	4. Identification of water quality problems in daily operations
5. Technical document	5. Willingness to improve technical capacity
6. Opportunities for staff training	

Table 3.7.15 Change in core capacity of core members of Output 3

Core Capacity for staffs in charge of water treatment plant (Average)	
<p>Status at the start of the project</p>	<p>Status as of the end of Term-2</p>
Core Capacity for staffs in charge of water treatment plant (All respondents)	
<p>Status at the start of the project</p>	<p>Status as of the end of Term-2</p>
Core Capacity for staffs in charge of water quality control (Average)	
<p>Status at the start of the project</p>	<p>Status as of the end of Term-2</p>
Core Capacity for staffs in charge of water quality control (All respondents)	
<p>Status at the start of the project</p>	<p>Status as of the end of Term-2</p>

Table 3.7.16 Change in technical capacity of core members of Output 3

Technical Capacity for staffs in charge of water treatment plant (Average)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity for staffs in charge of water treatment plant (All respondents)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity for staffs in charge of water quality control (Average)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity for staffs in charge of water quality control (All respondents)	
Status at the start of the project	Status as of the end of Term-2

Table 3.7.17 Change in technical capacity of supporting members of Output 3

Technical Capacity for staffs in charge of water treatment plant (Average)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity for staffs in charge of water treatment plant (All respondents)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity for staffs in charge of water quality control (Average)	
Status at the start of the project	Status as of the end of Term-2
Technical Capacity for staffs in charge of water quality control (All respondents)	
Status at the start of the project	Status as of the end of Term-2

Table 3.7.18 Summary of capacity assessment result for core member related to Output 3

	Status at the start of the project	Status as of the end of Term-2
Water Treatment		
Core Capacity	<ul style="list-style-type: none"> ➤ On average, the scores of "1. Organization and staffing", "3. Management system of O&M work" and "8. Technical capacity of organization" were below 3 on average. From this result, it can be inferred that the knowledge of water treatment plant management and water treatment plants such as staffing and O&M of WTP and whole organizational capacity is not sufficient. ➤ There were some respondents whose understanding of "2. Information management", "5. Outsourcing" and "9. Understanding of ability of WTPs" was notable. This may be due to the fact that each respondent is in charge of his or her own area, but it may also mean that knowledge and experience in these areas is not shared among core members, i.e. at the chief manager level, or is not addressed by the organization. 	<ul style="list-style-type: none"> ➤ Compared to the average at the beginning of the project, the scores for "1. Organization and Staffing," "8. Technical capacity of organization" "4. Ledger of facility and equipment", "6. O&M manual and SOPs" and "9. Understanding of ability of WTP" have increased. As a result of the activities conducted to date, it can be evaluated that the organizational and technical capacities have improved. ➤ In the per-respondent data, there is one respondent who scored 4 or higher on all of questions 4 through 9, which is a KVWSMB staff member. ➤ Compared to the KUKL staff member's score, there is a large difference in points for the "Budget and Procurement" item ➤ Since budget approval and execution has been stagnant at KUKL since around May 2023, this perception of the current situation is likely reflected in the KUKL staff member's response.
Technical Capacity	<ul style="list-style-type: none"> ➤ There were some variations in the level of technical knowledge in areas such as "3. Knowledge of water treatment technology", "6. Coagulation process" and "9. Chlorination". ➤ Although the respondents answered that they know about water purification treatment, their score is low. There is a need to improve the technical aspects from basic knowledge. 	<ul style="list-style-type: none"> ➤ Compared to the beginning of the project, there is an increase in scores in all items. In other words, it can be evaluated that the staff members themselves feel that their abilities have improved in all of the evaluation items. ➤ However, the improvement in scores for "2. Information Management" was relatively small. Observation of daily work shows that document management skills are not high, and there is room for improvement.
Water Quality Control		
Core Capacity	<ul style="list-style-type: none"> ➤ On average, all scores were above 3, but the score for "6. Opportunities for staff training" was low. In other words, there is a high need to improve the ability to support staff development, which should be taken into consideration in future TOT implementation. ➤ It was considered necessary to create opportunities to acquire and improve technical capacity not only in TOT but also in other research institutions (universities, etc.). 	<ul style="list-style-type: none"> ➤ On average, the score for "1. Planning" has decreased. Interviews confirmed that the reasons for the low scores were 1) the need to reconsider water quality monitoring sites, and 2) water quality reports are limited to a list of data. ➤ The above self-assessment is positive and part of capacity building. It is commendable that this awareness has been developed through project activities. ➤ For "5. Technical document", the score increase can be attributed to the fact that the respondents realized the importance of SOPs and understood their effectiveness as a result of on-the-job training on the maintenance and utilization of SOPs. ➤ Regarding "6. Opportunities for staff training", the provision of training opportunities through this project activity led to an increase in the score. However, since this can be seen as a passive attitude, it is necessary to improve the ability of KUKL to plan and implement internal training programs and to create opportunities on its own in the third phase of the project.
Technical Capacity	<ul style="list-style-type: none"> ➤ The overall score is high, but looking objectively at the CPs' responses to previous distance seminars, it is difficult to say that they necessarily have sufficient knowledge. It is important to re-teach the basic knowledge and 	<ul style="list-style-type: none"> ➤ The core members' competence has been high from the beginning and has continued to score well since the beginning of the project. There was a slight decrease in scores for "4. Identification of water quality problems in daily

	Status at the start of the project	Status as of the end of Term-2
	<p>make the CPs aware of the problems themselves.</p> <ul style="list-style-type: none"> ➤ The high score for "5. Willingness to improve technical capacity" is a very good sign for future technical guidance. The high level of motivation is also evident in the seminars. 	<p>operation" and "5. Willingness to improve technical capacity."</p> <ul style="list-style-type: none"> ➤ With regard to water quality management, unstable residual chlorine control, inadequate response to increased turbidity during the rainy season, and increased turbidity associated with pipeline construction and leakage response are still noted, and there may be a lack of a real sense of capacity building through the project. ➤ There is concern about a decrease in motivation to improve technology. As for the laboratory staff, although they are gaining knowledge and skills through project activities, it is believed that this is due to the fact that the project activities are not directly linked to solving current issues. In Term-3, it is necessary to devise activities that enable individuals to realize the results of their activities, and to consider technical support so that the activities will be autonomous rather than passive.

Table 3.7.19 Summary of capacity assessment for supporting member related to Output 3

Type	Status at the start of the project	Status as of the end of Term-2
Water Treatment	<ul style="list-style-type: none"> ➤ There is a varying degree of knowledge among the respondents. The results will continue to be organized by job title and analyzed in more detail. ➤ In future technical guidance, attention should be paid to improving the competence of staff at the level of the lowest average score. 	<ul style="list-style-type: none"> ➤ Improvements in capacity were observed in all evaluation categories. Among these, the scores for the water treatment process (coagulation and sand filtration) improved, which can be evaluated as a result of the activities. ➤ The relatively small increase in the score for "1. Knowledge role and manuals" was due to lower scores in the lower position groups. This may be due to the fact that information on rules and manuals has not reached the field workers in particular. ➤ In order for the manuals to be disseminated to field workers, it will be important to improve the text management skills of the core members of the core team.
Water Quality Control	<ul style="list-style-type: none"> ➤ Individual differences were observed in the items essential to the implementation of the work, such as "1. Understanding of SOPs and manuals", "2. Analytical operation", and "3. Water quality data analysis". It seems that these differences were caused by the position and career of the respondent, and it is necessary to eliminate these individual differences through OJT in the future. 	<ul style="list-style-type: none"> ➤ Level-3 and Level-4 staff improved their "3. Water quality data analysis" scores. This may be due to improved knowledge and techniques through expert guidance and increased interest in data analysis and field feedback. ➤ Level-3 staff showed an improvement in their score for "2. Analytical operation". (The opportunity to learn analytical techniques systematically through expert guidance and SOP development may have contributed to the improvement in competence and interest.

(4) Capacity related to Output 4

A summary of the results of the survey and the distribution of the rating are summarized below:

Table 3.7.20 Target group of capacity assessment related to Output 4

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
Action team (Core members)						
1	Mr. Prakash Kumar Rai	Chief of Administration and Finance Division	Manager, Level 9, Administrative	Customer Service	Core	✓
2	Ms. Chapala Dhakal	Chief of Customer Relation Section	Assistant Manager, Level 8, Administrative	Customer Service	Core	✓
3	Mr. Yogendra Bahadur Bam	Chief of Administration & Human Resource Division	Assistant Manager, Level 8, Administrative	Awareness Activities	Core	✓
4	Mr. Purna Bahadur Kuwar	Chief of IT Section	Assistant Manager, Level 8, IT	Customer Service	Core	✓
-	Mr. Durga Bahadur Basnet	Finance Division, Head Office	Assistant Manager, Level 8, Finance	-	-	*5
Supporting members						
5	Mr. Kamal Bahadur Bam	Lalitpur Branch	Administrative Officer, Level 7, Admin.	Customer Service/Awareness Activities	Core/Technical	✓*2
6	Ms. Gita Pokhrel	Maharajgunj Branch	Administrative Officer, Level 7, Admin.	Customer Service/Awareness Activities	Core/Technical	✓
7	Ms. Matina Shakya	Tripureshwor Branch	Administrative Officer, Level 7, Admin.	Customer Service/Awareness Activities	Core/Technical	✓
8	Mr. Chudamani Luitel	Baneshwor Branch	Asst. Administrative Officer, Level 6, Admin.	Customer Service/Awareness Activities	Core/Technical	✓*3
9	Ms. Rita Paudel	Madhyapur Thimi	Asst. Administrative Officer, Level 4, Admin.	Customer Service/Awareness Activities	Technical	✓*3
10	Mr. Bishowjit Bhandari	Kirtipur Branch	Asst. Administrative Officer, Level 4, Admin.	Customer Service/Awareness Activities	Core/Technical	✓*3
11	Mr. Rajeeb Kumar Singh	Chhetrapati	Asst. Administrative Officer, Level 4, Admin.	Customer Service/Awareness Activities	Core/Technical	✓*3
12	Ms. Ambika Bogati	Lalitpur Branch	Asst. Administrative Officer, Level 4, Admin.	Customer Service/Awareness Activities	Technical	✓*3
13	Mr. Pradip Chapagain	Mahankalchaur Branch	Asst. Administrative Officer, Level 4, Admin.	Customer Service/Awareness Activities	Technical	✓*3
14	Mr. Rakesh Chaudhary	Bhaktapur Branch	Asst. Administrative Officer, Level 4, Admin.	Customer Service/Awareness Activities	Technical	✓*3
15	Mr. Shailendra Shrestha	Sewage Management Dept.	Asst. Computer Officer, Level 6, Admin.	Customer Service/Awareness Activities	Core/Technical	✓*3
16	Ms. Santusha Kasapal	Sewage Management Dept.	Asst. Computer Officer, Level 6, Admin.	Customer Service/Awareness Activities	Technical	✓*2

No	Name	Organization *1	Position	Work field	Capacity type	Target on mid-term assessment
-	Mr. Nawal Singh Saud	Mahankalchaur Branch	Administrative Officer, Level 7, Admin.	Customer Service/Awareness Activities	Core	*4
-	Mr. Shankar Raj Joshi	Baneshwor Branch	Administrative Officer, Level 7, Admin.	Customer Service/Awareness Activities	Core/Technical	*4
-	Ms. Kamala Pathak	Kirtipur Branch	Asst. Administrative Officer, Level 6, Admin.	Customer Service/Awareness Activities	Core/Technical	*4
-	Mr. Labu Thapa	Madhyapur Thimi Branch	Asst. Administrative Officer, Level 6, Admin.	Customer Service/Awareness Activities	Technical	*4
-	Mr. Pramodnath Rimal	Bhaktapur Branch	Asst. Administrative Officer, Level 6, Admin.	Customer Service/Awareness Activities	Core/Technical	*4
-	Mr. Rajendra Bahadur Bam	Chhetrapati Branch	Administrative Officer, Level 7, Admin.	Customer Service/Awareness Activities	Core/Technical	*4
-	Ms. Maya Lama Poudyal	Water/Wastewater Quality Assurance Division	Asst. Account Officer, Level 6, Admin.	Customer Service/Awareness Activities	Core/Technical	*4

Note *1: Organization as of December 2023.

Note *2: Replaced during the project but targeted for mid-term evaluation.

Note *3: Persons to be evaluated from mid-term.

Note *4: Not subject to mid-term evaluation due to personnel transfer.

Note *5: Retirement during the project period.

Table 3.7.21 Items of capacity assessment related to Output 4

Question about core capacity	Question about technical capacity
1. Customer service	1. Customer management
2. Customer management	2. Customer satisfaction survey (significance)
3. Working environment	3. Customer satisfaction survey (execution)
4. Customer management analysis	4. Customer satisfaction survey (analysis)
5. Customer satisfaction survey	5. Customer satisfaction improvement
6. Public awareness	6. Public awareness
7. Internal training	7. Presentation

Table 3.7.22 Change in capacity of members of Output 4

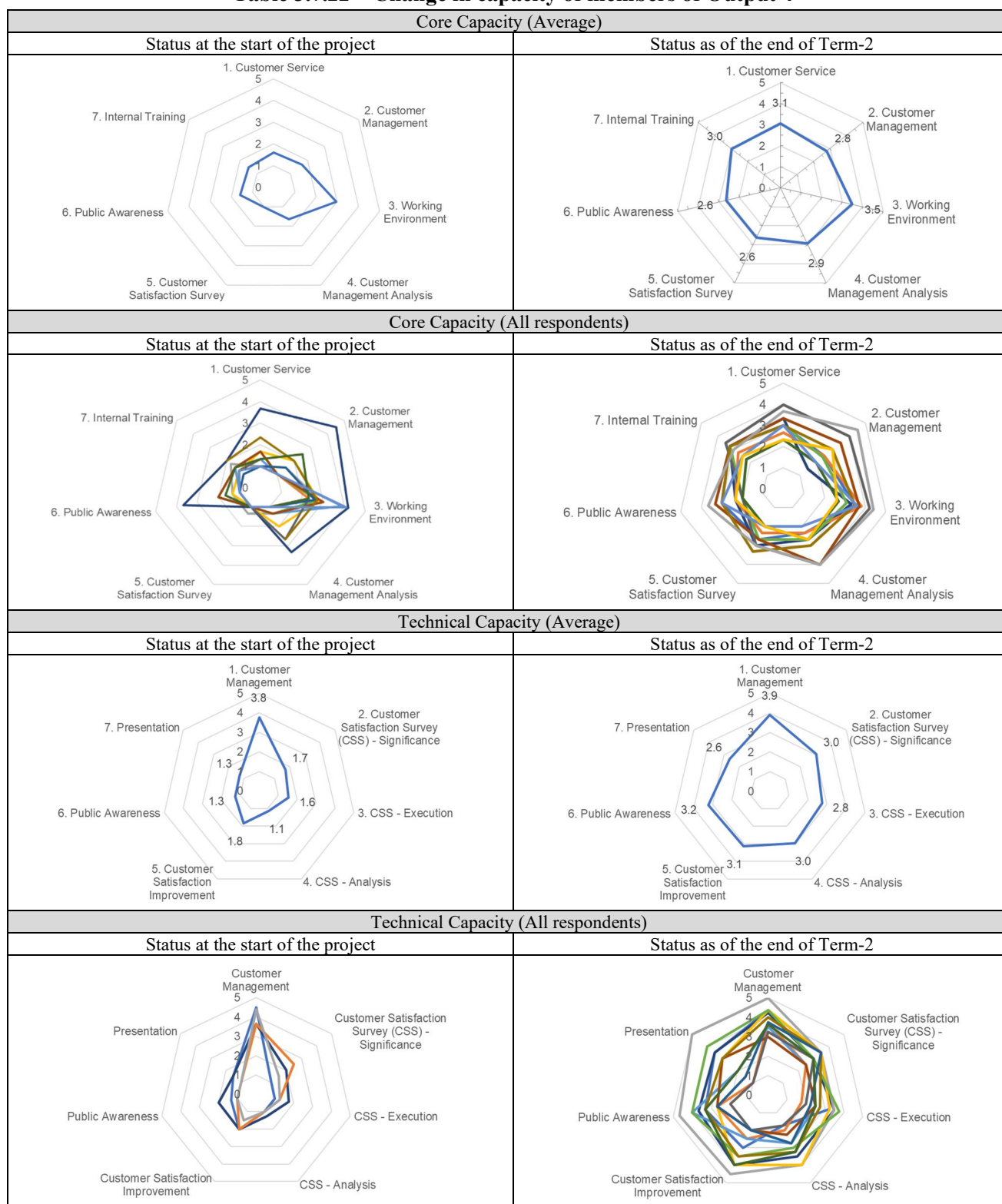


Table 3.7.23 Summary of capacity assessment related to Output 4

Type	Status at the start of the project	Status as of the end of Term-2
Core Capacity	<ul style="list-style-type: none"> ➤ Of all the responses, excluding those from one branch office, the characteristics of the overall trend are well illustrated in the graph of averages, although there is some variation. We therefore base our assessment on the average results. ➤ The item with the lowest rating was '5. Customer satisfaction survey' with a score of 1.0. This survey has no history of being carried out in any of the KUKL departments or sections and has been assessed appropriately. ➤ On the other hand, the item with the highest rating was "3. Work environment" with a score of 3.0. ➤ The "3. Work environment" section includes both questions for communication and questions about infrastructure. Particularly highly rated were the soft aspects of "communication at work" and "transparency and trust in the workplace". When asked about infrastructure, "staffing" and "PC maintenance" were rated slightly lower. ➤ There was no significant difference in the scores for the other questions about customer service, customer management (systems/rules), customer management situation analysis, public awareness and internal training, which generally ranged from 1.5 to 1.7. These scores are inadequate and could be improved by further training. 	<ul style="list-style-type: none"> ➤ Looking at all the responses, there was a general improvement in each of the evaluation items compared to when the project started. Evaluating from the average, "3. Working environment," which was relatively high from the beginning, has further improved, and the other items have followed suit with higher values. In addition, as can be seen from the shape of the radar chart, there is a favorable trend toward eliminating deviations among the items. ➤ "5. Customer satisfaction survey," which had a score of 1.0 at the start of the project, has increased to 2.6 after two surveys were conducted. Further improvement is expected in the future through training in preparation and implementation of orders. ➤ Both at the start of the project and at the end of the second phase, "3. Working environment" received high scores, with improvements in "Personnel evaluation," "Staffing," and "Availability of office PC" being the main factors. Soft aspects, which had been relatively highly rated in the past, improved further, and improvements were also seen in hard aspects such as "Availability of PC" which had been an issue. ➤ The scores for "Customer service," "Customer management," "Customer management analysis," "Public awareness," and "Internal training," which were generally 1.4 to 1.7 at the start of the project, improved to 2.6 to 3.1, with "Internal training" in particular showing an increase of 1.6 points.
Technical Capacity	<ul style="list-style-type: none"> ➤ Comparing the graphs of the average rate and all the responses, the trend of all the responses is very similar, so JET evaluates the results based on the average rate. ➤ The ratings for "Customer Satisfaction Surveys" (Item 2 to 4) are naturally low, as the survey has not yet started. ➤ In addition, "6. Public Awareness" is also rated low because it is not currently being implemented. ➤ On the other hand, the item with the highest rating was "1. Customer management" with a score of 3.8. ➤ In the "1. Customer management" field, respondents were asked about their working conditions and attitude to their job. Items judged to be good included "responsibility" towards customers, "friendliness" and "communication" in the workplace. The most highly rated item was "willingness to improve the customer management system at KUKL", with a score of 4.7. ➤ On the other hand, the lowest rated item in "1. Customer management" was "Ability to handle the new online grievance handling system", indicating that only a few staff members are still able to use the system. 	<ul style="list-style-type: none"> ➤ There is some variation in the graph of all responses, but the overall upward trend is well represented in the graph of averages. ➤ It can be seen that each of the items from No. 2. to No. 4., which were initially rated low, are improving across the board. ➤ Also, the "6. Public awareness" which was initiated through each branch office, showed an increase of 1.9 points. ➤ "1. Customer management," which showed the highest rating at the beginning of the project, also rose further. As in the previous survey, the highest ratings this time were for "friendliness" toward customers, "communication" in the workplace, and "willingness to improve customer management systems. ➤ On the other hand, the highest growth in evaluation was in "handling of online systems," indicating steady progress in digitization through the use of desktop PCs provided.

Type	Status at the start of the project	Status as of the end of Term-2
<p>Comments from JICA Expert Team</p>	<ul style="list-style-type: none"> ➤ The results show a relatively clear division between high and low ratings for both core and technical capacities. This is very helpful in planning future activities from the perspective of developing strengths and compensating for weaknesses. ➤ The fact that there is already good communication in the workplace and a sense of transparency and trust in the workplace is very important, as shown by the high score for core capacity (organization). In addition to this, by reinforcing a customer-first attitude and providing technical support, we can expect to achieve results. ➤ The results of the technical capacity assessment show a high level of "willingness to improve the customer management system at KUKL" at the individual level, and future activities will be planned to improve the job description through the active participation of C/Ps in the background of a good working environment. ➤ The trend in the comments received was clear, as were the scores. The most frequent request was firstly "digitization and computerization of operations", followed by "implementation of customer satisfaction surveys". ➤ As the results of this capacity assessment show, there is a desire to make greater use of the new online complaints system, to respond to complaints more efficiently and to strengthen our ability to monitor and analyze customer satisfaction. Therefore, future Output 4 activities will be planned and implemented accordingly. 	<ul style="list-style-type: none"> ➤ The gap in ratings that characterized both core and technical capacity at the start of the project has narrowed in the current evaluation, and the balance has improved, as can be seen from the shape of the radar chart. ➤ Good communication within the branch has resulted in an understanding and flexible response to the numerous training programs, and a successful training plan has been implemented through the second phase. The results are reflected in this evaluation: the capacity of the C/Ps has steadily increased and progress is being made toward achieving the goal of output. ➤ The high level of motivation and KUKL's proactivity and cooperation ensured that capacity building was carried out as planned at the beginning of the project. ➤ On the other hand, as shown in Table 5.7.20, there is a high turnover of supporting members, with only two original members from 12 sections from 2021. ➤ Even under such circumstances, the level of proficiency is maintained through cooperation among C/Ps, and at the end of Term-2, three TOT candidates have been selected, and the fixation of the members is being promoted in the section. ➤ Note that communication between C/Ps from different sections was rarely done prior to this project and is one of the important outcomes.

(5) Capacity related to Output 5

A summary of the results of the survey and the distribution of the rating are summarized below:

Table 3.7.24 Target group of capacity assessment related to Output 5

No	Name	Organization * ¹	Position	Work field	Capacity type	Target on mid-term assessment
Action team (Core members)						
1	Mr. Arjun Babu Dhakal	PID	Acting Manager (Level 9), Technical	Output 5	Core	✓
2	Mr. Dipendra Bdr. Oli	Chief of Procurement & Legal Section	Asst. Manager (Level 8), Administrative	Output 4	Core	✓
3	Mr. Bir. Bdr. Chand	Chief of Human Resources Development Section	Asst. Manager (Level 8), Administrative	Output 5	Core	✓
4	Mr. Shankar Thapa	Chief of Tanker Section	Engineer (Level 7)	Output 1	Core	✓
5	Mr. Aknur Nath Sharma	Planning & Support Dept., Head Office	Engineer (Level 7)	Output 2	Core	✓
6	Ms. Radha Dhakal	KVWSMB	Engineer	Output 3	Core	✓
7	Ms. Niru Burlatoki	Water/Wastewater Quality Assurance Division	Microbiologist (Level 7)	Output 3	Core	✓
8	Ms. Bina Khanal	Training & Research Section	Asst. Manager (Level 8)	Output 5	Core	✓*3
Supporting members						
9	Mr. Gyanendra Bdr. Karki* ²	CEO	Act. Deputy CEO (Level 11), Technical		Core	*4
10	Ms. Manju Manandhar	Human Resources Development Section	Admin. Officer (Level 7)	Output 5	Technical	✓
11	Mr. Ramesh Dhungana	Chief of Administration, Baneshwor Branch	Asst. Admin. Officer (Level 6)	Output 5	Technical	✓
12	Mr. Kabin Dhoj Adhikari	Administration & Human Resources Division	Senior Computer Operator (Level 5)	Output 5	Technical	✓
13	Ms. Sunil Chaudhary	Human Resources Development Section	Computer Operator (Level 4)	Output 5	Technical	✓
14	Ms. Neha Adhikari	Head Office – IT Section	Overseer (Level 5)	Output 5	Technical	✓
15	Ms. Muna Chaulagain	Training & Research Section	Assistant Computer Operator (Level 6)	Output 5	Technical	✓*3
-	Mr. Bijaya Bajracharya	Human Resources Development Section	Senior Assistant (Level 5)		Technical	*2

Note *1: Organization as of December 2023.

Note *2: Retirement during the project period.

Note *3: Persons to be evaluated from mid-term.

Note *4: Not included in the evaluation due to involvement as CEO.

Table 3.7.25 Items of capacity assessment related to Output 5

Question about core capacity	Question about technical capacity
1. Knowledge on water policy and plan	1. Knowledge on water policy and plan
2. Knowledge on water supply service	2. Knowledge on water supply service
3. Training preparation	3. Training preparation
4. Training Implementation, Monitoring and Evaluation	4. Training implementation
5. Presentation/Reporting Skill	5. Training Monitoring and Evaluation
6. Human Skill of Management	6. Presentation skill
7. Technical Skill of Management	7. Report writing

Table 3.7.26 Change in capacity of members of Output 5

Core Capacity (Average)	
<p>Status at the start of the project</p>	<p>Status at the end of the project</p>
Core Capacity (All respondents)	
<p>Status at the start of the project</p>	<p>Status at the end of the project</p>
Technical Capacity (Average)	
<p>Status at the start of the project</p>	<p>Status at the end of the project</p>
Technical Capacity (All respondents)	
<p>Status at the start of the project</p>	<p>Status at the end of the project</p>

Table 3.7.27 Summary of capacity assessment related to Output 5

Type	Status at the start of the project	Status as of the end of Term-2
Core Capacity	<ul style="list-style-type: none"> ➤ Many of the core members are staff from technical departments and have technical knowledge and experience in 1. water policy and planning, and 2. water services. ➤ As many of them are in managerial positions, there are many opportunities for "5. Presentation and report writing", and some of them have been lecturers in educational institutions in the past. ➤ Most of the members have no knowledge or experience of the tasks "3. training planning" and "4. Training implementation, monitoring and evaluation". 	<ul style="list-style-type: none"> ➤ Core members have improved their capacity ratings for training items as a result of their experience with training work. In addition, there is an appropriate balance in improving the capacity of each item. ➤ Many of the members were originally dispatched from the technical departments/sections, and many of them have knowledge and experience in "1. Water policy and plan" and "2. Water supply service". In some cases, members of the management (=non-technical) department who were unable to answer 1 and 2 in the previous evaluation have relearned them. ➤ In the previous assessment, most members answered that they had no knowledge or experience in "3. Training preparation" and "4. Training implementation, monitoring, and evaluation". ➤ Through the activities of this project, we were able to gain experience in preparation, implementation, and evaluation of training programs, and we were also able to accumulate knowledge on training implementation in a third country (Sri Lanka).
Technical Capacity	<ul style="list-style-type: none"> ➤ Many of the supporting members are administrative staff and do not have knowledge or experience in the technical aspects of 1. water supply policy and planning and 2. Water supply services. ➤ Although members are employees of a water utility, they have never received a lecture on water supply. ➤ As with the core members, there is no knowledge or experience of "3. Training planning" or "4. Training implementation, monitoring and evaluation". ➤ Some staff have had experience of practical work such as '6. presentation' and '7. report writing' in their previous jobs or as students, but often not in their regular work at KUKL. ➤ In general, the capacity of support members is at a low level. 	<ul style="list-style-type: none"> ➤ Support members were unable to leave their regular work posts, and many members were only partially involved in the activities of Output 5, so capacity did not grow as much as expected. ➤ There were originally large individual differences in capacity, but support members' capacity ratings were generally lower than those of core members. ➤ Most of the respondents were working in supportive administrative roles and had no knowledge or experience in "1. Water policy and plan", and "2. Water supply services". ➤ However, some members have made efforts for self-improvement since the last survey by re-reading water supply policies and voluntarily visiting water treatment plants during training sessions. ➤ In addition, for "3. Training preparation", "4. Training implementation" and "5. Training monitoring and evaluation", the growth rate of capacity increased slightly, partly because only some members were able to participate in the activities under Output 5. ➤ With regard to practices such as "6. Presentation skill" and "7. Report writing", the candidate is in charge of tasks that are supportive to his/her duties, and does not conduct presentations or write reports by himself/herself, thus his/her evaluation is low.
Comments from JICA Expert Team	<ul style="list-style-type: none"> ➤ The members of Output 5 come from a variety of departments, and their expertise varies from person to person. The common denominator is that they have little knowledge or experience of training. ➤ In the past, the KVWSMB has been responsible for the planning and implementation of training for KUKL, and KUKL has never organized training on its own initiative. In planning and implementing the internal training work in this project, it became clear that we were starting almost from scratch. 	<ul style="list-style-type: none"> ➤ Through the activities up to Term-2, the core members of Output 5 were able to experience a one-stop shop for training operations, from preparation to implementation and evaluation. This has contributed in no small measure to capacity building related to training. ➤ Capacity growth was slight for support members because, as noted above, they were busy with their regular work and limited their participation in Output 5 activities.

3.7.3 Baseline survey report

The information collected and the results of the analysis, the details of the capacity assessment and the overall direction of the project based on these were compiled in a baseline study report. The report shown in Annex 5 was then submitted to KUKL before the 2nd JCC on 14 February 2022. Based on this content and the reconfirmed project direction, the PDM and PO have been revised as Ver. 2.0.

Table 3.7.28 Contents of Baseline Survey Report

Contents	
Chapter 1: Objectives and target of the baseline survey	Chapter 4: Circumstances surrounding the project
1.1 Objectives of the baseline survey	4.1 Superior and related development plans
1.2 Targets of the baseline survey	4.1.1 Envisioning Nepal 2030
1.2.1 Survey area	4.1.2 The Fifteenth Plan (Fiscal Year 2019/2020 – 2023/2024)
1.2.2 Survey method and target group	4.1.3 Nepal Water Supply, Sanitation and Hygiene Sector Development Plan 2016-2030
1.3 Outline of the Project	4.1.4 Sustainable Development Goals (SDGs)
1.3.1 Challenges of Water Supply Service in Kathmandu Valley	4.2 Governance system of the water and sanitation sector in Nepal
1.3.2 Concept of the Project	4.2.1 Structure of governmental organizations in the water sector
1.4 Evaluation indicators for each output	4.2.2 Relevant laws and institutions in the water sector
Chapter 2: Performance Indicator (PIs) as a baseline of the Project	4.3 Water Supply Improvement Projects in Kathmandu Valley
2.1 Performance Indicators (PIs) of KUKL	4.3.1 Planning of water demand and water production
2.1.1 Benchmark and Indicators	4.3.2 Bulk Distribution System (BDS)
2.1.2 Other data related to performance indicators	4.3.3 Distribution Network Improvement (DNI)
2.1.3 Current status of customer satisfaction	4.4 Current Situation of Water Supply System in Kathmandu Valley
2.2 Evaluation of current capacity	4.4.1 Service Area of KUKL
2.2.1 Capacity related to Output 1	4.4.2 Water Supply System in the 5 Main Municipalities
2.2.2 Capacity related to Output 2	4.4.3 Water distribution plan after completion of the Melamchi water supply project
2.2.3 Capacity related to Output 3	4.4.4 Current Status of the Existing Water Treatment Plant
2.2.4 Capacity related to Output 4	4.5 Prospects for the Melamchi Water Supply Project
2.2.5 Capacity related to Output 5	4.5.1 Trial operation of the Melamchi Diversion Tunnel
Chapter 3: Conclusion	4.5.2 Damage caused by flooding
3.1 Direction of activities for Output 1	4.5.3 Impact on water supply in the Kathmandu Valley
3.1.1 Review of the challenges faced by KUKL for Output 1	4.5.4 Current Status of New Sundarikal WTP
3.1.2 Capacity to be enhanced through the project for Output 1	4.5.5 Impact on Project Activities
3.1.3 Baseline value of objectively verifiable indicator for Output 1	Chapter 5: Organizational structure of KUKL
3.1.4 Necessity to change the activities for Output 1	5.1 Organizations involved in water and sewerage services in the Kathmandu Valley
3.1.5 Review of evaluation indicators for Output 1	5.2 Organization of KUKL
3.1.6 Review of evaluation indicators for Overall Goal and Project Purpose	5.3 Organization of KUKL branch offices
3.1.7 Necessity to change the timeline of activities for Output 1	5.3.1 Service area by branch offices
3.2 Direction of activities for Output 2	5.3.2 Organization of each branch office
3.2.1 Review of the challenges faced by KUKL for Output 2	5.4 Training & Research Section of KUKL Head Office
3.2.2 Capacity to be enhanced through the project for Output 2	5.5 Reorganization plan for branch offices following completion of DNI project
3.2.3 Baseline value of objectively verifiable indicator for Output 2	5.6 NRW management system in KUKL
3.2.4 Necessity to change the activities for Output 2	5.6.1 Current division of labour roles in relation to NRW
3.2.5 Review of evaluation indicators for Output 2	5.6.2 Current status of staff engaged in work related to NRW
3.2.6 Review of evaluation indicators for Overall Goal and Project Purpose	5.7 Water Quality Control System in KUKL
3.2.7 Necessity to review the timeline of activities for	5.7.1 Organizational Structure for O&M of the New Sundarikal WTP

Contents	
Output 2	5.7.2 Water Quality Control System in KUKL
3.3 Direction of activities for Output 3	5.7.3 Water Quality Control System by the Planning & Support Department
3.3.1 Review of the challenges faced by KUKL	5.7.4 Standard Operating Procedure (SOP) for Water Quality Analysis
3.3.2 Capacity to be enhanced through the project for Output 3	5.7.5 Current Status of Equipment for Water Quality Analysis
3.3.3 Baseline value of objectively verifiable indicator for Output 3	5.7.6 Parameters of Water Quality Analysis
3.3.4 Necessity to change the activities for Output 3	5.7.7 Requirements for Water Quality Control
3.3.5 Review of evaluation indicators for Output 3	5.8 Operation and Management System of WTPs by KUKL
3.3.6 Review of evaluation indicators for Overall Goal and Project Purpose	5.8.1 Operation and Maintenance Staff for Existing WTP
3.3.7 Necessity to change the timeline of activities for Output 3	5.8.2 O&M staff at the New Sundarijal WTP
3.3.8 Rehabilitation policy for the Mahankalchaur WTP	
3.4 Direction of activities for Output 4	Chapter 6: Budget System and Financial Situation of KUKL
3.4.1 Review of the challenges facing KUKL for Output 4	6.1 Budget composition
3.4.2 Capacity to be enhanced through the project for Output 4	6.2 Budget Planning Process
3.4.3 Baseline value of objectively verifiable indicator for Output 4	6.2.1 Capital Budget Planning
3.4.4 Necessity to change the activities for Output 4	6.2.2 Operational Budget Planning
3.4.5 Review of evaluation indicators for Output 4	6.2.3 Budget Allocation for Operation and Maintenance
3.4.6 Review of evaluation indicators for Overall Goal and Project Purpose	6.3 Financial Situation of KUKL
3.4.7 Necessity to change the timeline of activities for Output 4	6.3.1 Overall financial situation
3.5 Direction of activities for Output 5	6.3.2 Payments to KVWSMB and WSTFC
3.5.1 Review of the challenges facing KUKL for Output 5	6.3.3 Collection of water charges
3.5.2 Capacity to be enhanced through the project for Output 5	6.4 Water Tariff and Billing Systems
3.5.3 Baseline value of objectively verifiable indicator for Output 5	6.4.1 Current Water Tariff
3.5.4 Necessity to change the activities for Output 5	6.4.2 Electronic billing and accounting systems already in place
3.5.5 Review of evaluation indicators for Output 5	
3.5.6 Review of evaluation indicators for Overall Goal and Project Purpose	
3.5.7 Necessity to change the timeline of activities for Output 5	

3.7.4 Performance Indicators (PIs) of KUKL

(1) Benchmark and Indicators

There is no department/section at KUKL head office responsible for collecting and monitoring operational indicators, and this situation remains the same at the branch offices.

KUKL's data profile was published in the report 'Water Service Providers Capacity Assessment and Benchmarking Data Year 2071-72 (2014-15)' compiled by the Sector Efficiency Improvement Unit (SEIU) of the Ministry of Water Supply and Sewerage (MoWSS), Nepal in 2016.

Indicators are calculated based on data from water supply service providers for FY2071-721 (2014-2015) and a field survey in 2016, with definitions for each indicator as follows:

Table 3.7.29 Definition of performance indicators

No	Indicator	Unit	Definition
1	Water Coverage	%	(Population with access to water services /Total population under the service area of the utility)*100
2	Staff Rate	No	(Total number of staff/ Total number of tap connections) *1000
3	Metered Rate	%	(Total number of tap connections with an operating meter/Total number of tap connections) *100
4	Water Production (Use) Rate	LPCD	Average daily water supplied to the distribution system (Used)/Population covered by water service
5	NRW	%	(Average daily water production - average daily water consumption)/Average daily water production*100
6	Production Cost	NRs/m ³	Annual operational cost/Average daily water production/365
7	Operating Ratio ^{*2}	-	Annual operational cost/ Annual Sales revenue (Billing)
8	Collection Rate	-	Annual tariff collection/ Annual Billing
9	Service Hours	HR/day	Average hours of service per day from water supply.
10	Water Quality ^{*1}	%	(Number of sample meeting standard/ Number of samples tested in supply point) *100

Note *1: Can be segregated as Physicochemical, Biological and FRC etc.

Note *2: This is not an operating balance ratio, but an operating cost to sales ratio

In addition to this, with the support of JICA directly managed experts, a capacity assessment of the KUKL organization was conducted in 2016, in which data related to key operational indicators were compiled. (JICA Institutional Capacity Assessment of KUKL, Feb 2016).

The following is a summary of the data identified from the data collected at the start of the project, together with the values published in the above report.

Table 3.7.30 Key Performance Indicators of KUKL

Type	Parameter	Latest Study Data (2014/2015)	As of Starting time of the Project	Mid-term of the Project	Remarks	Data Source
Information of Water Utility	Number of staffs (person)	1,067	977	933 a		Baseline: Data provided by KUKL Head Office (As of the end of Falgun 2077) Permanent staffs: 750/Non-permanent staffs: 227 Mid-term: KUKL Human Resource Section (As of Falgun 2079) Permanent staffs: 648/Non-permanent staffs: 285
	Population of Coverage Area (person)	2,059,940	2,300,000	2,300,000 b		JICA Institutional Capacity Assessment of KUKL (Feb 2016)
	Service Coverage Ratio (%)	80.5	90	-		JICA Institutional Capacity Assessment of KUKL (Feb 2016)
	No. of staffs per 1000 connections	5.4	4.3	3.9 d=a/e*1000		
	Total number of connection (taps)	199,416	228,808	239,396 e		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
Service Connection	Number of stand post (public taps)	1,196	652	600 f		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
	Number of metered connection (taps)	184,687	220,659	230,160 g		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
	Metering ratio (%)	92.6	96.4	96.7 g/e*100		
	Number of new connection in FY	4,698	7,719	10,275		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
	Number of disconnection in FY	0	0	-		
Customer Service	Number of complaints (No/100 connections/year)	4.9	-	4.9		KUKL Customer Grievance Handling System
	Customers satisfied with overall service of KUKL (%)	0	38.8	69.1		Baseline: Customer Satisfaction Survey in 2021 Interim: Customer Satisfaction Survey in 2023
	Customers satisfied with telephone attention by KUKL (%)	-	30.0	68.8		Baseline: Customer Satisfaction Survey in 2021 Interim: Customer Satisfaction Survey in 2023
	Customers satisfied with on-site attention by KUKL (%)	-	45.9	83.7		Baseline: Customer Satisfaction Survey in 2021 Interim: Customer Satisfaction Survey in 2023
	Number of break of pipes (No/km/year)	1,629	-	-		
Water Production	Average supply hour (hour/day)	1.5	-	-		Water Service Providers Capacity Assessment and Benchmarking Data Year 2071-72
	Daily average production (m3/day)	116,266	114,000	126,550 h		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
	Daily maximum production (m3/day)	-	133,000	154,680		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
	Daily minimum production (m3/day)	-	100,000	102,660		Baseline: KUKL Annual Report 2077 Falgun (Feb/Mar 2021) Mid-term: KUKL Annual Report 2079 Falgun (Feb/Mar 2023)
	NRW ratio (%)	24.6	35	-		Baseline: KUKL Institutional Reform Study Presentation Data (Feb 14th, 2021)
Average consumption per capita (LPCD)	Average production per capita (LPCD)	43.0	38 (Rainy) 22 (Dry)	- i		JICA Institutional Capacity Assessment of KUKL (Feb 2016)
	Average production per capita (LPCD)	56.4	49.6	55.0 j=h/b*1000		
	Customers whose domestic demand is fully covered by KUKL water supply (%)	-	14.1	38.8		Baseline: Customer Satisfaction Survey in 2021 Interim: Customer Satisfaction Survey in 2023

Type	Parameter	Latest Study Data (2014/2015)	As of Starting time of the Project	Mid-term of the Project	Remarks	Data Source
Income and Expenditure	Annual O&M cost (Rs)	747,036,783	804,250,957	799,713,043	k	Baseline: KUKL Financial Statement 2078/Ashad (2020/2021) Mid-term: KUKL Financial Statement 2079 Ashad (2021/2022)
	Annual billing (Rs)	781,525,701	858,146,648	936,975,412	l	Baseline: KUKL Financial Statement 2078/Ashad (2020/2021) Mid-term: KUKL Financial Statement 2079 Ashad (2021/2022)
	Collection ratio	0.7	0.96	0.98		Data from KUKL Financial Division
	Total operation income including charges and other income (Rs)	-	1,005,119,402	1,135,095,863	m	Baseline: KUKL Financial Statement 2078/Ashad (2020/2021) Mid-term: KUKL Financial Statement 2079 Ashad (2021/2022)
	Operating ratio	1.0	0.94	0.85	k/l	
	Operating balance ratio	-	1.25	1.42	m/k	
	Unit cost of water production (Rs/m ³)	23.1	19.3	17.3	n=k/(h*365)	
	Average billing (Rs/connection/month)	329	313	327	o=l/(e-f)/12	
	Minimum charge 1/2" metered (Rs)	100	100	100		KUKL Annual Report
	Monthly fixed charge 1/2" unmetered (Rs)	785	785	785		KUKL Annual Report
Water Tariff	Additional charge 1/2" metered (Rs/m ³)	32	32	32		KUKL Annual Report
	Community supply (Rs)	1600	-	-		KUKL Annual Report
	No of sample tested for physicochemical parameters (% Passed)	1469 (90%)	-	-		
	No of samples tested for biological parameters (%Passed)	1274 (65%)	-	-		
	No of sample tested for Free Residual Chlorine (%Passed)	1262 (68%)	-	-		
	Exceedance ratio of standard limit in treated water turbidity at Mahankalchaur WTP (Exceeded %)	-	32.4	11.2		Baseline: KUKL Central Lab (Data from April/2020 - March/2021) Mid-term: KUKL Central Lab (Data from July/2022 - October/2023)
	Exceedance ratio of standard limit in treated water turbidity at Bode WTP (Exceeded %)	-	2.7	0.1		Baseline: KUKL Central Lab (Data from April/2020 - March/2021) Mid-term: KUKL Central Lab (Data from July/2022 - October/2023)
	Exceedance ratio of limit value in treated water turbidity at Bansbari WTP (%Exceeded)	-	0.5	0.1		Baseline: KUKL Central Lab (Data from April/2020 - March/2021) Mid-term: KUKL Central Lab (Data from July/2022 - October/2023)

(2) Other data related to performance indicators

Baseline data based on KUKL's annual reporting for the last three years, arranged as follows.

1) Production and Supply Volume

The amount of water produced and supplied in the Kathmandu Valley is not based on precise measurements, but is an estimate based on the operating hours and capacity of the pumps.

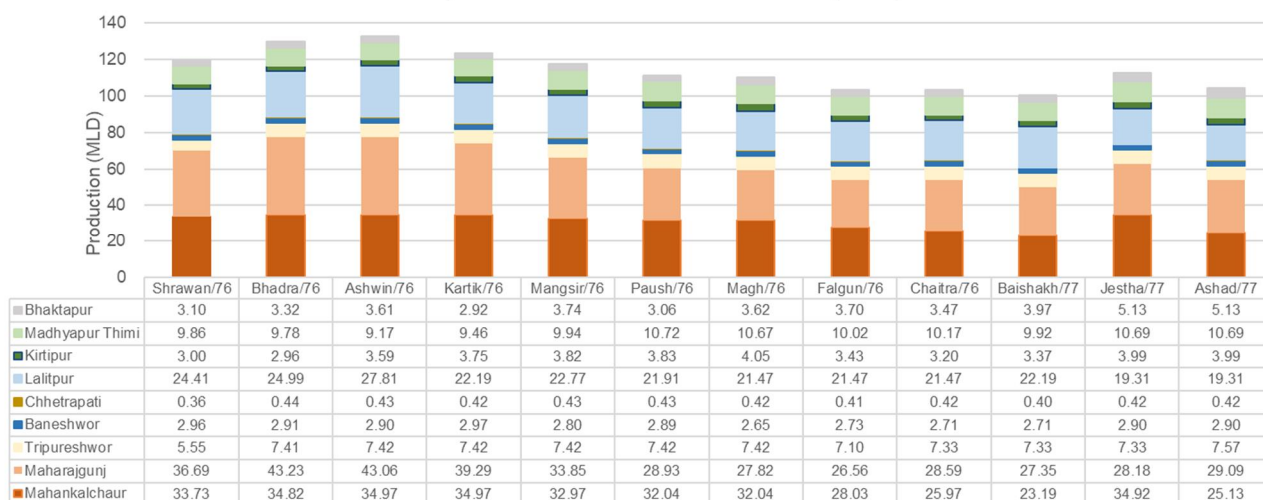
Table 3.7.31 Water production and supply volume of KUKL

	Indicator		2074/2075 (2017/2018)	2075/2076 (2018/2019)	2076/77 (2019/2020)	
1	Water demand	MLD	415	430	470	
2	Production volume	Min	MLD	127	95	2
		Max	MLD	164	196	133
		Ave	MLD	145	129	114
3	Supply volume *1	Min	MLD	102	76	3
		Max	MLD	131	157	106
		Ave	MLD	116	103	91

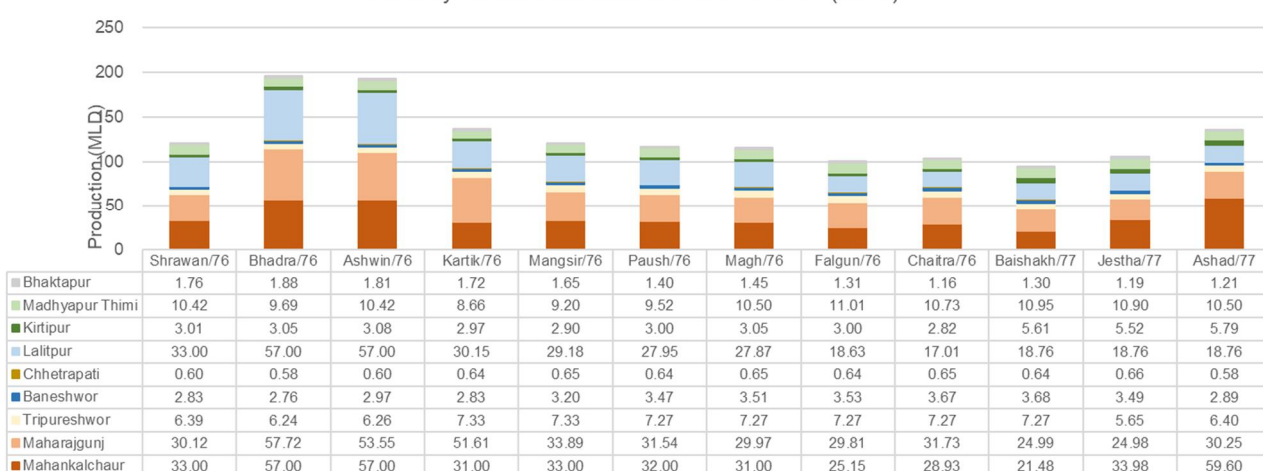
*1: The amount of water produced minus the assumed leakage.

Of the KUKL branches, the Chhetrapati branch does not have any water production facilities such as wells or water treatment plants in its area of jurisdiction and the customers are supplied with water allocated by other branches. The amount of water produced varies greatly from one branch to another, especially in Bhaktapur, Baneshwor and Kirtipur, which produce less water than the other branches. The maximum water production occurs between August and October during the rainy season and the minimum between April and May.

Monthly Water Production in 2019/2020 (MLD)



Monthly Water Production in 2018/2019 (MLD)



Monthly Water Production in 2017/2018 (MLD)

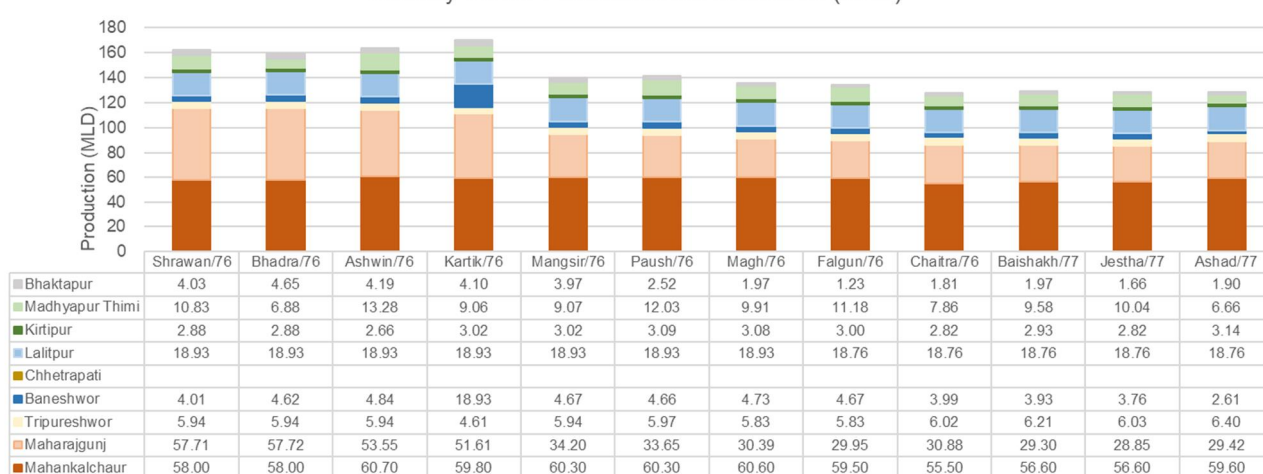


Table 3.7.1 Monthly water production by branches

2) Number of customers

The data on the number of customers for each branch is shown below.

While The Kamaldi branch has been merged into the Maharajgunj branch in 2018, the Chhetrapati branch is planned to be merged into Maharajgunj and Tripureshwor, but due to delays in the Melamchi Water Supply Project, this is not yet in prospect.

Table 3.7.32 Number of customers at each branch office

Branches	Type	2074/75 (Jul/2018)	2075/76 (Jul/2019)	2076/77 (Jul/2020)
Mahankalchaur	Government Connection (Metered)	74	82	66
	Private Connection (Metered)	31,010	36,245	37,349
	Government Connection (Non Metered)	46	46	46
	Private Connection (Non Metered)	4,411	801	806
	Stand Post	137	137	0
	Sub-total	35,678	37,311	38,267
Maharajgunj	Government Connection (Metered)	53	256	347
	Private Connection (Metered)	32,484	41,197	42,886
	Government Connection (Non Metered)	51	96	97
	Private Connection (Non Metered)	1,099	1,251	1,335
	Stand Post	173	193	0
	Sub-total	33,860	42,993	44,665
Tripureshwor	Government Connection (Metered)	192	192	192
	Private Connection (Metered)	19,471	19,647	19,713
	Government Connection (Non Metered)	110	110	110
	Private Connection (Non Metered)	1,497	1,519	1,519
	Stand Post	137	137	138
	Sub-total	21,407	21,605	21,672
Baneshwor	Government Connection (Metered)	140	140	140
	Private Connection (Metered)	26,407	26,607	26,811
	Government Connection (Non Metered)	16	16	16
	Private Connection (Non Metered)	801	801	801
	Stand Post	32	32	32
	Sub-total	27,396	27,596	27,800
Chhetrapati	Government Connection (Metered)	42	42	42
	Private Connection (Metered)	12,624	12,742	12,845
	Government Connection (Non Metered)	10	9	9
	Private Connection (Non Metered)	1,452	1,452	1,452
	Stand Post	180	180	174
	Sub-total	14,308	14,425	14,522
Lalitpur	Government Connection (Metered)	290	292	292
	Private Connection (Metered)	41,896	43,347	45,694
	Government Connection (Non Metered)	27	25	25
	Private Connection (Non Metered)	1,214	799	799
	Stand Post	314	314	0
	Sub-total	43,741	44,777	46,810
Kirtipur	Government Connection (Metered)	10	0	0
	Private Connection (Metered)	9,396	10,063	11,070
	Government Connection (Non Metered)	0	0	11
	Private Connection (Non Metered)	114	112	112
	Stand Post	0	0	52
	Sub-total	9,520	10,175	11,245
Madhyapur Thimi	Government Connection (Metered)	18	18	18
	Private Connection (Metered)	10,654	10,881	11,500
	Government Connection (Non Metered)	7	7	7
	Private Connection (Non Metered)	0	0	0
	Stand Post	0	0	82
	Sub-total	10,679	10,906	11,607
Bhaktapur	Government Connection (Metered)	36	37	37
	Private Connection (Metered)	10,823	11,285	11,657
	Government Connection (Non Metered)	11	11	11
	Private Connection (Non Metered)	323	325	341
	Stand Post	203	203	174
	Sub-total	11,396	11,861	12,220
Kamaldi	Government Connection (Metered)	143		
	Private Connection (Metered)	5,759		
	Government Connection (Non Metered)	30		
	Private Connection (Non Metered)	213		
	Stand Post	20		
	Sub-total	6,165	0	0

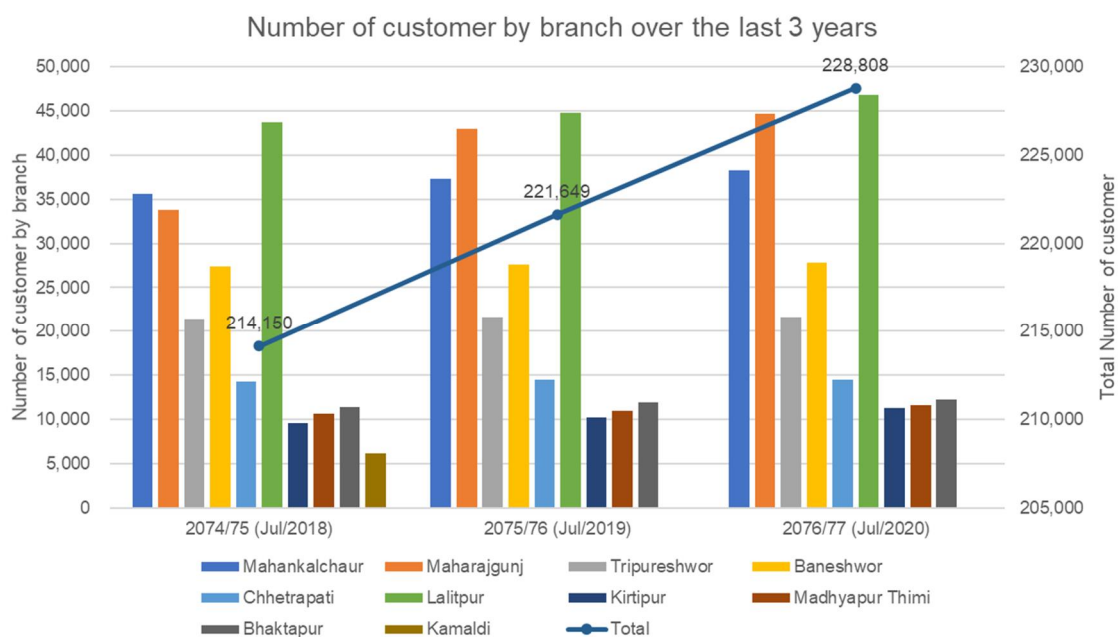


Figure 3.7.2 Change in the number of customers of KUKL

In July 2020, the number of customers is 228,808.

Data for the last three years shows a steady increase in the number of water customers, with around 7,300 new customers being generated every year. The fastest growing branch is Maharajgunj, followed by Mahankalchaur, while the rest of the branches have remained largely unchanged.

3) Complaints from customers

As a baseline study for the future evaluation of the results of the activities under Output 3 and Output 4, the complaints received in each month and their contents based on the complaints register of the Mahankalchaur branch office (for the past year) were summarized as follows:

Due to the ageing distribution network, the majority of complaints are aimed at improving water supply conditions, such as leaks, blockages caused by foreign objects and changes to water supply junctions, followed by a high number of complaints about billing amounts and overdue payments.

Table 3.7.33 Breakdown of complaints received by Mahankalchaur Branch

No	Complang	Request	Type of complaints/request	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Total in 2020
1	✓		Water doesn't come	8	23	20	Lock Down	Lock Down	21	35	2	14	14	1	4	142
2		✓	New Meter Connection	3	522	190	Lock Down	Lock Down	84	154	21	13	4	3	16	1010
3	✓		Existing meter repair & installation	68	85	41	Lock Down	Lock Down	44	90	32	59	47	67	102	635
4	✓		Meter cleaning	6	5	3	Lock Down	Lock Down	1	2	2	0	0	1	1	21
5	✓		Lab test for Meter	1	0	0	Lock Down	Lock Down	3	0	1	0	2	0	0	7
6		✓	Meter Stolen	3	0	0	Lock Down	Lock Down	2	4	3	2	1	1	2	18
7	✓		Hole change	58	52	32	Lock Down	Lock Down	33	57	28	38	84	46	272	700
8	✓		Hole repair	14	9	11	Lock Down	Lock Down	6	9	2	3	4	14	3	75
9	✓		Installation of pump/motor	42	56	44	Lock Down	Lock Down	13	35	15	23	20	42	44	334
10	✓		Polluted water	0	1	0	Lock Down	Lock Down	0	2	0	1	0	3	0	7
11	✓		Discount in penalty	26	20	14	Lock Down	Lock Down	3	33	17	17	33	6	35	204
12	✓		Adjustment of tariff (billed fee)	20	12	11	Lock Down	Lock Down	72	107	22	39	40	55	55	433
13		✓	Change /correction of customer name	43	33	29	Lock Down	Lock Down	10	33	21	10	22	18	32	251
14		✓	Correction of meter number or connec	7	0	1	Lock Down	Lock Down	18	6	0	7	6	3	6	54
15	✓		Temporary closed	15	10	2	Lock Down	Lock Down	3	10	3	7	3	1	11	65
16	✓		temporary open of tap	1	3	2	Lock Down	Lock Down	0	10	6	5	2	3	3	35
17	✓		Repair of Sewerage	1	0	1	Lock Down	Lock Down	0	0	0	0	0	0	1	3
18	✓		Cleaning of Sewerage	0	1	0	Lock Down	Lock Down	0	0	0	0	0	0	0	1
19	✓		Discount in fee of sewerage	0	1	0	Lock Down	Lock Down	0	1	0	0	0	0	0	2
20	✓		Repair of Tap	3	5	1	Lock Down	Lock Down	4	4	7	2	8	6	18	58
21	✓		Repair of leakage	85	60	30	Lock Down	Lock Down	53	23	35	40	56	46	37	465
22		✓	Extension of Pipeline	0	0	0	Lock Down	Lock Down	0	0	0	0	0	0	0	0

The main complaints from customers can be divided into 22 categories according to their content, including general requests and applications. Therefore, we have selected the water supply complaints that are clearly the responsibility of KUKL to deal with and arranged them in a graph. With the completion of the DNI project, the number of complaints about leaks and inadequate water supply is expected to decrease as the existing distribution pipes will be taken out of service and replaced by new distribution pipes and water supply via water meters. On the other hand, prompt and appropriate handling of enquiries about bills and late payments will continue to be required under the new water supply system, and in this respect it is important to focus on commercial losses in Output 2.

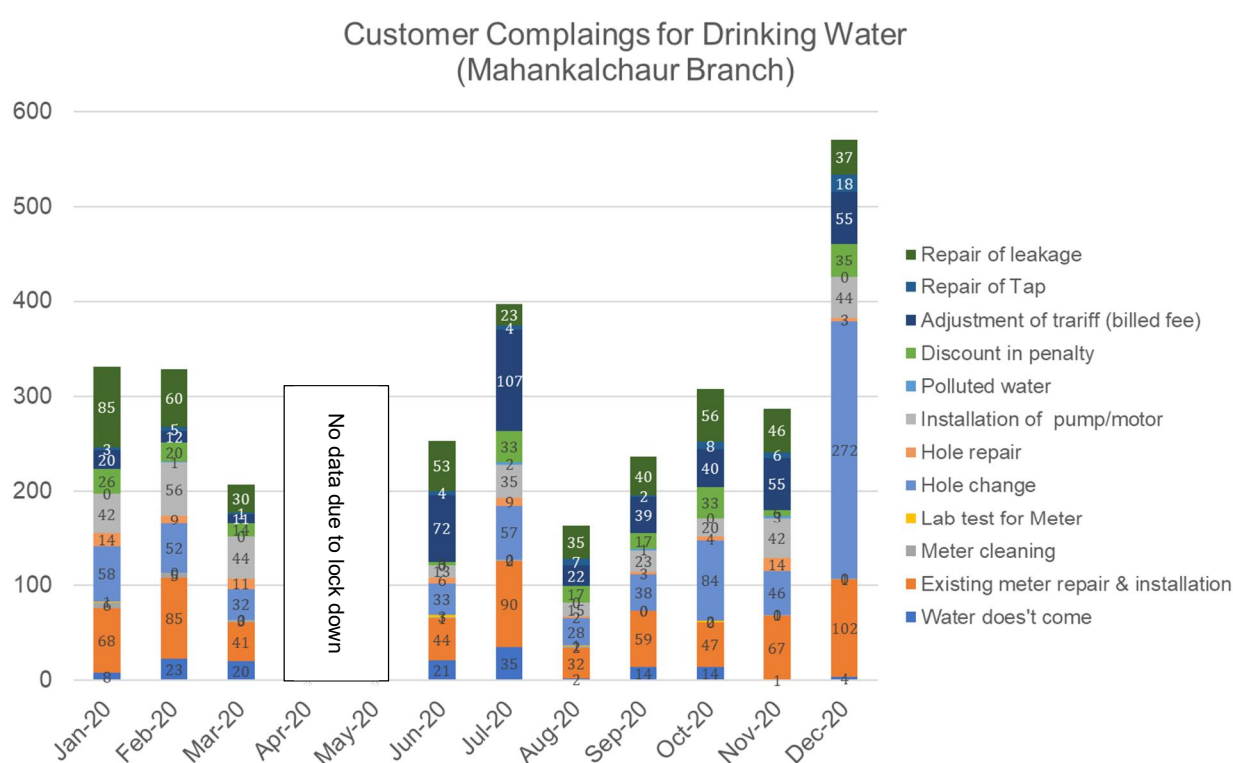


Figure 3.7.3 Number of complaints received by the Mahankalchaur branch (2020)

4) Water quality in WTP

The three water treatment plants, Mahankalchaur, Bansbari and Bode, which are currently functioning as the main water treatment plants in the Kathmandu Basin, have water quality laboratories where water quality is tested for a minimum number of items on an almost daily basis. Based on the water quality test data for one year from April 2020, a comparison was made with the national drinking water quality standards of Nepal for turbidity, pH and total iron, which are considered to be particularly important.

Table 3.7.34 Main water source of existing WTPs

WTP	Wet season	Dry season
Mahankalchaur WTP	Surface water (Bagmati river) Ground water (Gokarna wells)	Ground water (Gokarna wells)
Bode WTP	Underground water (Manohara river) Ground water (wells)	Underground water (Manohara river) Ground water (wells)
Bansbari WTP	Surface water (Shivapuri river) Surface water (Bishnumati river)	Ground water (Bansbari wells)

Table 3.7.35 Water quality of treated water

Item	Turbidity	pH	Total Iron	
NDWQS	Limit value	5 NTU	6.5~8.5	0.3 mg/L
	Allowable value* ¹	10 NTU	-	3.0 mg/L
Mahankalchaur WTP				
Number of tested samples	136	136	136	
Number of exceedances of limit value	44	1	4	
Exceedance ratio of limit value	32.4%	0.7%	2.9%	
Number of exceedances of allowable value	10	-	-	
Exceedance ratio of allowable value	7.4%	-	0.0%	
Bode WTP				
Number of tested samples	146	146	146	
Number of exceedances of limit value	4	3	146	
Exceedance ratio of limit value	2.7%	2.1%	100.0%	
Number of exceedances of allowable value	3	-	1	
Exceedance ratio of allowable value	2.1%	-	0.7%	
Bansbari WTP				
Number of tested samples	384	384	384	
Number of exceedances of limit value	2	1	3	
Exceedance ratio of limit value	0.5%	0.3%	0.8%	
Number of exceedances of allowable value	0	-	0	
Exceedance ratio of allowable value	0.0%	-	0.0%	

*1: Values in parenthesis refers the acceptable values only when alternative is not available.

The National Drinking Water Quality Standards (NDWQS) of Nepal have separate allowable values for turbidity and total iron when there is no alternative water source. This is due to the high content of iron and manganese due to geological factors when using subsoil water or groundwater as a source.

Among the existing water sources, the raw water from the Bode water treatment plant has a high iron content and the quality of the water after treatment cannot be brought within the Nepalese national standards.

In the case of the Mahankalchaur WTP, it is clear that there is an urgent need to improve the treatment of the water, as the percentage of turbidity exceeding the standard and permissible values after treatment is high.

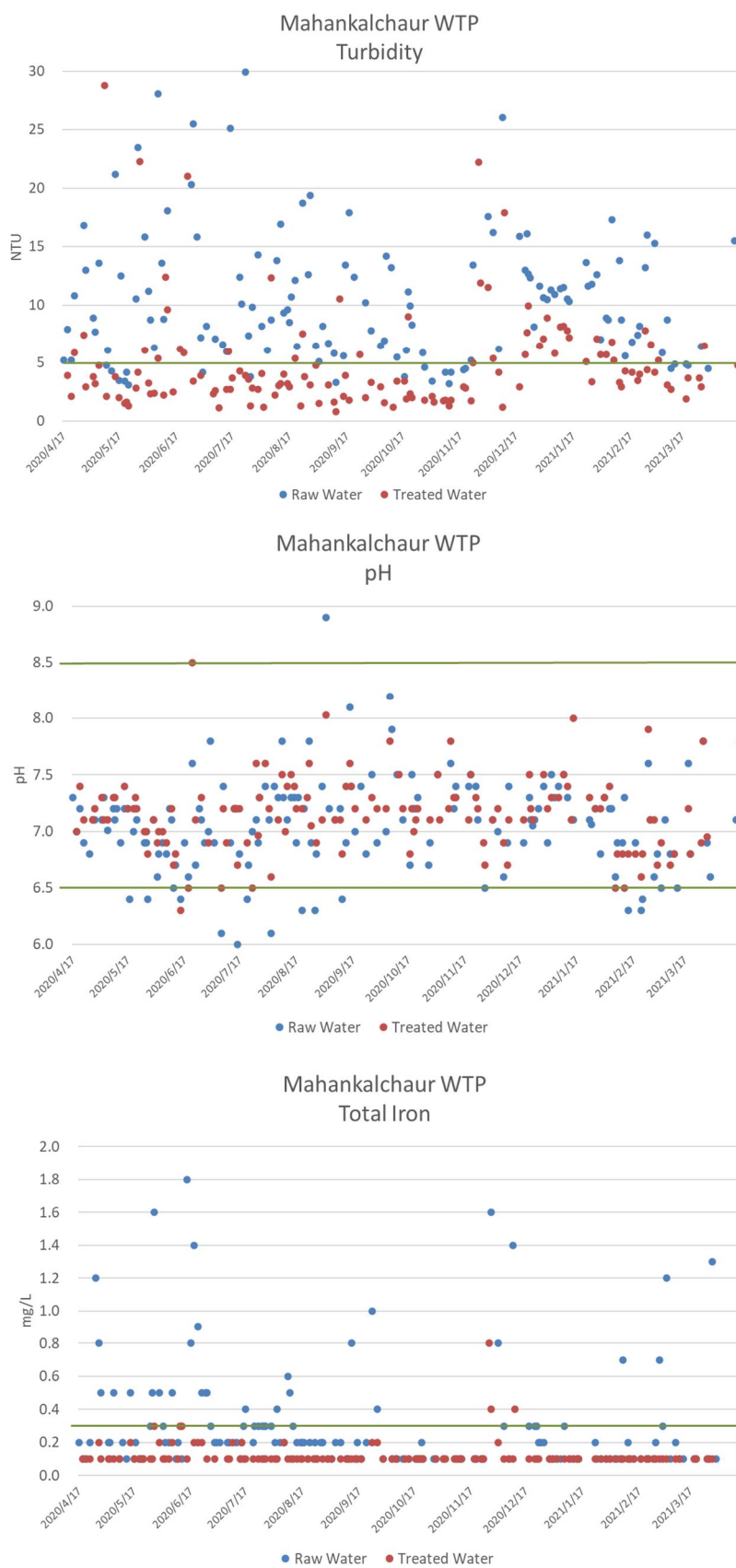


Figure 3.7.4 Water quality of raw & treated water in Mahankalchaur WTP

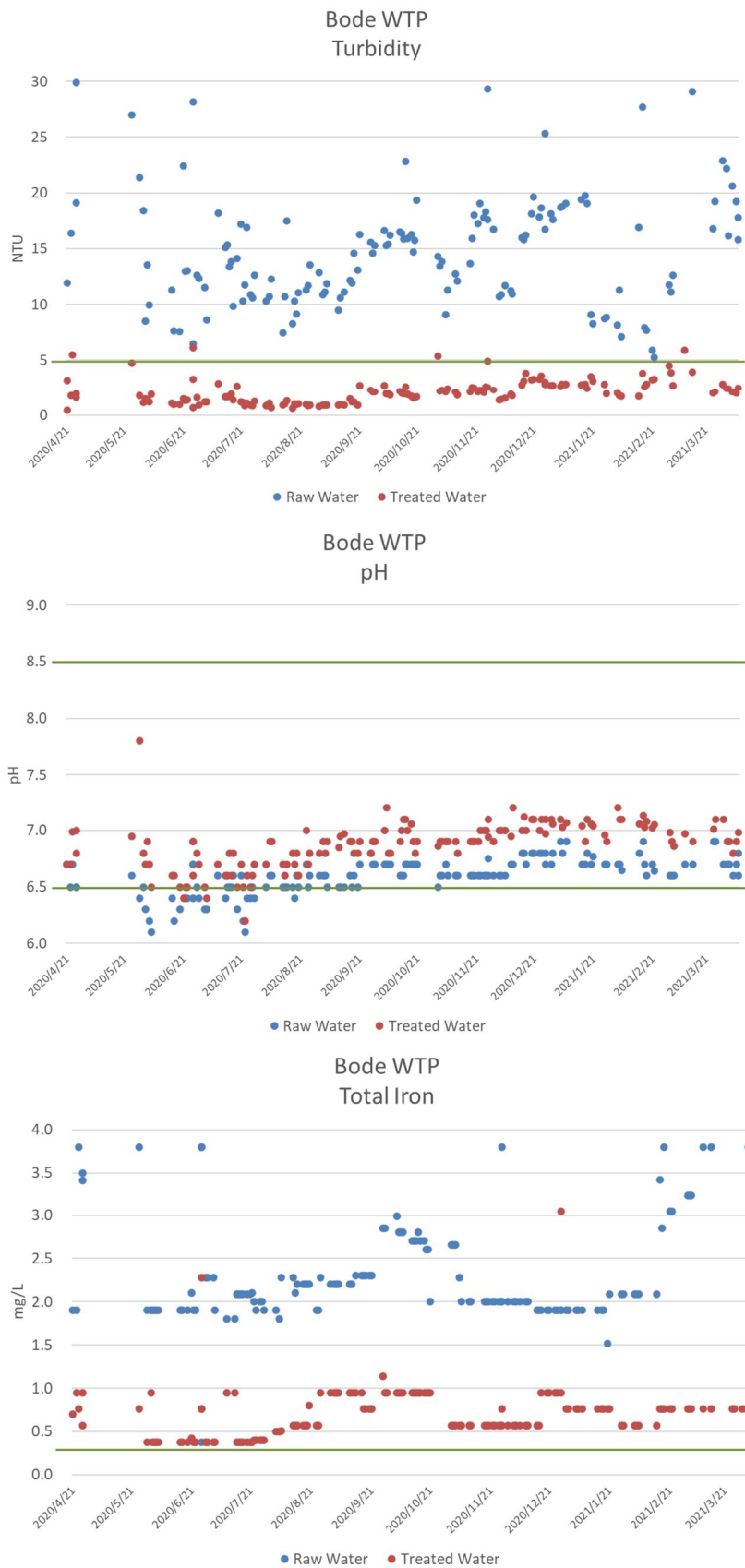


Figure 3.7.5 Water quality of raw & treated water in Bode WTP

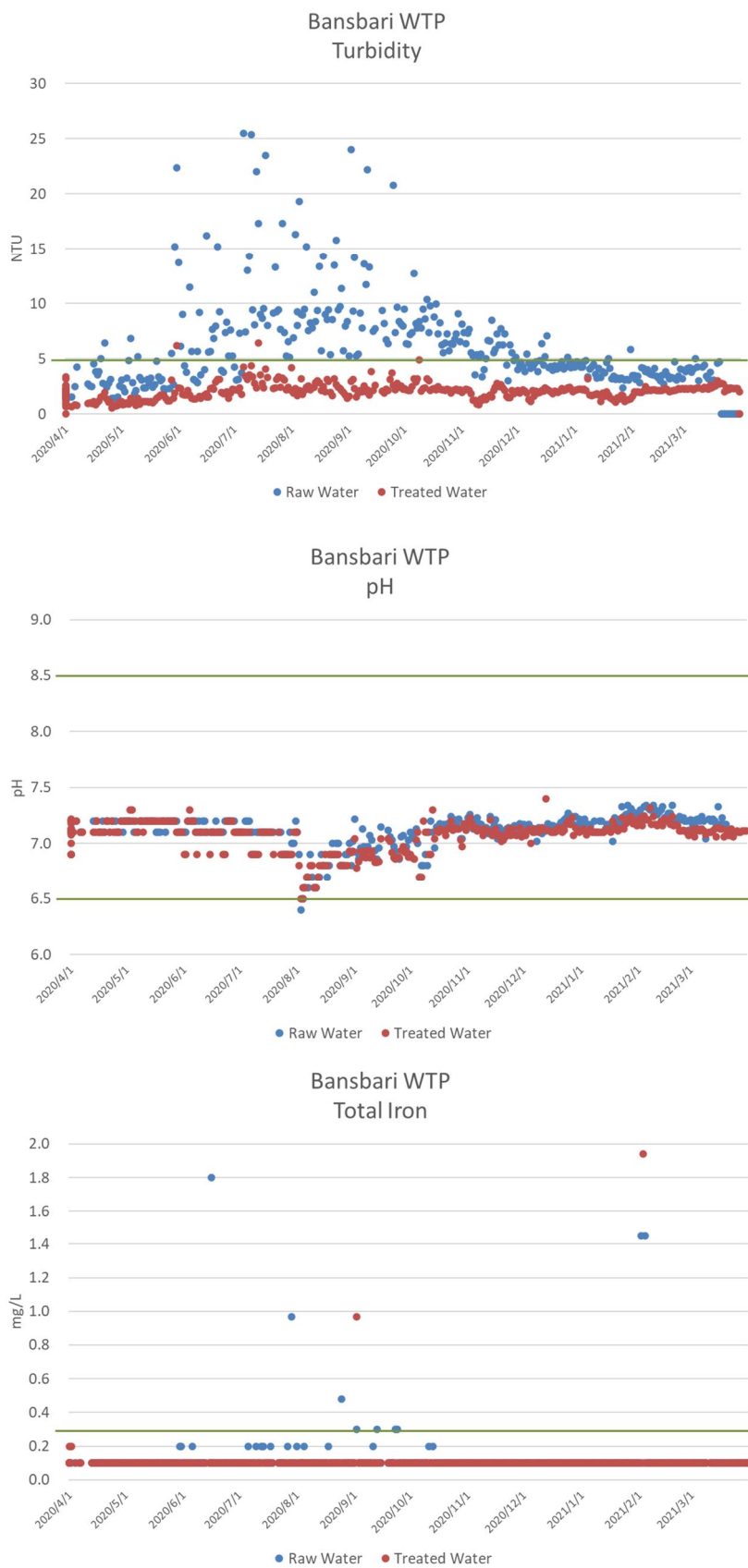


Figure 3.7.6 Water quality of raw & treated water in Bansbari WTP

5) Result of water quality testing at the customer's water taps

KUKL carries out water quality testing of water taps in the distribution network on an irregular basis. The results of water quality testing of water taps in the Kathmandu Valley (within the Ring Road and surrounding suburban areas) are presented below.

These are the results from 18 October 2019 (2076/7/1) to 9 January 2022 (2078/9/25) and the four parameters are free residual chlorine, turbidity, total coliforms and fecal coliform.

Table 3.7.36 Results of water quality testing of water taps in Kathmandu Valley

Parameters		Free residual chlorine	Turbidity	Total coliforms	Fecal Coliform
NDWQS	Limit value	0.1-0.2mg/L	5 NTU	0/100mL in 95% of sample	0/100mL
	Allowable value* ¹	-	10 NTU	-	-
DNI 1					
2078/1/9	Anamnagar	N.D.	-	N.D.	-
2078/1/27	Anamnagar	0.10	-	N.D.	-
2078/5/20	Anamnagar	N.D.	-	>180	>180
2078/9/26	Ghattekulo	N.D.	1.1	>180	N.D.
2078/3/18	Hattisar	N.D.	-	>180	5
DNI 2					
2077/3/11	Kalopul	N.D.	-	18	-
2078/8/23	Purano Baneshwor	0.74	-	N.D.	N.D.
2077/4/9	Purano Baneshwor	N.D.	5.5	11	-
2077/5/2	Purano Baneshwor	N.D.	-	40	-
2077/4/15	Purano Baneshwor	N.D.	-	>180	-
2077/4/21	Purano Baneshwor	N.D.	-	>180	-
2077/3/29	Sifal	0.50	-	N.D.	-
DNI 3					
2078/3/6	Baneshwor	N.D.	-	>180	18
2078/5/17	Baneshwor 1	N.D.	-	>180	20
2078/5/17	Baneshwor 2	N.D.	-	1	N.D.
2078/5/17	Baneshwor 3	N.D.	-	3	3
2078/3/10	Baneshwor House No.1	N.D.	-	1	N.D.
2078/3/10	Baneshwor House No.2	N.D.	-	>180	5
2078/3/10	Baneshwor House No.3	N.D.	-	5	N.D.
2078/3/10	Baneshwor House No.4	N.D.	-	>180	160
2078/3/10	Baneshwor House No.5	N.D.	-	-	-
2078/3/10	Baneshwor House No.6	N.D.	-	-	-
DNI 7A					
2078/9/25	Chochhen	0.72	-	N.D.	N.D.
Northern area of airport (Outside of DNI 2)					
2077/11/25	Kumarigal 1	N.D.	-	>180	-
2077/11/25	Kumarigal 2	N.D.	-	N.D.	-
2076/7/1	Maijubahal	N.D.	-	>180	-
2077/4/9	Milan Chowk	N.D.	38	11	-
2077/4/15	Milan Chowk	N.D.	-	>180	-
2077/4/21	Milan Chowk	N.D.	-	>180	-
Western suburbs					
2078/3/13	Balaju	N.D.	-	>180	-
Eastern suburbs					
2078/9/25	Bholachhen 1	0.08	-	N.D.	N.D.
2078/9/25	Bholachhen 2	0.17	-	N.D.	N.D.
2078/9/9	Chasukhel 1	N.D.	-	16	1
2078/9/9	Chasukhel 2	0.51	-	N.D.	N.D.
2078/9/9	Chasukhel 3	0.14	-	N.D.	N.D.
2078/9/13	Chasukhel 4	0.18	-	N.D.	N.D.
2078/9/13	Dudhpati	0.02	-	9	N.D.

Parameters		Free residual chlorine	Turbidity	Total coliforms	Fecal Coliform
2078/9/25	Golmadi	0.12	-	N.D.	N.D.
2078/9/9	Itachhen	0.42	-	N.D.	N.D.
2078/9/13	Taumadi	N.D.	-	>180	3
Southern suburbs					
2078/3/13	Bhalsepati	N.D.	-	1	-
2078/1/23	Khumaltar	N.D.	-	N.D.	-

*1: Acceptable values only when alternative water source is not available.

*2: “-“ means that no realized water quality analysis. N.D. means Not detected.

As there is no information on the exact water sampling points, the locations estimated from the place names are shown below.

The KUKL laboratory does not know the exact water sampling point (water tap) and only uses the name of the place to manage the data.

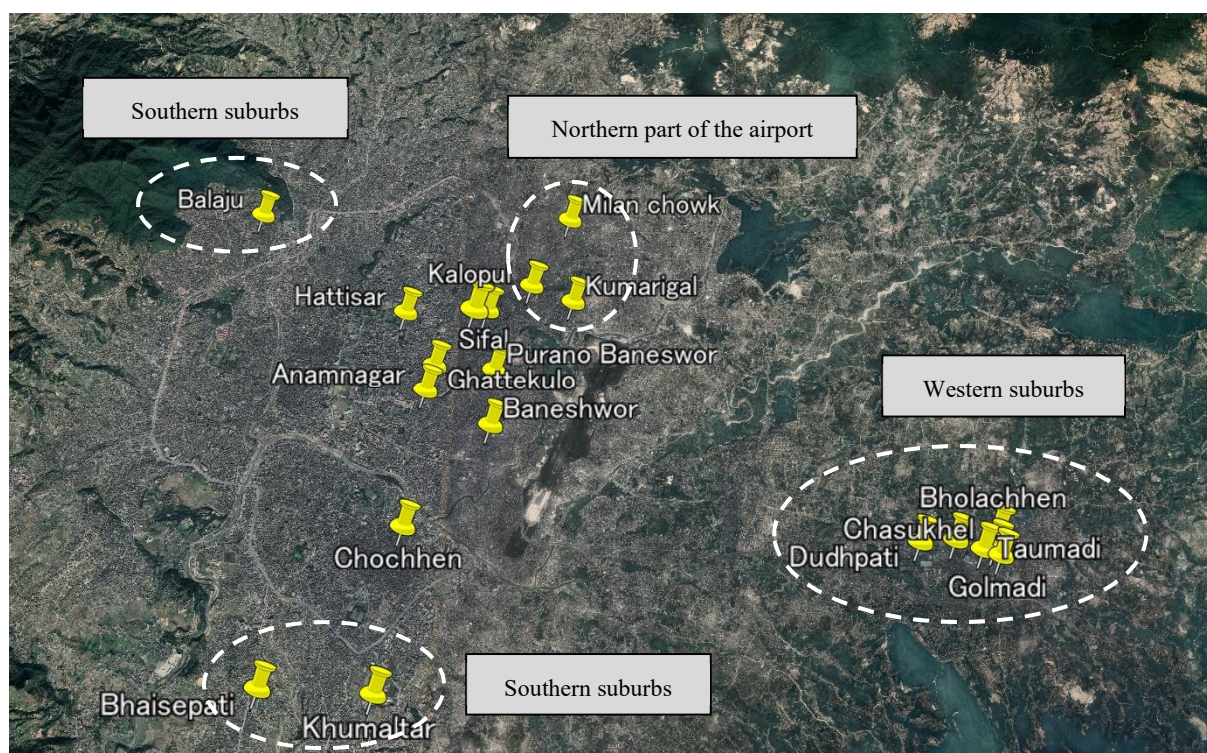


Figure 3.7.7 Sampling point of water testing

Due to the unstable chlorination process at the water treatment plants and the influence of a timed water supply of once every few days, residual chlorine in the distribution network is often undetectable.

Coliforms have also been detected and there is a possibility of contamination of rooftop water storage tanks, which are common in many homes.

Within the ring road (area subject to DNI) and to the north of the airport, residual chlorine is often not detected and coliforms are above 180/100mL.

There is no correlation between the values of total coliform and fecal coliform. Microbial sources

of contamination could be from sources other than sewage effluent or treatment plants (e.g. septic tanks) (e.g. animal feces in household water storage tanks).

The issues identified in obtaining water quality data at the above hydrants are as follows:

- Water quality testing of taps is not carried out on a regular and systematic basis.
Water quality surveys at taps are carried out on a case-by-case basis when users complain about the quality of the water. There is a strong need for this as a response to customer complaints, but in the future it will be necessary to define specific water sampling points and carry out regular sampling surveys to monitor drinking water quality in close proximity to customers.
- The information on the tap is inaccurate.
The central laboratory does not have the exact information on the water taps that were sampled. In the future, it will be necessary to record the address of the water tap from which the water was sampled, the customer account and the location by GPS.

Chapter 4: Plan of activities in Term-3
(2024 - 2025)

Chapter 4: Plan of activities in Term-3 (2024 - 2025)

4.1 Plan of activities related to Output 1

Output 1 The capacity of water distribution management utilizing GIS is enhanced.

4.1.1 Challenges and measures to achieve Output 1

Based on the results of the activities to date, the outlook for the achievement of the performance indicators planned in the PDM is shown below.

(1) Indicator 1-1

GIS data is updated according to SOP in the areas within the ring road where the DNI project has been completed.

By the end of Term-2, practical training for engineers and supervisors at each branch office and head office was planned and implemented, ensuring that technical skills were enhanced and firmly established.

Although KUKL has not been able to begin practical work with GIS data on new water distribution networks, during this period the staff of the several branches has routinely collected and managed GIS data on water supply facilities, customer locations, and other information in existing water distribution networks that are not included in the DMA construction.

After a certain number of DMAs are completed by the start of Term-3 and their GIS data are officially handed over to KUKL, practical GIS management can proceed under the guidance of JICA experts.

The following is a list of issues to be addressed to achieve Indicator 1-1.

Table 4.1.1 Issues to achieve the indicator 1-1

Issues	Contents and measure
Proficiency in GIS data updating practices	Regarding GIS data updating, an environment for data updating work was developed, including data management by a GIS server, acquisition of local customer information using tablet devices, and preparation of submission customer registration form using GIS maps. The handover of the official GIS data is expected to be delayed to Term-3. The challenge is to address this schedule delay and complete the practical training of operation and management using the official GIS data at all the branches. To this end, the training will be provided in an efficient and effective manner to enhance and proficient GIS data updating capabilities.
Establishment of a quality inspection system for GIS data	Regarding the quality inspection system, in order to avoid concentrating only on those in charge at the head office, the JICA experts instructed data quality inspection and correction methods at group training sessions for GIS personnel at the head office and at each branch office. In previous activities, as part of GIS data quality control, data quality inspections have been conducted using informally provided GIS data, but several errors in graphic and attribute information have been identified because contractors are not complying with PID requirements. In the future, when official data is provided by PID to KUKL, KUKL itself must

Issues	Contents and measure
	<p>immediately conduct a quality check of the data. Especially for serious errors or more than a certain number of errors, it is assumed that it is difficult for KUKL's GIS staff to solve them alone. Therefore, it is necessary to take measures such as clearly indicating the error location and requesting the contractor to correct it through PID. Considering this situation, the JICA Expert Team will create an environment that facilitates the transfer of technology by developing a quality inspection manual. The JICA Expert Team will also encourage KUKL to establish a quality inspection office or take other organizational corrective actions.</p>
<p>Thorough management of personal information in GIS data collection operations</p>	<p>The issue is to add a lecture on information security measures as part of GIS training to raise awareness of personal information management among those in charge. Measures to reduce information security risks will be practiced in daily operations, such as restricting mobile device logins, deleting applications deemed unnecessary, restricting the use of specific applications (restricting the use of Internet browsers and application search and installation that may lead to information leakage), and setting access rights to folders/files on the GIS server.</p>

(2) Indicator 1-2

GIS data is shared between Head Office and Branches according to SOP in the areas within the ring road where the DNI project has been completed.

Through the activities up to Term-2, "GIS utilization plans and operation methods" were generally agreed upon, and activities to finalize the SOP are planned in the future. In addition, the installation of IT equipment and server settings necessary for data sharing between the branch offices and the head office have been completed, so the infrastructure in terms of both software and hardware is now in place.

After the GIS data is officially provided to KUKL, each branch office will work on adding and updating GIS data, and these data will be shared between the head office and the branch offices by utilizing the already established system.

The following are issues to be addressed to achieve Indicator 1-2.

Table 4.1.2 Issues to achieve the indicator 1-2

Issues	Contents and measure
<p>Operation of GIS data server</p>	<p>Since official GIS data is not yet available, the system that has been built has not been actually utilized to share data. Operational guidelines for GIS technology describing how to utilize and operate GIS are being prepared, and SOPs integrated with equipment operating procedures will be compiled in Term-3. Future training will further increase the level of mastery of GIS server data access authority settings and data management methods, and encourage each person in charge to understand appropriate data sharing and management methods.</p>

(3) Indicator 1-3

The water distribution plan for maintaining proper water pressure is prepared for the areas within the ring road where the DNI project has been completed.

The completion of the DNI project has been delayed and only a limited number of areas have started

to be supplied with water through the new distribution pipes; based on the situation in the second half of 2023, it is necessary to develop activities to achieve this indicator in the plan of activities in Term-3.

Table 4.1.3 Issues to achieve the indicator 1-3

Issues	Contents and measure
Ensure water supply necessary to develop and implement water distribution plans	<p>The New Sundarijal WTP began full-scale operation in March 2023, and by May 2023, the water production volume reached approximately 170 MLD, equivalent to the design value.</p> <p>On the other hand, the conditions for planning water distribution are not yet in place, as new distribution pipes have only been put into service in a limited number of areas, and water intake has had to be restricted since June in order to prevent damages to the tunnel by high turbidity of raw water.</p> <p>The completion and handover of several DMAs is expected to be done between the end of 2023 and April 2024, allowing the necessary activities to be deployed upon its completion.</p> <p>However, it is assumed that the achievement of this indicator will not extend to the entire area within the ring road, as the completion of the DMA for the entire area within the ring road will still take some time.</p>
Hydraulic analysis modeling in the completed DMAs	<p>Completion and handover of several DMAs is expected to be done between the end of 2023 and April 2024, but completion of all the DMA throughout the ring road will still take time.</p> <p>It is assumed that the achievement of this indicator will not extend to the entire area within the ring road.</p> <p>However, at a minimum, the activities required in Term-3 will be to identify a few DMAs within the commercial management area by each branch, build a hydraulic analysis model using GIS data, and implement the analysis practices through on-the-job training.</p>

4.1.2 Detail of activity related to Output 1 in Term-3 (2024-2025)

(1) Continuation/follow-up from Term-2 (2022-2023)

[Activity 1-1] Decide the utilization plan and operation rule of GIS.

Through the activities up to Term-2, the IT environment for operating GIS within KUKL and the acquisition of technology have progressed.

A working flow of digital information sharing from the field to the GIS has been established and supervisors have made progress in digitizing their work.

To make appropriate and efficient use of these devices and GIS data, and to promote efficient use of GIS in other operations as well, including reviewing business processes and improving technology through the introduction of GIS, the JICA Expert Team will continue to follow up in Term-3.

In addition, JICA experts follow up with the IT section to ensure proper operation and management of the GIS servers as well.

[Activity 1-2] Conduct training program (OJT) on GIS operation.

Through the activities up to Term-2, basic knowledge related to GIS and practical operation techniques were established among KUKL staff.

In Term-3, activities will focus on the implementation of organizational training by potential instructors in order to establish an internal training system for the systematic propagation and transmission of skills within KUKL.

[Activity 1-3] Import GIS data which is taken over from PID into KUKL's GIS system.

In Term-2 the data intake process was confirmed using provisional data of DMAs.

In Term-3, an inspection and acceptance system will be established for the GIS data officially provided by PID in conjunction with the handover of the DMA, and an environment will be created to prepare the inspected data as data for the update work.

<GIS data check items>

The official data should be inspected for the following items, and for each error, KUKL is required to notify the PID to confirm and correct the data.

Data Definition:	Availability of data definition documents and consistency of their contents.
Coordinate system setting:	Is it set to WGS84-UTM45N?
Attribution Information:	Are there any anomalies in consistency with the data definition document?
Object Information:	Detection of abnormal shapes by geometry check

<Preparation of update work data>

Convert the data into the GeoPackage format that is convenient for work in KUKL and prepare the data for updating work by dividing it by branch wise.

Shapefile, the most popular data format in conventional GIS, consists of multiple files with the same name, which causes problems such as complicated file management, character code restrictions, and the existence of size limits.

New formats suitable for modern GIS handling include GeoDatabase and GeoPackage, and the GIS data provided by PID conforms to the Geodatabase format.

GeoDatabase is a standard ArcGIS data format designed by Esri, the developer of Arc GIS, to store GIS data. Since KUKL is using the open source QGIS as a GIS application this time, we will convert the data to the Geopackage format recommended there.

GeoPackage is a standard developed by OGC (Open Geospatial Consortium) that allows multiple data (even raster data) to be stored in a single file. Compared to the shapefile format, the file size and the allowable number of attribute field characters are larger.

[Activity 1-7] Conduct trainings on hydraulic analysis and water distribution management.

In the activities up to Term-2, KUKL staff members acquired the basic knowledge necessary for hydraulic analysis, including understanding ultrasonic flow meters, flow measurement, water pressure control, and the theory of hydraulic analysis, as well as practical training using hydraulic analysis software.

In Term-3, a model district will be set up for simulation using DMA data handed-over to KUKL through PID to establish the hydraulic analysis technique among the KUKL staff.

Furthermore, in Term-3, JICA experts will enhance the capacity of the candidate lecturers selected in Term-2 to conduct internal training at KUKL, and establish a system to ensure the sustainable implementation of technical transfer within KUKL.

[Activity 1-8] Prepare an SOP on data input and updates of GIS.

In addition to the operation procedure manuals for various GIS technologies created by the end of Term-2, JICA experts will create operational guidelines for GIS technologies that describe how to utilize and operate GIS, and integrate a series of documents to finalize them as SOPs.

[Activity 1-9] Update GIS data as daily routine work.

Within KUKL, updating GIS data has become a routine task. However, in order for the updated GIS data to be used continuously as basic information for various operations, the quality of the data must be properly maintained.

To this end, JICA experts will prepare a quality control manual as part of the SOP and work with KUKL to create an environment that facilitates the transfer of quality control within the organization. The possibility of establishing an organized quality control system, such as the establishment of a quality inspection room, will also be considered.

(2) Activities to be initiated in Term-3

[Activity 1-4] Compile the customer data by DNI/DMA wise.

The organization of this data is an important process for linkage with the electronic billing system and grievance information to be discussed in Activity 1-10.

The JICA Expert Team will check the consistency of the GIS data imported through [Activity 1-3], including customer information, water meter locations, and other water facility location information. The data will then be organized as GIS data for each DNI/DMA and used for pipe network hydraulic analysis and water distribution planning for each DNI/DMA.

[Activity 1-5] Conduct hydraulic analysis of distribution network utilizing GIS.

The SW WSP V3 hydraulic analysis program provided by Softwel, which was used for trainings in Term-2, will continue to be used for the pipe network hydraulic analysis, which enables KUKL smooth integration with GIS. In addition, the above software will be installed on desktop PCs provided to each branch office for centralized data management.

As a practical technique for hydraulic analysis using GIS data, GIS data provided by PID will be incorporated into PCs and a DMA will be selected to serve as a model district (pilot area). After checking the quality of the GIS data provided, locate valves and flow meters and organize hydraulic analysis conditions. The information obtained from the hydraulic analysis will then be compared and analyzed with the actual water supply conditions in the pilot area. In order for confirmation of the water supply situation, the water distribution time will be tabulated and the water pressure within the area will be measured.

[Activity 1-6] Prepare the water distribution plan based on the results of hydraulic analysis and actual situations of water distribution.

Although Melamchi Water Diversion Tunnel has been in full operation since March 2023, it will be

closed during the rainy season (June to October) to prevent the inflow of high turbidity raw water. In the meantime, the operation of the New Sundarikal WTP can be continued by switching to intake water from the Bagmati River. This is an emergency measure, but it is not expected to be resolved quickly.

During the rainy season, the conditions for conducting hydraulic analyses within the DMAs are not sufficiently favorable because of the reduced water supply and greatly restricted water supply hours within the ring road. Therefore, water distribution planning for each branch and DMAs will focus on the dry season, November through May.

The JICA experts will review the differences between the results of the hydraulic analysis conducted in Activity 1-5 and the actual water distribution situation, and discuss with KUKL possible improvement measures for water distribution management that they can implement. In particular, the actual water operation continues to be a trial-and-error situation in which water is distributed according to the amount of water available.

Actual water supply conditions may differ from the hydraulic analysis results due to changes in water usage and pipeline conditions in the DMAs. Standard operating procedures, such as the method of adjusting the water from each distribution reservoir and the necessity and timing of valve opening and closing, should also take such changes in conditions into account.

In addition, even during the period when Melamchi Water Diversion Tunnel is in operation, there will always be the constraint of hourly water supply in the city. Monitoring will be conducted to avoid imbalances within the same DMA, and a draft water allocation plan (management plan) will be developed to eliminate the imbalances.

[Activity 1-10] Examine integration or computerized billing system and information of customer complaints into GIS.

With regard to CBAAS (Computerized Billing and Account System), the electronic billing system currently implemented by KUKL, the JICA Expert Team will discuss with KUKL the linkage between complaint information stored in CBAAS and GIS data, and study the possibility of integrating CBAAS and GIS systems.

Since KUKL has restrictions on sharing data containing personal information with other systems, direct sharing methods via programs will not be employed. Specific integration and management methods will be considered for how to link with GIS systems, update frequency, contents to be shared, and visualization in GIS, taking into account information security risks.

4.1.3 Activity timeline related to Output 1 in Term-3

The timeline of activities related to Output 1 for Term-3 is shown below.

Table 4.1.4 Timeline of activities related to Output 1 for Term-3

Planned Activities	2024												2025												2026		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1-1: Decide the utilization plan and operation rule of GIS.																											
Reconsideration of operational rules				●					●				●														
Approval by KUKL									●				●						●								
1-2: Conduct training program (OJT) on GIS operation.																											
Training of Trainers (TOT)				●					●																		
Conducting Internal Trainings									●				●						●								
1-3: Import GIS data which is taken over from PID into KUKL's GIS system.																											
Quality inspection of GIS data of handed-over DMAs				●																							
Data modification, format conversion				●																							
1-4: Compile the customer data by DNI/DMA wise.																											
Organize GIS data of DMAs				●					●				●						●								
Supporting the use of data for non-revenue water management activities				●					●				●						●								
1-5: Conduct hydraulic analysis of distribution network utilizing GIS.																											
Organize GIS data for DMAs, select DMAs for hydraulic analysis				●	●						●	●															
Creation of hydraulic analysis models and analysis of simulation results				●	●						●	●															
1-6: Prepare the water distribution plan based on the results of hydraulic analysis and actual situations of water distribution.																											
Monitoring of BDS operational status				●	●																						
Measuring water distribution pressure and organizing issues for water distribution planning				●						●	●		●	●	●	●	●					●					
Prepare water distribution plans for each branch office				●						●	●		●	●	●	●	●					●					
1-7: Conduct trainings on hydraulic analysis and water distribution management.																											
Training of Trainers (TOT) for Hydraulic Analysis										●	●																
Internal Training for Hydraulic Analysis										●									●					●			
Training of Trainers (TOT) for Distribution Management										●	●													●			
Internal Trainers (TOT) for Distribution Management										●									●					●			
1-8: Prepare an SOP on data input and updates of GIS.																											
Revision and finalization of SOPs				●																							
1-9: Update GIS data as daily routine work.																											
Patrol guidance for each branch office				●																							
1-10: Examine integration of computerized billing system and information of customer complaints into GIS.																											
Identification of customer data management system in use at KUKL				●					●																		
Identification of issues for integration of the computerized billing system with GIS				●					●				●						●								

4.2 Plan of activities related to Output 2

Output 2 The capacity of NRW reduction is enhanced.

4.2.1 Challenges and measures to achieve Output 2

Based on the results of the activities to date, the outlook for the achievement of the performance indicators planned in the PDM is shown below.

(1) Indicator 2-1

The data of water inflow and water consumption in the areas within the ring road where the DNI project has been completed is monthly reported from Branches to Head Office.

Achievement within the project period is possible. However, the timing of achievement of the indicators will depend on the progress of the completion and handover of the DMAs. It is anticipated that the timeframe for starting the calculation of non-revenue water in the ring road will be after 2024. However, in DMA 4.1.2, of which the new pipeline is already in service, water inflow and water consumption data collection was initiated in Term-2 on a trial basis.

The following is a list of issues to be addressed to achieve Indicators 2-1.

Table 4.2.1 Issues to achieve the indicator 2-1

Issues	Contents and measure
The timing of handover of DMA to KUKL will affect the achievement of this indicator, since the progress of DMA construction work by the DNI project varies from area to area. Although the calculation of the non-revenue water ratio can be started in the order of DMAs that have been completed and handed-over, the challenge is to secure a certain number of DMAs at each branch office that can be deployed for OJT in Term-3.	Hold regular consultations with KUKL and PID to review the progress of DNI project from time to time. Efficiently deploy the non-revenue water rate calculation and data sharing findings in DMA 4.1.2 to other areas and branches.
Water consumption data is unreliable because the meter reading rate is not 100%. The challenge is to properly estimate the water consumption of unmetered customers.	The work to calculate the amount of water billed in DMA 4.1.2 will be discussed with the members of Output 2 Action Team. Strongly request for an increase in the meter reading rate conducted by the branch offices, and expand the method of calculating water consumption obtained here to other areas and branch offices.

(2) Indicator 2-2

The NRW ratio in the areas within the ring road where the DNI project has been completed is monthly calculated at Head Office.

Achievement within the project period is possible. However, the timing of achievement of the indicators will depend on the progress of the completion and handover of the DMAs. It is anticipated that the timeframe for starting the calculation of non-revenue water in the ring road will be after 2024. However, in DMA 4.1.2, which is already in service, water inflow and water consumption data collection was initiated in Term-2 on a trial basis.

The following is a list of issues to be addressed to achieve Indicators 2-2.

Table 4.2.2 Issues to achieve the indicator 2-2

Issues	Contents and measure
As the understaffing of KUKL is chronic, the challenge is to secure staff to collect and calculate data on non-revenue water rates at the branch offices and the head office.	In order to broaden the scope of technical transfer, the project will ask as many staff members as possible from each branch to be involved in project activities.

(3) Indicator 2-3

The number of training participants on NRW reduction measures (Basic training, TOT and Internal Training by KUKL) is more than 120 persons.

Achievement within the project period is possible. The trainings conducted to date and the number of participants is 114 in total.

- [TOT]
 - Basics of Non-revenue Water: 17 persons
 - Meter accuracy testing skill: 14 persons
 - Meter reading skill: 20 persons
 - Data entry/check skill: 8 persons
 - Illegal connection measures: 18 persons
- [Internal Training]
 - Meter accuracy testing skill: 18 persons
 - Basics of NRW: 19 persons

Three internal training sessions are scheduled in the future. The following is a list of issues to be addressed in order to achieve Indicator 2-3.

Table 4.2.3 Issues to achieve the indicator 2-3

Issues	Contents and measure
The challenge is to plan and manage the internal training by KUKL itself according to the training modules that have been established so far.	Deepen communication with the Training & Research Section, the department responsible for internal training, and secure a stable training budget with the understanding and support of KUKL's upper management. As in the past, the training plan will be explained and discussed in advance at regular meetings with the Output 2 Action Team members.

(4) Indicator 2-4

The NRW ratio in the areas within the ring road where the DNI project has been completed does not exceed 15%

Prospects for achievement within the project period will depend on post-delivery activities of the DMA, but may also be affected by the non-revenue water rate at the time of handover.

The baseline non-revenue water rate for DNI project is not yet known and cannot be determined at this time.

The following is a list of issues that need to be addressed in order to achieve Indicator 2-4.

Table 4.2.4 Issues to achieve the indicator 2-4

Issues	Contents and measure
The completed and handed-over DMAs are not yet operational. The challenge is to determine the baseline value of the non-revenue water ratio as soon as possible after the water supply from Melamchi is resumed.	The communication and coordination with KUKL and PID should be fully coordinated and, if necessary, re-set to feasible targets after baseline values are known.
There are a certain number of customers who do not have meters installed or who have meters but cannot be read. The challenge is to properly assess the water usage of these customers and reflect it in the calculation of the non-revenue water ratio.	A policy on how to estimate water usage for unmetered customers should be fully discussed with the Action Team members for Outcome 2. The assumptions on which the calculations are based should be described in detail in the monthly report, etc., and any changes that may be necessary should be well discussed and recorded in the meeting memo.

4.2.2 Detail of activity related to Output 2 in Term-3 (2024-2025)

(1) Continuation/follow-up from Term-2 (2022-2023)

[Activity 2-1] Define the roles/responsibilities of Head Office and Branches for NRW reduction activities.

In Term-1, a draft of the roles and responsibilities for non-revenue water reduction measures was developed in consultation with KUKL. The division of roles for non-revenue water measures should be determined through calculating work of non-revenue water in the actually handed-over DMAs and discussing measures against commercial losses. Based on the draft prepared in Term-1, the JICA Expert Team will continue discussions with KUKL and make modifications as appropriate, taking into account knowledge gained through on-the-job training on non-revenue water control measures, etc.

[Activity 2-2] Decide the data collection process of NRW ratio.

Based on the draft assignment of roles for non-revenue water reduction measures, the process for measuring, collecting, and storing non-revenue water rates will be studied in collaboration with KUKL to clarify a system that enables the organization to accurately monitor non-revenue water rates. Since the operation of these data collection processes will take place after the management of the new water distribution network is handed over to KUKL, it will be necessary to establish a system with optimal timing, keeping an eye on the status of the transfer.

[Activity 2-3] Conduct trainings on NRW reduction measures.

Since two internal training sessions on "2) Customer Meter Accuracy Testing Skill " and "1) Basics of NRW" were held in August 2023 and December 2023 respectively, the other three training sessions will be prioritized in Term-3. Thereafter, a second internal training will be conducted as needed.

1) Internal Training on Basics of NRW

Basic training is not intended to provide training in practical or specific skills, but rather to provide basic knowledge of the definitions, problems, and solutions for non-revenue water and commercial losses, and to promote an understanding of non-revenue water in general.

The internal training conducted during Term-2 included lectures, group discussions, and quizzes for 19 participants, all led by KUKL staff under the support by the JICA Expert Team.

In Term-3, internal training in other areas will be prioritized, but the JICA Expert Team will provide necessary support if the KUKL side requires its implementation.



Internal Training on Basics of NRW
(Commercial Losses)

2) Internal Training on Meter Accuracy Testing Skill

The purpose of this training is to provide staff with the skills to verify the accuracy of customers' water meters in the field.

It is important to continuously monitor meter accuracy trends, not only to respond to customer complaints, but also to consider effective non-revenue water control measures.

In the training conducted in Term-2, 18 participants were invited from the 9 branches to which the test meters have been handed over, and the potential trainers who showed a high performance in the past TOT were appointed as instructor and demonstrators. The training was conducted under the initiative of KUKL with the support of the JICA Expert Team, including the above-mentioned lectures, practical training, and achievement tests.



Internal Training on Meter Accuracy
Testing Skill

In Term-3, internal training in other areas will be prioritized, but the JICA Expert Team will provide necessary support if the KUKL side requires its implementation.

3) Internal Training on Meter Reading Skill

In order to improve meter reading skill, KUKL itself needs to continue working on improving its skill, not only to accurately determine the amount of water consumption, but also to improve customer trust.

The internal training in Term-3 targets about 20 participants with the appointed KUKL staff who showed the top-performing through the past TOT.

Preparation for lectures, the above-mentioned paper tests and meter reading competitions will be conducted by KUKL with the assistance of the JICA Expert Team.



TOT for Meter Reading Skill

4) Internal Training on Data Input/Check Skill into the Billing Database

Meter reading and its input within KUKL is done manually. In recording accurate non-revenue water data, it is extremely important to prevent human error during data entry.

In the training of Term-3, about 9 participants will be invited from the 9 branches to which the test meters have been handed-over, and the potential trainers who showed a high performance in the past TOT will be appointed as lecturers and demonstrators. The training will be conducted under the auspices of KUKL with the support of the JICA Expert Team, including the above-mentioned lectures, practical training, competition, and achievement tests.



TOT for Data Input/Check Skill

5) Internal Training on Illegal Connection Measure

In developing and implementing measures to address non-revenue water (commercial losses), it is essential to deepen knowledge and improve skills in illegal connection measures. Through ongoing internal training, KUKL is expected to acquire an understanding of meter characteristics and mechanism, how to detect illegal bypass pipes, and proper customer care.

In the training of Term-3, about 20 participants will be invited from the 9 branches to which the test meters have been handed-over, and the potential trainers who showed a high performance in the past TOT will be appointed as lecturers and demonstrators. The training will be conducted under the auspices of KUKL with the support of the JICA Expert Team, including the above-mentioned lectures, practical



TOT for Illegal Connection Measures
(Operation of Leak Detector)

training and achievement tests.

Table 4.2.5 Outline of Internal Training on NRW Reduction Measures (Commercial Losses)

No.	Training Course	Timing	Contents	Target	No of trainees
1	Basics of NRW	Dec/2023	Lecture, Group Discussion, Achievement test	Branch Managers & Engineers other than Output 2 Action Team, Managerial Staff of Head Office	18
2	Meter Accuracy Testing Skill	Aug/2023	Lectures, Practice of Test Meter, and Achievement Test	Chief of Technical Field, Chief of Meter Reader	18
3	Meter Reading Skill	Feb/2025	Lecture, Paper-based meter reading, and Competition	Meter Reader (Approx. 2 persons per branch)	20
4	Data Input/Check Skill into the billing database	Feb/2025	Lecture, Q%QA Session, Practice of Data Input/Check, Competition, Achievement Test	Section Chief and Staff in charge of data input	9
5	Illegal Connection Measure	July/2025	Lecture, Group Discussion, Workshop, and Achievement Test	Staff in charge of illegal connection measures (Meter Reader or Chief of Technical Field)	20

[Activity 2-4] Prepare maintenance plan for maintaining NRW ratio low.

Regarding the maintenance plan to maintain NRW ratio low, it was agreed at the regular meeting of the Output 2 Action Team on December 20, 2022, that the plan was prepared based on the following framework and handed out to the members of action team.

In Term-3, in collaboration with the members of Output 2 Action Team, the JICA Expert Team will materialize each of the following items and complete the maintenance and management plan, revising the contents as appropriate based on the knowledge obtained through OJT.

Maintenance Plan for Maintaining NRW Ratio Low (1st draft)

Summary of Maintenance Plan for Maintaining NRW Ratio Low in the Medium & Long Term
Maintenance Plan to Keep Low NRW Ratio in Each DMA in the Short-Term

Contents

1. Components of NRW Commercial Losses
2. Accurate customer water meters
 - (1) Importance of accurate meter
 - (2) Periodical replacement of customer water meters
 - (3) Check and replacement of customer water meters
 - (4) Improvement of meter installation condition
3. Accurate meter reading
 - (1) Reduction of meter unread billings
 - (2) Improvement of meter reading skill
 - (3) Incentive/management of meter readers
4. Updated Customer Database
 - (1) Check and correction of meter reading data, data input, and bill preparation
 - (2) Customer visiting / hearing investigation to update the database
5. Illegal Connection Countermeasures
 - (1) Incentive to the Staff of KUKL based on Their Performance
 - (2) Voluntary Disclosure (e.g., Tax Amnesty)
 - (3) Ask Cooperation to Community Leaders
 - (4) Legal Arrangements (delivery of reminder letter, accompany with policeman, etc.)
6. Continuous trainings for the staff related to commercial loss reduction



[Activity 2-6] Calculate NRW ratio monthly.

Training on calculation of NRW ratio was provided in TOT on the basics of NRW conducted in Term-2. In Term-3, JICA experts will support KUKL to organize internal training in basic areas by KUKL itself and to provide training to more KUKL staff.

Although only three DMAs have been completed and delivered so far, a certain number of DMAs are expected to be completed in the first half of 2024 and will be handed over to KUKL from time to time.

KUKL will then begin reading bulk meters and monitoring water consumption by DMA wise, while confirming customer information in the new distribution network and responding to customers who have not yet installed meters.

(2) Activities to be initiated in Term-3

[Activity 2-5] Implement maintenance plan (prepared by Activity 2-4) for maintaining NRW ratio low.

Although this activity was planned to start based on the maintenance plan in Term-2 and beyond, no significant progress was made in the DNI project by the end of Term-2, and only three DMAs were handed over to KUKL.

Since the maintenance plan needs to be put into practice in the DMAs where the new distribution network has started supplying water, the same maintenance plan will be implemented in Term-3.

Although this project will end in Term-3, it is believed that if the maintenance plan can be implemented as on-the-job training at several DMAs in the ring road, KUKL itself can then expand similar activities to other DMAs.

The proposed items for the OJT on non-revenue water (commercial loss) measures to be implemented are as follows, which basically conform to the content of the lecture conducted as a TOT on illegal connection measures.

Items of OJT for NRW (Commercial Losses) Measures

1. Preparation of a customer list in DMA
2. Calculation of NRW ration in DMA
3. Monthly monitoring of NRW ratio
4. Listing of customers and residents who need to be visited (Suspicious illegal connection, unregistered customer, customer whose meter is not working, undesirable meter location)
5. Prepare visit plans for listed customers and residents
6. Technical inspection of customers and residents
7. Meter accuracy test
8. Legalization of illegal connection, Change of meter position, Meter replacement)
9. Incentive for the technical inspection team

<Reference: Incentive mechanism for technical inspection team >

JICA experts proposed to KUKL the idea of paying the Technical Inspection Team a portion of the fines collected through the detection of illegal connections.

According to the core members of Output 2 Action Team, the Board of Directors has approved a proposal to pay a certain amount per illegal connection, but this has not been realized.

The JICA Expert Team will continue to encourage the implementation of incentives for the Illegal Connection Reduction Team at regular meetings, as all believe these incentives will have a significant impact on the continuation of their activities.

If the maintenance plan is implemented without waiting for the completion and handover of the DMAs, it is desirable to apply this incentive system in the order of the DMAs for which the non-revenue water ratio can be calculated, in order to visualize the effects of implementation.

However, some branches may not yet have a DMA ready to calculate the non-revenue water ratio. In such cases, an idea to visualize the effect would be to measure the effect by the change in the amount of water billed by customers who have taken measures such as illegal connection measures (see table below).

Table 4.2.6 Example of benefit calculation from legalization of illegal connections

No.	Customer No.	Consumption (m3/month)		
		2016 Average	June 2018	
1	794341		21.00	past illegal user
2	794339		21.00	past illegal user
3	794337		21.00	past illegal user
4	795600		42.00	past illegal user
5	160045	0.31	0.31	past illegal user
6	794747		14.00	past illegal user
7	160497	0.00	31.00	past illegal user
:	:	:	:	:
98	xxxx	yy	zzz	past illegal user
		Consumption (m3/month)		
		2016 Average	June 2018	
Total		1,351.39	2,675.61	
Period			30	
Adjusted			2,712.77	
Increase			1,361.38	m ³ /month

Note: Fines and other collections are also taken into account in monetary benefits.

[Activity 2-7] Head Office compiles Performance Indicators, such as amount of water production, amount of water distributed, or NRW ratio, which are collected at Branches.

At the KUKL Head Office, the NRW Section has been established under the direction of the Planning & Monitoring Division.

According to the agreement between KUKL and the JICA Expert Team (4th JCC), it is envisioned that in the future, the non-revenue water data of DMAs will be consolidated at the head office and the NRW Section will be responsible for providing necessary support to each branch office. Therefore, the NRW Section will be responsible for compiling the operational indicators related to non-revenue

4.3 Plan of activities related to Output 3

Output 3 The capacity of O&M of WTPs and water quality control is enhanced.

4.3.1 Challenges and measures to achieve Output 3

(1) Indicator 3-1

The water is treated according to SOPs in the target WTPs.

This indicator can be achieved within the project period. OJT and TOT are underway using the prepared SOPs, and the following capacity improvements have been observed with respect to water treatment.

- ① The staff deeply understood the importance of turbidity removal and residual chlorine as a water treatment plant operating techniques.
- ② The PAC dosing facilities and the chloring dosing facilities have been gradually upgraded, and operators have become accustomed to using these facilities.
- ③ Using a conversion table prepared by the JICA Expert Team, the operators began the process of calculating the inflow of water from the water level at the weir and confirming the required chemical dosing rate.
- ④ When operational results are not favorable, consultations are voluntarily held to remedy the situation.

The following is a list of issues to be addressed in order to achieve Indicator 3-1.

Table 4.3.1 Issues to achieve the indicator 3-1

Issues	Contents and measure
Determination of water treatment operation at the time of inflow of high turbidity raw water	Operators are not able to cope with fluctuations in raw water turbidity during the rainy season and high turbidity water inflow at night. Utilize the automatic raw water quality monitoring device currently being installed by the Electromechanical Department. Assign water treatment plant operators to work at night so that pH and turbidity measurements can be made at night as well, and provide necessary technical guidance. Instruct KUKL to prepare a conversion chart between "Raw water turbidity" and "PAC dosing rate" at each WTP and instruct operators to adjust the chemical dosing volume.
Improvement of chemical dosing facilities and operational capacity	The coagulant and chlorinating agent dosing facilities at Bansbari and Bode WTPs are aging, and the replacement of these facilities has not been completed. The JICA Expert Team follows up with KUKL to promote the renewal of equipment and provide operational guidance after maintenance.
Establishment of residual chlorine control standard values for each water treatment plant	Target residual chlorine concentration (at the outlet of the water treatment plant) is not determined for each WTP. After the chlorine dosage can be adjusted at WTP, the residual chlorine data of the distribution system is analyzed to set the residual chlorine control standard value at the outlet of WTP. Provide guidance on how to operate to comply with the determined residual chlorine standard value.

(2) Indicator 3-2

The water quality is measured according to SOPs.

By the end of Term-2, SOPs for each measurement parameter were prepared and distributed to the water quality labs at each water treatment plant. In addition, the necessary SOPs have been prepared and distributed for water quality measurement personnel at KUKL branches.

Water quality measurements according to SOPs have been initiated in the water quality labs at the water treatment plants, but there are still many issues for improvement at the branch level. The following issues need to be addressed to achieve Indicator 3-2.

Table 4.3.2 Issues to achieve the indicator 3-2

Issues	Contents and measure
Thorough SOP referencing in KUKL branches	The required SOPs have already been distributed to the water quality lab at the water treatment plant and to the water quality measurement personnel at each branch office. In the water quality labs in WTPs, SOPs are bound in files and kept in desk-top holders, ready to be used at any time. On the other hand, water quality measurement staff at branch offices do not refer to SOPs as well as manuals for measuring instruments, so it is necessary to ensure that SOPs and manuals are utilized at monthly seminars and on-site guidance.
Establishment of SOP documents management rules (assignment of text numbers, storage and management of text data)	By the end of Term-2, the first version of the SOP was prepared. In the future, it will be necessary to revise the SOPs based on improvements in measurement methods, changes in measuring equipment materials, etc., but this must be done in accordance with the management rules for SOP documents, and the latest version must always be available in the laboratories. The JICA Expert and KUKL will prepare a Master SOP that defines the rules for the management of SOPs. The expert will also designate a person in charge of SOP management and provide guidance to ensure smooth management of SOP documents and its revision.

(3) Indicator 3-3

The monitoring activities are carried out at all target WTPs according to the water quality control plan.

Water quality monitoring is being conducted at the target water treatment plants (Mahankalchaur, Bansbari, Bode, and The New Sundarijal) according to a schedule.

However, the development of a water quality management plan is an issue that needs to be addressed in Term-3. The water quality management plan should include both the implementation of water quality monitoring and the operation and management of WTPs reflecting the monitoring results, but the project has not yet reached the stage of proper operation and management, especially since the maintenance and improvement of chemical dosing facilities at existing WTPs (Mahankalchaur, Bansbari, and Bode) are still in progress.

A Water Quality Management Plan should be developed that integrates the Water Quality Monitoring Plan and the Water Treatment Plant Operation and Management Plan, while taking into account the progress in the development of chemical dosing facilities and training of operators at existing water

treatment plants.

It is assumed that the water quality management plan will include basic policies regarding the following items, and that detailed items such as facility operation and monitoring plans will be cited from individual plans, SOPs, etc. to be developed separately.

Table 4.3.3 Contents of Water Quality Management Plan (Draft)

Items	Contents	Remarks
Water quality monitoring at WTPs	Parameter, Sampling point, Frequency	To be referred to a separately established monitoring plan.
WTP operation plan	Appropriate method of WTP operation	To be described the operation method for each water treatment plant facility.
Experiment of water quality at WTPs	Chlorine demand test, Frequency of implementation of jar test	To be referred to a separately established monitoring plan.
Emergency attention at WTPs	Response to abnormal water quality (assuming high turbidity or low pH) : Water quality monitoring system when high turbidity is expected, Method of controlling coagulant dosing rate and chlorine dosing rate	Describe the basic response policy. For individual facility operations, refer to separately defined SOPs, etc.
Maintenance plan of distribution facilities	Maintenance method of reservoirs: to be referred to SOP of BDS reservoirs	Describe the basic maintenance policy. For individual facility operations, refer to separately defined SOPs, etc.
Water quality monitoring plan at reservoirs and taps in the city	Water quality monitoring being conducted by KUKL branches: Parameter, Sampling point, Frequency	To be referred to a separately established monitoring plan.
Organizational system for water quality control	To ensure smooth implementation of the above activities, the duties of each of the departments concerned and the system for coordination among them are clearly stated.	To be mentioned in the water quality management plan

The following issues need to be addressed in order to develop the water quality management plan described above (see also the issues in Indicator 3-1)

Table 4.3.4 Issues to achieve the indicator 3-3

Issues	Contents and measure
Establish operational procedures for water treatment plants	JICA Experts will continue to provide guidance to ensure that the chemical dosing facilities are in place and that coagulant and chlorine dosing rates are controlled based on water quality data.
Establish additional operating procedures for water treatment plants	Establish a response method for abnormal water quality and develop necessary SOPs.
Establish a monitoring plan for reservoirs and taps in the city.	Based on the start of operation of The New Sundarijal WTP, the city's water quality monitoring points should be reviewed and a water distribution basin monitoring plan should be developed. Build coordination with relevant departments, as the monitoring schedule will be greatly influenced by the water transmission and distribution plan at that time.

It should be noted that the policy of the Government of Nepal requires water utilities to adopt a Water Safety Plan (WSP) to monitor water quality and services, and that a Water Safety Plan Handbook (WSP) was developed in 2013 by the Department of Water Supply and Sewerage (DWSS) of the Ministry of Urban Development (UDM) in collaboration with WHO, but KUKL has not initiated the

preparation of this plan.

Considering this situation, the project decided to incorporate the following basic elements of the WSP in developing the water quality management plan (See Table 4.3.3).

- Develop a water quality testing plan at critical points for water quality control (raw water, water treatment process, and critical points on the water distribution route)
- Establish a rational maintenance management method for water treatment plants and distribution facilities to enable the results of water quality measurements to be reflected in operational management on a daily basis.
- Assume possible water quality incidents and develop an emergency response plan (emergency monitoring, water treatment process management, etc.) for such incidents.

The water quality management plan to be developed under this project will cover the requirements of the WSB. Once that plan is developed, it is expected to be further developed into a WSP that incorporates disaster countermeasures (restoration of water supply facility functions, securing water supply, and ensuring water quality safety), clarification of cooperation with higher level organizations, and functions for evaluation and improvement of countermeasures.

(4) Indicator 3-4

The water quality is regularly measured at the taps in the water supply areas by the target WTPs.

Water quality analysis at taps through collaboration with KUKL's nine branches began in the second half of Term-1 and has continued since then.

This indicator has been generally achieved, but the following issues need to be addressed.

Table 4.3.5 Issues to achieve the indicator 3-4

Issues	Contents and measure
Lack of staff in charge of water quality monitoring	The shortage of water quality analysis personnel has become a problem in both branches due to transfers as a result of the start of operation of the New Sundarijal WTP and retirements of staff. The JICA Expert Team will request KUKL upper management to fill the position of water quality analysis personnel and provide technical training to the newly assigned staff.
Improvement of Technical Capability	Although water quality analysis personnel at each branch office receive guidance from the central water quality lab, mistakes are often made in the field due to a lack of understanding by staff. JICA experts continue to provide expert guidance and encourage proactive technical improvement efforts, such as regular seminars from the central water quality laboratory.
Efforts to improve water quality using water quality data	Water quality measurement data from each branch is being sent to the central water quality lab and data is being accumulated. Data are discussed and reviewed with JICA experts and the central lab at monthly debriefing meetings, but the results have not yet been used to improve water quality at the taps. The core members need to discuss how to use water quality data and establish the use of data within the organization.
Maintenance of analytical	Some branches were observed where analytical equipment was not adequately cleaned

Issues	Contents and measure
equipment and response to equipment failure	and maintained. JICA experts will instruct them to pay attention to the dirt and deterioration of analytical equipment, especially sampling cells. In addition, JICA experts will provide guidance on the establishment of an annual procurement plan and regular procurement of necessary consumables and reagents so that they can be replenished as needed from the central water quality lab.

4.3.2 Detail of activity related to Output 3 in Term-3 (2024-2025)

(1) Continuation/follow-up from Term-2 (2022-2023)

[Activity 3-1] Define the roles/responsibilities of WTPs, Branches, Head Office and laboratories in water quality control.

1) Water Treatment

A monthly meeting for reporting the operation status of water treatment plants and a monitoring committee of water treatment plant operation will be held for the following personnel:

- Managerial and technical staff involved in water treatment plant operation
- Staff of Water quality laboratories
- Staff of Electromechanical Department

The Operation Monitoring Committee is scheduled to meet quarterly.

[Follow-up matters]

- Through these meetings, staff will recognize the importance of water treatment and organize/analyze information related to water treatment plant operations.
- Encourage stronger coordination between water treatment plants with little interaction and between related departments to strengthen the system so that water treatment plants can operate well.

Although reports are made at the monthly meeting and at the monitoring committee. KUKL has not voluntarily collected and stored information on the operation of the water treatment plants, analyzed this information, improved the operation methods by reflecting the analysis results, or improved the facilities themselves.

From Term-3, the JICA Expert Team will start supporting to build a system that can collect and store information related to the operation of water treatment plants and analyze such information on a daily basis.

In addition, chemicals currently used at the water treatment plants and other chemicals that cannot be used due to poor storage conditions are left unattended.

The JICA Expert Team provides guidance on chemical inventory management, offer suggestions for improvement, and if possible, assists in creating a list of facilities and equipment owned by KUKL and managed by the Electromechanical Department, and in building a system that allows related information to be easily shared.

2) Water Quality Control

With the start of operation of The New Sundarijal WTP and the implementation of water quality monitoring at the 9 KUKL branches, an organizational frame for water quality control has been established.

However, all information on water quality management is concentrated in the central water quality laboratory, and this information has not been organized and analyzed efficiently.

[Follow-up matters]

- JICA Expert Team and KUKL select persons in charge of organizing and analyzing information. Furthermore, JICA Expert Team enhance cooperation among related departments and encourage the establishment of a system in which water quality data is reflected in the operation and management of the water treatment process and the maintenance of water distribution facilities.
- In the past, joint seminars and other activities between water quality labs, branch offices, and water treatment plants have been held to strengthen relationships and deepen understanding of technical knowledge. In addition to continuing these activities, a new division of water distribution management will be added to deepen the linkage between the maintenance of the water distribution network and water quality.

In Term-3, the JICA Expert Team will start formulating a "Water Quality Management Plan" that will include water quality monitoring, water treatment plant operation and management, and water distribution facility maintenance.

In addition to technical content, this plan will clarify the relationship between the water quality laboratory, water treatment plants, and KUKL branch offices (reporting, information transmission, and chain of instructions), and clarify the division of duties.

[Activity 3-2] Conduct trainings on water treatment and water quality control.

1) Water Treatment

[Continuation of basic training]

At the three existing water treatment plants, JICA experts will provide guidance on the operational know-how using the equipment once the ongoing improvements to the chemical dosing facilities are completed.

At the New Sundarijal WTP, training will be provided to increase maturity and achieve efficient operation due to unstable operation when raw water turbidity fluctuates greatly.

In both cases, short-term TOT-based training should be repeated to ensure that the technology is well established.

[Follow-up matters]

- Repeat the training with short-term TOT at the three existing water treatment plants, utilizing the improved chemical dosing facilities.
- At New Sundarijal WTP, JICA Expert Team will check the operational status and provide guidance on technical uncertainties and solutions to improve operational maturity and efficiency.

[Establishment of Internal Training System]

At the time this project was initiated in March 2021, the completion and handover of The New Sundarijal WTP was not yet in sight.

Therefore, while providing the necessary support for the handover of the facilities, the project activities included on-the-job training at three existing water treatment plants that will require continuous operation in the future.

In Term-3, JICA experts will support the establishment of a sustainable training system, as internal training will begin in earnest with KUKL staff serving as instructors.

[Newly proposed activities]

In the case of the New Sundarijal water treatment plant, 10 months have passed since KUKL took over operational management from the contractor.

While it is inherently desirable to improve the operation to be more economical and efficient while taking into account changes in raw water quantity and turbidity, the operation still follows the basic method instructed by the contractor, leaving room for improvement.

The following improvements can be made at this time.

- ① Response to sudden increase in turbidity (20-30 NTU) of raw water inflow during dry season
- ② Response to power outages
- ③ Establish economical operating methods, such as reducing excessive backwashing

The New Sundarijal WTP currently can receive 170 MLD of water from Melamchi Diversion Tunnel during the dry season for treatment, but during the rainy season, the production volume will drop to 40 MLD as the plant switches to raw water from the Bagmati River.

In Term-2, during the rainy season when raw water from the Bagmati River is used, the filtration rate was temporarily changed for a short period of time, allowing us to understand the actual load generated at the facility and points to keep in mind during operation.

For the time being, the water supply from the Melamchi River is limited to the dry season only, but the water quality is good and turbidity is low during that period. Therefore, it is considered possible to secure a water purification capacity of 200 MLD, an increase of about 20% from the original capacity, by devising operational methods even with the current facilities.

This increase of 30 MLD is equivalent to the capacity of more than one existing water treatment plant, and although it is limited to the dry season, it is a great advantage for KUKL to be able to

realize this increase in water supply.

Based on the requests from KUKL, the following activities will be implemented at The New Sundarijal WTP in Term-3 to enhance the capacity of KUKL operators and to increase water production.

- ① Confirmation of the impact on the entire facility when 200 MLD of raw water, a 20% increase, flows into the water treatment plant.
- ② Confirmation of floc sedimentation effect in sedimentation basin.
- ③ Confirmation of the impact of increasing the filtration rate by 20% (e.g., increase of water level in the filtration basin, outflow of turbidity from filter, etc.)
- ④ Checking the affordability of related facilities, especially drug dispensing facilities, etc.

2) Water Quality Control

JICA experts will continue to provide on-site guidance during the stay in Kathmandu and through online seminars to improve and sustain the water quality analysis capacity of the laboratories in water treatment plants and KUKL branch offices.

[Follow-up matters]

- As New Sundarijal WTP is now fully operational, JICA experts will prepare SOPs and provide training of water quality analysis to the plant's laboratory staff.
- JICA experts will provide technical guidance for the additional water quality staff at each branch office (currently under consideration for increase at each branch office).

Maintenance of service reservoirs is another important factor of water quality management. Although guidance on the maintenance of service reservoirs has been provided in Activity 3-4, the lack of active coordination between those responsible for the management of the facilities and the section in charge of water quality control is a problem.

In Term-3, JICA experts will guide the use of water quality monitoring data, especially the incorporation of water quality monitoring data from each branch office into the maintenance and management of water distribution reservoirs.

Regarding the water quality monitoring plan by the branch offices, water quality monitoring of service reservoirs was added in the second half of Term-2.

In the future, JICA experts will work with the Central Water Quality Laboratory and each branch office to develop a maintenance plan for service reservoirs based on water quality data (seasonal changes in turbidity and residual chlorine) and further improve water supply quality in cooperation with the supervisors of reservoir.

[Activity 3-3] Prepare SOPs of water treatment and water quality control.

1) Water Treatment

SOPs for the three existing WTPs (Mahankalchaur, Bansbari, and Bode) and The New Sundarijal

WTP were mostly prepared by the end of Term-2.

However, in the latter half of Term-2, KUKL has started to improve the chemical dosing facilities at these water treatment plants (installation of rotameters for flow measurement and piping work). Therefore, the SOPs prepared so far need to be revised based on the results of these facility improvements.

[Follow-up matters]

- The JICA expert team has been in charge of SOP preparation until the end of Term-2, but from Term-3 onward, KUKL must proceed with preparation and updating on its own initiative.

2) Water Quality Control

The JICA Expert Team and KUKL will make necessary modifications to the SOPs created so far and create additional SOPs while observing actual measurement operations and field work conditions.

[Follow-up matters]

- In the process of revising SOPs, it is important for those who perform measurement operations to find technical issues (hereinafter referred to as "awareness").
- Guidance should be provided to lab and branch measurement personnel so that they can "become aware" through seminars and on-site guidance.
- JICA experts will promote interaction and collaboration between the Central Water Quality Laboratory and those in charge of measurements at each water purification plant by holding seminars and other events to facilitate better communication between the both parties.

From Term-3, The JICA Expert Team and KUKL will establish rules and persons in charge of management of SOP document (SOP revision procedures, document storage, and version control), and JICA experts will provide guidance to ensure that new SOPs are created and revised on an ongoing basis.

Since it is desirable that SOPs be managed centrally together with SOPs of water treatment plants, a management system that can provide cross-sectional guidance for water treatment plant management and water quality analysis should be established.

Specifically, the following items will be determined and documented as Master SOPs.

- Administrator of SOP
- Methods of managing document data. (Secure dedicated data storage)
- Establish SOP preparers/revisers and approvers
- Rules for SOP version management: collecting old SOPs, distributing new SOPs and explaining their contents

[Activity 3-4] Prepare monitoring plan of water treatment and water quality control.

1) Water Treatment

Continued technical follow-up through monthly reporting meetings on water treatment plant operations and through the monitoring committee of WTP operation, each of which meets monthly and quarterly respectively.

2) Water Quality Control

Regarding the Water Quality Monitoring Plan by branch offices, it was decided to add the new service reservoirs constructed under the BDS project to the monitoring scope, as The New Sundarijal WTP has started its full-scale operation in March 2023.

Although the monitoring based on these changes began in the second half of Term-2, the revision and its implementation of the monitoring plan for reservoirs will be followed up by JICA experts.

[Activity 3-5] Monitor the water quality based on the monitoring plan prepared in Activity 3-4.

1) Water Treatment

Through the monthly meeting for reporting of operation status of WTPs attended by managerial staffs in charge of water production, chief of WTPs, staff of water quality laboratories, and staff of the Electromechanical Department, as well as quarterly monitoring committee, the status of water quality control based on the monitoring plan will be confirmed by all concerned and issues and measures will be discussed.

2) Water Quality Control

The water quality monitoring at the water treatment plant conducted by the laboratories and the water quality monitoring at the taps conducted by the branch offices will be monitored through regularly scheduled stakeholder meetings (including online), and technical follow-up will be continued by JICA experts.

Regarding water quality monitoring by the branch offices, the water distribution plan from The New Sundarijal WTP (date and time of water supply) has a significant impact on the implementation of the monitoring plan.

Although monitoring plans are reviewed from time to time according to water supply conditions, records of these revisions (changes in monitoring points, changes in sampling times) should be kept in the laboratories.

In addition, water quality analysts in branch offices are not in the habit of recording supplementary information (original field data, calculation process, etc.) related to water quality analysis. The project will establish a system to keep and manage various records of water quality analysis work at each branch office, because not only the results of water quality tests, but also the supplementary information behind the results will be important information when verifying the data later.

Currently, when water quality data from each branch office is reported to the central water quality laboratory, it is sent via SMS from the mobile phone of the person in charge. This is due to the fact that there is no Internet connection between each branch office and the central water quality laboratory, but even data collected in this manner needs to be managed after establishing data sharing rules.

The JICA Expert Team has been proposing improvements to this issue since Term-1, and the central lab is gradually making improvements such as the creation of a common format. However, since Term-3 is the final phase of the project, The JICA Expert Team will strongly encourage both the branch offices and the central water quality laboratory to further establish the improvement measures.

[Branch office]

- Make it a practice for water quality analysts to carry a field notebook with them.
- Storage of field books, data sheets, and related electronic data: It is desirable to have a dedicated person at each branch office, consider making it the responsibility of the branch office manager.

[Central lab]

- Select a person responsible for compiling, organizing, and storing water quality data
- Establish rules for data storage (e.g., rules for storing data on PCs, data formatting, data backup rules, etc.)

[Activity 3-6] Reflect the monitoring results to water quality improvement and effective water treatment.

The project continues celebrate the monthly meeting and quarterly monitoring committee for operation of water treatment plant that has been held from Term-2.

At these meetings, the staff in charge of water treatment plant, water quality laboratory, and electromechanical facilities will participate to confirm the operational status of the water treatment plants, water quality control, and problems, and to discuss solutions and requests to the Electromechanical Department in order to improve operations and maintenance.

4.3.3 Activity timeline related to Output 3 in Term-3

The timeline of activities related to Output 3 for Term-3 is shown below.

Table 4.3.6 Timeline of activities related to Output 3 for Term-3

Planned Activities	2024												2025												2026		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
3-1: Define the roles/responsibilities of WTPs, Branches, Head Office and laboratories in water quality control.																											
Monthly meeting on WTP operation.			●																								
WTP Operation Supervising Committee.			●																								
Organize water quality information and select analyst.							●																				
Development of water quality management plan.							●							●													
Approval by KUKL of Water Quality Management Plan.														●						●							
3-2: Conduct trainings on water treatment and water quality control.																											
Guidance of operation of New Sundarijal WTP.			●																								
Conduct TOT on operation of New Sundarijal WTP.			●																								
Conduct internal training on operation of New Sundarijal WTP.			●																								
Operation guidance for existing 3 WTPs.							●	●												●							
Conduct TOT on operation of existing 3 WTPs.							●	●												●							
Conduct internal training on operation of existing 3 WTPs.							●	●												●							
Monthly meeting on water quality control.			●																								
Guidance of water quality control for staff of New Sundarijal WTP.							●							●													
Development of maintenance plan of reservoir and follow-up of its implementation.							●							●						●							
3-3: Prepare SOPs of water treatment and water quality control.																											
Revision of SOP on operation of WTPs.							●							●						●						▶	
Revision of SOP on water quality analysis.							●							●						●						▶	
Development of SOP for laboratory of New Sundarijal WTP and its revision.							●							●												▶	
Establishment of management system of SOP documents.							●							●													
3-4: Prepare monitoring plan of water treatment and water quality control.																											
Formulate an operation plan in compliance with SOPs for WTP operation.														●						●							
Preparation of reservoir monitoring plan and follow-up of its implementation.							●							●						●							
3-5: Monitor the water quality based on the monitoring plan prepared in Activity 3-4.																											
Establishment of water quality monitoring data management system for branch offices and central laboratory.							●							●						●							
3-6: Reflect the monitoring results to water quality improvement and effective water treatment.																											
Compliance and confirmation of WTP operation based on water quality management plan.			●				●	●						●						●							

4.4 Plan of activities related to Output 4

Output 4 The capacity of customer service management is enhanced.

4.4.1 Challenges and measures to achieve Output 4

Based on the results of the activities to date, the outlook for the achievement of the performance indicators planned in the PDM is shown below.

(1) Indicator 4-1

The future plan of customer services management is prepared.

The JICA expert team proposes the establishment of a planning committee to share and discuss the current status and issues related to customer service in order to develop a future plan for customer service management. Currently, the project is focusing on sharing information on the current status of customer service and improvement measures, and are aiming to establish a system for reporting the results of analysis of customer requests and grievances, which is being conducted as part of the Output 4 activities.

The following is a list of issues to be addressed in order to achieve Indicator 4-1.

Table 4.4.1 Issues to achieve the indicator 4-1

Issues	Contents and measure
Establish a reporting system for analyzing customer requests and grievances.	Reporting of the results of the analysis of customer grievance information to KUKL managerial staff is underway as Activity 4-8, and the reporting system is currently being used on a voluntary basis at Head Office, seven branch offices, and the Wastewater Operation Division. To date, this reporting process has not been formally adopted within KUKL and is being implemented on a genus basis by C/Ps who are active in training for Output 4. Work has begun within KUKL to institutionalize this improvement.
Establishment of planning committee	After the establishment of the reporting system, the JICA Expert Team plans to create an opportunity to discuss measures for KUKL as a whole or externally, with the aim of holding a plenary meeting at the upper levels of KUKL based on reports from each branch office, etc. Discussions regarding this improvement began at the end of Term-2 and moved toward institutionalization within KUKL.

(2) Indicator 4-2

Customer satisfaction about KUKL's customer care is improved.

Compared to the first customer satisfaction survey, the second survey also shows an improvement in customer satisfaction with customer care and with overall service of KUKL. This result is likely due in large part to the progress of Melamchi Water Supply Project, but it has also drawn attention to the response of staff in the field, and the challenge for the future is to raise awareness of KUKL as a whole beyond the scope of the activities in Output 4.

The following is a list of issues to be addressed in order to achieve Indicator 4-2.

Table 4.4.2 Issues to achieve the indicator 4-2

Issues	Contents and measure
Continue service improvement activities	Already, improvement was seen in the second survey compared to the first customer satisfaction survey. On the other hand, there is still room for improvement in telephone support and online system support, so continued efforts are required.
Raise awareness of KUKL as a whole	The second customer satisfaction survey showed an increase in satisfaction with KUKL as a whole. On the other hand, it has been recognized that raising awareness of KUKL as a whole beyond the scope of activities in Output 4 is an issue. In Term-3, this will be considered an important issue, and the JICA Expert Team and C/Ps plan to propose countermeasures.

(3) Indicator 4-3

The results of customer complaints analysis and how KUKL responds to their complaints are regularly reported to KUKL's management.

Currently, the outputs of the C/P compilation and analysis through Activity 4-2 and Activity 4-7 will be compiled into a report as Activity 4-8.

There are differences in the level of capacity development of C/Ps, and there are variations among branches in reporting process and its contents. In the future, the JICA Expert Team aims to establish a reporting system by improving the capacity of all members of Output 4 activities, mainly through guidance by TOT.

The following is a list of issues to be addressed in order to achieve Indicator 4-3.

Table 4.4.3 Issues to achieve the indicator 4-3

Issues	Contents and measure
Establish a reporting system for analyzing customer requests and grievances.	Reporting of the results of the analysis of customer grievance information to KUKL managerial staff is underway as Activity 4-8, and the reporting system is currently being used on a voluntary basis at Head Office, seven branch offices, and the Wastewater Operation Division. To date, this reporting process has not been formally adopted within KUKL and is being implemented on a genus basis by C/Ps who are active in training for Output 4. Work has begun within KUKL to institutionalize this improvement.

(4) Indicator 4-4

Public awareness activities are planned and developed by KUKL and implemented annually from 2022.

The awareness-raising action plan was developed in 2022 and is being implemented on an ongoing basis as of the end of Term-2. KUKL itself will monitor and advise on the establishment of a structure and budget for continued implementation.

Since PID has been conducting PR activities since 2017 and has secured a continuous budget, the JICA Expert Team plans to develop effective awareness-raising activities in Term-3 with PID as a partner, referring to the good practices implemented by PID and incorporating its know-how into the activities of Output 4.

The following is a list of issues to be addressed in order to achieve Indicator 4-4.

Table 4.4.4 Issues to achieve the indicator 4-4

Issues	Contents and measure
Continue to conduct awareness-raising activities after project completion	The plan for awareness-raising activities has been drafted for 2022 and is being implemented. The plan will be updated according to issues based on the results of customer satisfaction surveys and other information. In Term-3, the JICA Expert Team will monitor and advise KUKL on the establishment of a system to enable it to continue its activities and to secure a budget for this purpose, with an emphasis on sustainability.
Building collaborative relationships with PID	The project plans to collaborate with PID, which is active in public relations activities, with the goal of holding regular meetings.

4.4.2 Detail of activity related to Output 4 in Term-3 (2024-2025)

(1) Continuation/follow-up from Term-2 (2022-2023)

[Activity 4-1] Prepare a plan of customer satisfaction survey including survey design and TOR for survey company.

The overall plan has already been prepared in Term-1. After analyzing the results of each survey, necessary revisions will be made in Term-3. As a result of the surveys up to the second survey, the following items are to be improved in the next survey.

- Add categorized choice responses to the questionnaire that categorize the reasons why customers are dissatisfied, which is important for service improvement. (So far, there have been some cases where answers were given in abstract expressions, which were not useful for the analysis. On the other hand, the open-ended response section will remain so as not to exclude non-optional opinions.)
- The number of questions in the questionnaire was increased from the first to the second round, thus increasing the burden on respondents. Based on the results of the analysis, the JICA Expert Team will consider removing unnecessary questions since there are similar questions with little difference in answers.
- In the statistical process up to the 2nd survey, C/Ps learn how to organize raw data. In the third survey, the C/Ps will conduct an orientation with the survey company, etc., and communicate specific instructions from the C/Ps to the survey company on how to better organize the data.

[Activity 4-2] Conduct customer satisfaction survey at baseline, mid- term and end-line.

The third survey is scheduled to be conducted in November 2024. This period corresponds to the beginning of the dry season, and water supply from the New Sundarijal WTP is expected. Since the first phase of the survey was also conducted around November, it will be easy to compare and analyze the survey results before and after water supply from Melamchi. The second survey was conducted in May, making it possible to compare seasonal differences.

[Activity 4-3] Prepare a plan for measures to improve customer satisfaction.

Statistical processing of the results of the 1st and 2nd customer satisfaction surveys and their detailed analysis were conducted for KUKL staff as on-the-job training. In the latter half of Term-2, KUKL began organizing the results of the analysis and formulating an action plan to apply them to customer service improvement. In Term-3, based on the results of the third customer satisfaction survey, the action plan being formulated together with the C/P will be reviewed.

The customer satisfaction survey also records the location of the water supply service area, enabling cross-analysis with the responses to water quality and other questions. This enables cross-analysis of responses to water quality, etc. Regional characteristics of water quality, etc., are identified to some extent, and information is also shared with Output 3 Action Team.

The results of such analysis can be used as a factor in selecting sampling points for water quality inspections at taps conducted by each branch office. In addition, by conducting fixed-point observations, it would be possible to evaluate the effectiveness of water service improvements in terms of both water quality items and customer satisfaction.

In addition, the last two customer satisfaction surveys, conducted before and after the Melamchi water supply, mapped the improvement in water supply conditions by KUKL. Satisfaction was also found to have increased accordingly.

The third survey is scheduled at the same time as the first survey, which will allow for even more accurate comparisons and is expected to be useful for updating the Action Plan.

[Activity 4-6] Prepare an activity plan for data management utilizing the Customer Grievance Module, analysis of customer complaints and improvement of customer care management.

The activities identified in Activities 4-5 (Term-1) have been under continuous implementation since the beginning of Term-2.

The activity plan developed early in Term-2 was revised by the C/P in the second half of Term-2 through finding through activities and parallel customer satisfaction surveys.

The JICA Expert Team will support the establishment and ongoing implementation of a system to ensure that activity plans are regularly reviewed in Term-3.

[Activity 4-7] Analyze the customer complaints.

The JICA Expert Team is currently supporting the systemization of complaint information processing to prepare for future increase in the number of grievances and diversification of their grievance contents.

At the start of the project, all grievance information was recorded and managed in paper form, but the information is now being digitized using desktop PCs provided by the project.

It should be noted that the use of the online grievance handling module has not yet grown, and the majority of grievances are handled by face-to-face at each branch office.

In Term-2, the JICA Expert Team and C/Ps began using this data to compile and analyze grievance and request response records. In Term-3, this activity will be continued, and support will be provided by the JICA Expert Team to improve the skills of direct input into PCs at the counter.

In addition, in Term-3, to increase the number of users of the online grievance handling module, guidelines, including updating the system, will be finalized and reflected in the Action Plan.

As shown in Figure 3.4.19 of Chapter 3, " Level of use of online grievance system" the use of the online system temporarily increased due to the polo motion accessing the KUKL website.

However, since then, the number of grievances has been decreasing, and this is partly due to the fact that KUKL itself does not respond promptly to grievances filed online. Therefore, this measure will be included in the Action Plan.

Furthermore, complaint information obtained through the system will be organized from the following perspectives, and training will be conducted for each process.

- ① Classification and categorization
- ② Analysis (e.g., whether the problem is related to the operation of KUKL, a one-time problem, or a potentially recurring problem)
- ③ Planning measures

At the same time, the JICA Expert Team will support KUKL in adapting as careful a response as possible referring to Japanese good practice.

Example in Tokyo Metropolitan Bureau of Waterworks

- Complaints and customer feedback are categorized.
- Complaints and requests are published in monthly and annual reports.
- A committee headed by the director general takes up problems, discusses and analyzes them, and assigns solutions to the respective departments.
- The responsible department will explore, propose, and implement solutions.

[Activity 4-8] Report the results of analysis on customer complaints to KUKL management.

In Term-2, a reporting system was introduced on a trial basis using the outputs obtained through the training. In this reporting system, each CP of Output 4 submits a written report to a higher level within the organization (e.g., branch director) for approval (signature) and reports to the KUKL Head Office. At the end of Term-2, discussions were initiated to institutionalize this reporting process.

In Term-3, the committee will hold meetings (chaired by the CEO and including technical staff) based on reports from each branch, etc., with the aim of establishing and institutionalizing this process. At this meeting, the JICA Expert Team will then assist KUKL in discussing the need for a response as a whole or external measures, and also propose the publication in the KUKL Annual Report of information on complaints, the results of their analysis, and the decisions made by the Committee.

[Activity 4-9] Conduct trainings on customer care (how to behave to customers) targeting for staff in charge of customer care and meter readers.

Regarding customer service training, basic training was almost completed by the end of Term-2, and

the project shift those trainings from TOT stage to the internal training stage in Term-3. A Nepali version of the PowerPoint materials for lectures was prepared in Term-2. In Term-3, this material will be revised to incorporate KUKL case studies, and will be used in the internal training.

In addition, while the TOT in Term-2 has focused on strengthening the knowledge required for lecturers, the selection of lecturers will also incorporate an evaluation of their practical customer service experience, as its experience is also considered essential for the actual role of lecturer.

In setting up the training modules, the course on customer relations for the general public that was conducted in Term-2 will be arranged for meter readers, and necessary content will be built for each theme, such as data processing, analysis, and awareness-raising activities.

Training courses related to Outcome 4 are planned as follows.

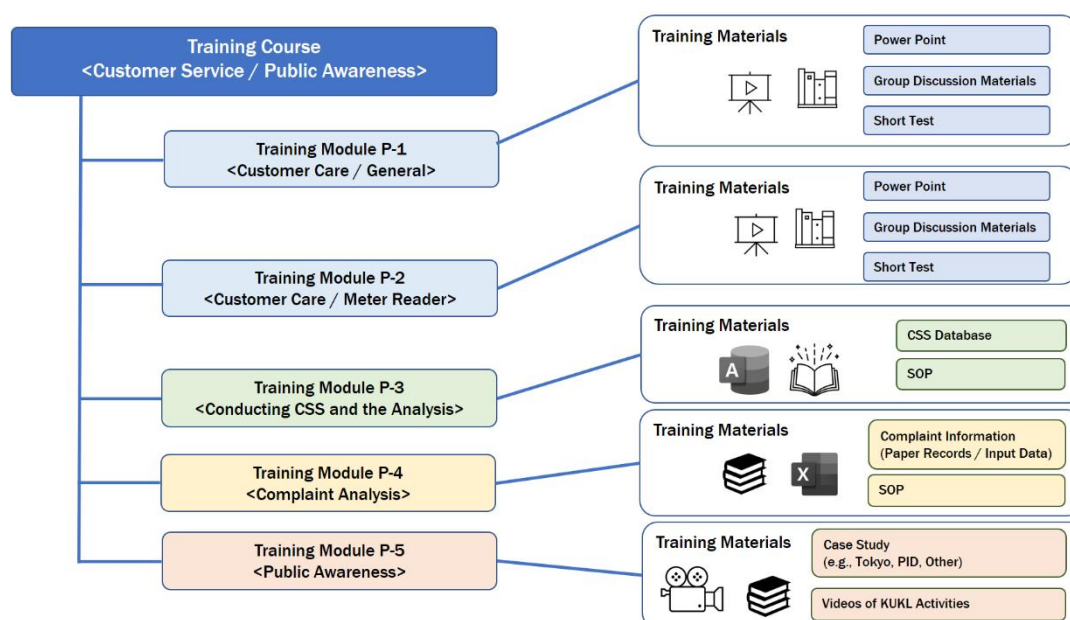


Figure 4.4.1 Composition of internal training module in the fields of customer service and public awareness

[Activity 4-11] Conduct public awareness activities based on Activity 4-10.

At the beginning of the project, an online system for receiving complaints on KUKL's website was put into operation, and access promotion to the website was conducted from Term-1 to Term-2, with a certain level of success. However, in the second half of Term-2, it was found that the number of accesses could not be maintained, and a countermeasure plan was discussed, which will be supported in Term-3.

In Term-2, polo shirts, caps, clipboards, etc., worn by staff working in the field were created and distributed to staff who have contact with customers, such as those reading water meters and responding to customers. These materials are also expected to have a public relations effect.

Subsequently, with the expansion of water supply from Melamchi, opportunities for communication with customers in the field have increased, making it a challenge to raise the awareness of the entire

KUKL staff beyond the scope of works of Output 4. In Term-3, a system to share information on the output of Output 4 within KUKL will be established.

During the activities up to Term-2, JICA experts and C/Ps participated in discussions with PID and as observers in awareness-raising activities conducted by PID; the main activities listed by the JICA Expert Team at the beginning of the project have been continuously implemented by PID since 2017.

- Various contests for citizen participation
- Cooperation with Educational Institutions
- Lectures at schools
- Participation/exhibition in various events, etc.

Considering these circumstances, KUKL's awareness-raising activities are more efficient and sustainable when conducted in collaboration with PID, and the JICA Expert Team will support the holding of this conference and the implementation of collaborative activities in Term-3.

[Activity 4-12] Summarize and review the results of public awareness activities and utilize it for next plan.

This activity will begin at the end of Term-2 and will be fully implemented in Term-3. By revising the plan already developed, each activity will spiral up to contribute to "customer awareness" of water service improvements and "increased confidence" in KUKL.

Based on the results of awareness-raising activities underway, changes in C/P awareness and trends in customer satisfaction survey results will be investigated, issues will be identified and discussed for resolution, and reflected in the activity plan.

(2) Activities to be initiated in Term-3

All activities will be continued from Term-2 and no new activities will be initiated in Term-3.

4.5 Plan of activities related to Output 5

Output 5 The capacity of managing KUKL's internal training is improved.

4.5.1 Challenges and measures to achieve Output 5

Based on the results of the activities to date, the outlook for the achievement of the performance indicators planned in the PDM is shown below.

(1) Indicator 5-1

An overall structure of training (rough structure) for KUKL staff is developed.

The training up to Term-2 was led by the JICA Expert Team, and a tentative overall training plan for KUKL has been prepared.

From now on, the Training & Research Section will work closely with the training groups and related departments of each output members to develop more accurate training plans in accordance with the Training Supervision Manual.

It is expected that the Training & Research Section will be able to develop an overall training plan by the time the project is completed.

The following is a list of issues to be addressed in order to achieve Indicator 5-1.

Table 4.5.1 Issues to achieve the indicator 5-1

Issues	Contents and measure
Capacity building for Training & Research Section	Currently, the work related to training is being transferred from Output 5 Action Team to the Training & Research Section as a full-time staff member has been assigned to this section. In the future, capacity building of the Training & Research Section should be promoted to improve its capacity to formulate training programs. At present, the relationship between the Training & Research Section and each training group and related departments is weak, and the JICA Expert Team will support KUKL to maintain close communication with them to actively exchange information on training plans.
Response to External Factors	Flexibility is needed to respond to external factors affecting the training plan, such as the availability of water supply from the Melamchi River and the number of DMAs where the new water distribution pipeline will be operational. To this end, the organizational changes to the Output 5 Action Team described below will ensure that the Training & Research Section is in constant communication with related organizations and other departments, and will establish a system to obtain the latest information when necessary.

(2) Indicator 5-2

The number of training programs that KUKL plans and implement by itself (without JICA experts support) is more than 10 courses.

As described in the details of activities up to Term-2, more than 30 training programs are planned for 2024 and 2025, albeit tentatively.

In the future, as mentioned above, the project plans to reduce the involvement of JICA experts in training and increase the number of training programs conducted primarily by KUKL. Currently, KUKL is not able to conduct training on its own due in part to the results of internal lecturers yet to be determined, but from the second half of 2024, more KUKL-led training is planned, and the indicator is expected to be achieved.

The following is a list of issues to be addressed in order to achieve Indicator 5-2.

Table 4.5.2 Issues to achieve the indicator 5-2

Issues	Contents and measure
Capacity building for Training & Research Section	As with Indicator 5-1, the Training & Research Section has just been substantively established and cannot operate without the support of JICA experts and the Output 5 Action Team. The JICA Expert Team will promote capacity building in the Training & Research Section so that this section can take the lead in implementing training programs, while deepening cooperation with internal instructors and other results training groups.

(3) Indicator 5-3

The number of trainers in each area is more than target values.

Specific training instructor targets are as follows.

Table 4.5.3 Target number of trainers to be trained

	Technical Field	Course (draft)	Target number of trainers (Minimum)
1	Water Distribution Management	GIS Operation	2
		Hydraulic Analysis	2
		Water Distribution Management	1
2	NRW Management	Anti-illegal Connection	1
		Meter Accuracy Control	2
		Commercial Loss	2
3	Water Quality Management	Water Quality Control	3
		Water Treatment	3
4	Customer Management	Customer Care	1
		Meter Reading	2
		Total	19

Currently, candidates for internal training instructors are being selected for each training theme defined in each output, and various training programs are being implemented with the support of JICA experts in order to meet the above target number.

Although internal lecturers will be gradually determined in each output in the second half of 2024, the targets are expected to be achieved.

The following is a list of issues to be addressed in order to achieve Indicator 5-3.

Table 4.5.4 Issues to achieve the indicator 5-3

Issues	Contents and measure
Clarify treatment of internal lecturers within the organization	<p>It is desirable that more staff members engage in friendly competition to become internal instructors and to improve the technical skills of KUKL. To this end, incentives for becoming an internal lecturer should be clarified.</p> <p>Currently, the Training Supervision Manual proposes that lecturers be compensated in accordance with the common regulations for public institutions in Nepal, but the Manual has not been approved within KUKL at this time.</p> <p>The JICA Expert Team reminds the CEO through the project manager on the Nepalese side for his understanding and approval.</p> <p>In addition, the JICA Expert Team will continue to request KUKL to consider the construction of a point scoring system for personnel evaluation for staff who become internal lecturers.</p>
Deepening the relationship between internal instructors and the training section	<p>As mentioned above, the Training & Research Section has just been established and has not yet established relationships with the various departments within KUKL.</p> <p>The internal lecturers and the Training & Research Section will maintain close communication, and the JICA Expert Team will support the smooth implementation of the internal training program under communication with the staff selected as internal lecturers.</p>

4.5.2 Detail of activity related to Output 5 in Term-3 (2024-2025)

(1) Continuation/follow-up from Term-2 (2022-2023)

[Activity 5-1] Identify the training necessary for KUKL staff, [Activity 5-2] Prepare an overall training program (rough plan) necessary for KUKL staff, and [Activity 5-3] Prepare a database (on Excel basis) on training programs.

Training needs have been identified through Term-1 activities, but a review of these needs will be conducted in conjunction with supervisory guidance to the Training & Research Section.

A tentative version of the overall training program has been prepared, but will be reviewed at the beginning of the year and modified flexibly as circumstances change.

A training database has also been created and is already accumulating data. The training database will be modified as needed for convenience.

[Activity 5-4] Prepare a manual for internal training management.

As for the Internal Training Supervision Manual, the first draft has been completed and the Output 5 Action Team has conducted training in accordance with it on a pilot basis. When the internal training is fully implemented in Term-3, the JICA Expert Team and C/Ps will check for consistency with the contents of the said manual and make appropriate revisions if there appear to be any discrepancies or defects. During the implementation of the project, trial and error will be repeated, and a final version

will be created by the end of 2025.

The manual has not yet been approved by KUKL, and the JICA Expert Team will continue to urge KUKL's internal approval process through the Nepalese project manager.

[Activity 5-5] Conduct trainings on internal training management targeting for the nominated staffs of Output 5 members and Human Resources Development Section.

By the end of Term-2, the members of the Action Team and the staff in charge of the Training & Research Section have already received training on the methods and know-how of training implementation.

Training on training supervisory skills will continue to be provided on a regular basis, especially for the staff of the Training & Research Section, which is primarily responsible for internal training.

The project is also considering providing training on training supervisory skills to all staff selected as internal training instructors through the TOT.

[Activity 5-6] Prepare training programs (modules) on the fields that the Project targets such as GIS, Hydraulic Analysis, Water Distribution Management, Water Quality Control, Water Treatment, Customer Management in collaboration with staff in the relevant section

The training plan (training modules) has been prepared by each output activities. However, as mentioned above, the schedule may be affected by external factors, and the timing of implementation will be flexible.

The JICA Expert Team will also support the Training & Research Section to deepen the relationship between the section and the training groups and departments in charge of each output, and to increase opportunities to discuss training plans in each field.

By the end of the project, the Training & Research Section will compile an internal training plan for the entire KUKL after the project.

[Activity 5-7] Prepare for trainings such as development of training materials, examination of how to measure the effectiveness of training, etc., in collaboration with staff in the relevant section.

Following the activities of Term-2, the Output 5 Action Team and the Training & Research Section will continue to provide lateral support in preparing for the implementation of training for each output. The involvement of the Training & Research Section will be further increased in Term-3.

In addition to supporting the preparation of individual training programs, the Training & Research Section will also review the evaluation methods of training programs in consultation with the relevant departments.

[Activity 5-8] Conduct training of trainers (TOT) in each area.

Following the activities of Term-2, the TOT for each output will be supported by the Output 5 Action Team and the Training & Research Section. The involvement of the Training & Research Section will be increased in Term-3.

[Activity 5-9] Conduct trainings. (Support training implementation as staff in charge of training management)

Following the activities of Term-2, the trainings for each output will be supported by the Output 5 Action Team and the Training & Research Section. The involvement of the Training & Research Section will be increased in Term-3.

[Activity 5-10] Summarize and review the results of trainings.

As implemented in Term-2, feedback surveys will be conducted at all training sessions by the Output 5 Action Team and the Training & Research Section, and the results will be input into a training database to analyze the good and bad points of each training session.

[Activity 5-11] Reflect the training results to next training plans.

The results of analysis obtained in [Activity 5-10] will be shared by the Output 5 Action Team and the Training & Research Section with each output group that conducted the training and related sections under their jurisdiction. If the result of analysis identifies areas for improvement or items to be added, they will be reflected in the training plan and content for the next term.

(2) Activities to be initiated in Term-3

Individual activities are mainly continuation and follow-up of activities from Term-2, and there are no new activities to be started in Term-3.

However, in order to sustain the project after its completion and to accommodate the internal training that will begin in earnest in Term-3, the project team has proposed two reorganizations as described below.

1) Enhancement of Training & Research Section

The Training & Research Section that should be responsible for implementing internal training, has had virtually no staff assigned to it since the project's inception, and discussions have continued with KUKL to resolve this issue.

In January 2023, one full-time staff member and one concurrent staff member were assigned to the section, but were replaced again in November of the same year by personnel transfer; two appointed staff members were assigned toward the end of Term-2, partly as a result of the resumption of recruitment at KUKL, which resulted in the hiring of several staff members.

The current staffing structure is a total of four, including the two concurrent staff members already assigned to the section.

Table 4.5.5 Staffing of the Training & Research Section

Staff	Current situation
Ms. Bina Khanal (Chief) *Replacement of predecessor Mr. Milan Thapa	(full-time) • Hired through Recruitment Process (2019/2020) and joined KUKL in November 2023 • Assistant Manager (Level 8) • A lot of experience in water supply projects as a civil engineer in NGOs and private consulting firms
Ms. Muna Chaulagain *Replacement of predecessor Ms. Santusha Kasapal	(full-time) • Assistant Computer Officer (Level 6) • Transferred from Baneshwor Branch Adm. • Plans to retire next year
Mr. Kabin Dhoj Adhikari	(Concurrent) • Supporting member of Output 5 • Concurrently serving in three other divisions
Mr. Akrur Nath Sharma	(Concurrent) • Core member of Output 5 • Concurrently serving in Planning and Support Department (Chief)

Following the enhancement of the Training & Research Section in January 2023, discussions were held with the Output 5 Action Team and the project manager on the KUKL side, and it was agreed that the training support tasks currently being carried out by the Output 5 Action Team would be gradually transferred to the Training & Research Section.

However, although progress has been made in strengthening the personnel of the Training and Research Section, the full-time chief, Mr. Bina Khanal, has just joined KUKL in November 2023 and is still in the process of building internal connections.

Ms. Muna Chaulagain, who supports the chief as secretary, has also just transferred from another bureau and is new to training-related work.

In addition, the two staff members who are concurrently assigned to other departments have heavy workloads and cannot be expected to provide support except in emergency situations. Currently, the precarious situation of the Training and Research Section has not been resolved, and the Action Team of each output will continue to provide support as needed until the Training and Research Section is able to conduct training programs on its own.

If the Training and Research Section becomes a stable organization, it must also be given the authority to take budgetary measures to sustain internal training.

The budget for internal training, which is under the jurisdiction of the project manager, is being negotiated with upper management to be allocated to the Training & Research Section. Ideally, the Training & Research Section should be given the authority for internal training, so that requests for training can be sent to the Training & Research Section from the training groups and related departments of each output, and the budget for each training will be allocated through the Training Division.

However, as of now, the Training & Research Section does not have the capacity to handle all training operations, so the first priority is to enhance the structure of the organization, including increasing the number of staff.

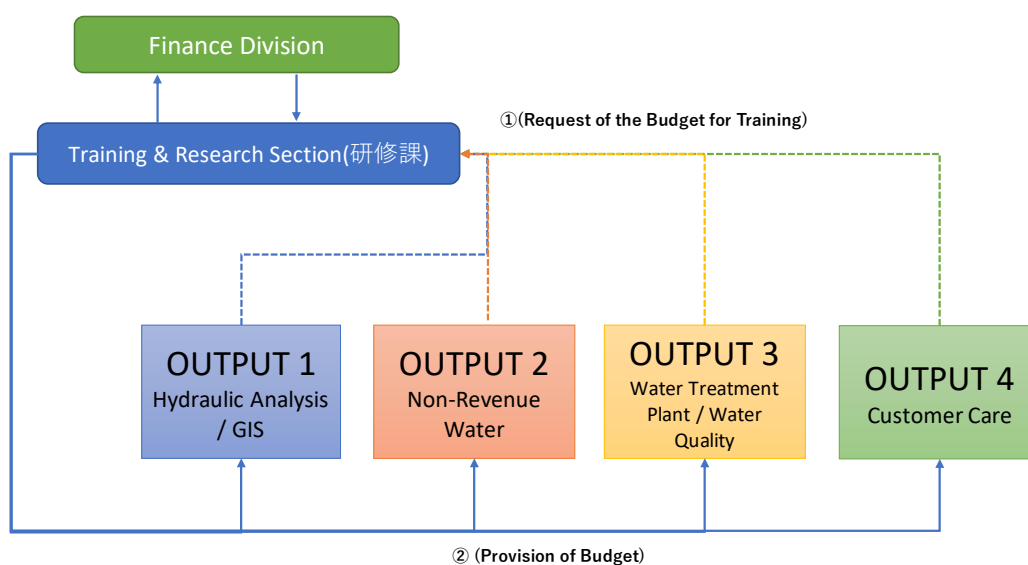


Figure 4.5.1 Budget process for training (draft)

Regarding internal training, which will begin in earnest from Term-3, the Training & Research Section should play a central role while providing lateral support for each training program. For this reason, the JICA Expert Team has been providing the chief of Training and Research Section with intensive training for internal trainers on an individual basis since the second half of the second term.

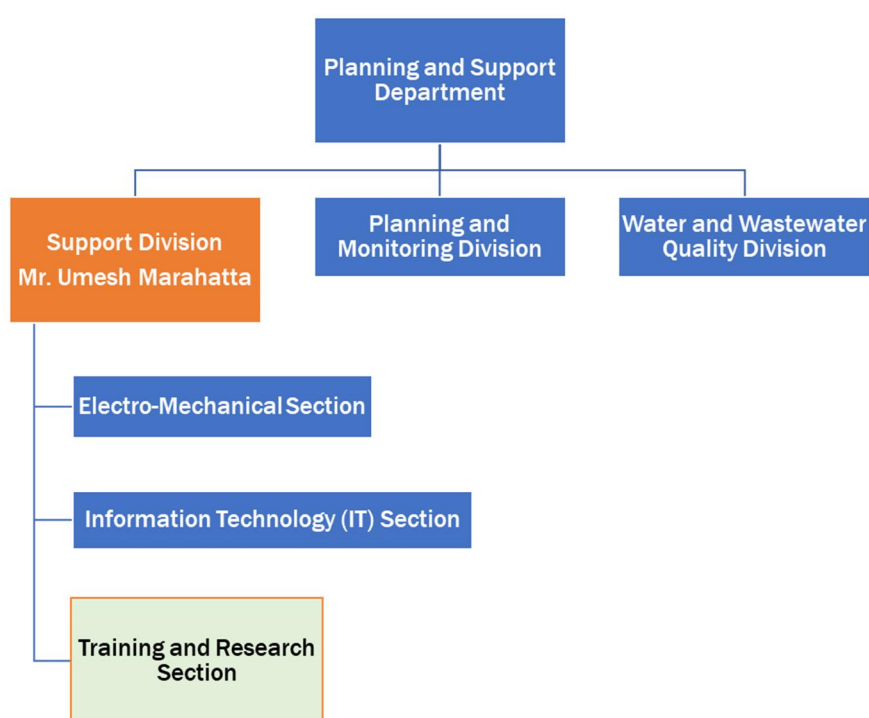


Figure 4.5.2 Organization chart related to the Training & Research Section

2) Reorganization of the Output 5 Action Team

As noted above, some members of the Output 5 Action Team may not have day-to-day work related to the technical theme of each Output. (e.g., the person in charge for training of Output 1 (GIS) is the chief of Tanker Section.)

Unlike other output groups, the Output 5 Action Teams will be dissolved after the completion of this project, and there were concerns from the beginning of the project about their sustainability. During the project period, a full-time staff member was assigned to the Training and Research Section, and an organizational structure to manage internal training is being established, but it is still difficult for the section to support all training programs under its current structure.

Considering this situation, the need for the reorganization of Output 5 Action Team was discussed in consultation with the project manager of KUKL and the Output 5 Action Team. Many of original members of the Output 5 Action Team had the same concerns about the sustainability of Output 5 as the JICA Expert Team, and finally agreed on the direction of the reorganization at the Output 5 members meeting on June 14, 2023.

As shown in the chart below, in the new organizational structure, for each output training, one or two staff members from the relevant department was selected to be included in the team for Output 5. (e.g., Outcome 4 - Customer Service training supervision is handled by Customer Relation Section staff)

The selection of the project team was decided in consultation with the KUKL project manager, the leader of Output 5 Action Team, and the JICA Expert Team.

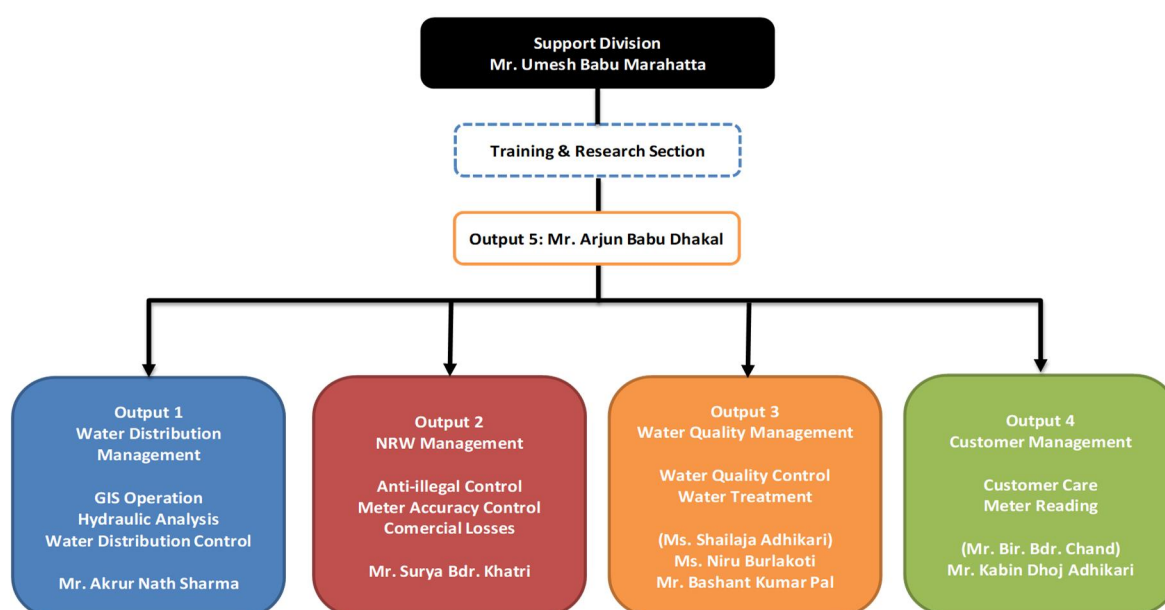


Figure 4.5.3 New Organizational Structure of Output 5 Action Team

As for the Output 5 Action Team, it will continue to be led by Mr. Arjun Babu Dhakal, and the new members will be in charge of training support for each output.

Supervisory training for newly appointed staff was conducted from June 14, when the reorganization was decided, until the end of the month, based on the training supervision manual and database.

Through discussions with the Chief of the Training & Research Section and the members of the Output 5 Action Team, the following assignments of tasks necessary for training supervision were determined, taking into consideration the current organization and work description of KUKL.

While the goal is that the Training & Research Section will eventually be responsible for all activities related to training support, for the time being the roles will be divided among the Training & Research Section, Output 5 Action Team, and the JICA Expert Team to conduct internal training until the Section is fully staffed.

Table 4.5.6 Work assignment of the main tasks of training supervision

Preparation Phase	Training Section	Output 5	JET	Relevant Output
1) Preparation of contents and schedule of Training			✓	✓
2) Selection of Trainers			✓	✓
3) Selection of Trainees				✓
4) Issurance of letter to Project Manager	✓			
5) Booking the classroom or venue	✓			
6) Preparation of teaching material (Textbook)			✓	✓
7) Preparation of stationary	✓			
8) Booking of Catering (Lunch and coffee break) and drinking water	✓			
9) Meeting with Trainers	✓			✓
10) Preparation of Certificates			✓	
Implementation Phase	Training Section	Output 5	JET	Relevant Output
1) Confirmation of classroom and facilities/equipment	✓	✓		
2) Confirmation of Catering Service	✓	✓		
3) Support for training	✓	✓		
4) Implementation of feedback survey	✓	✓		
Evaluation Phase	Training Section	Output 5	JET	Relevant Output
1) Input of the results of the survey in database		✓		
2) Share the results with the relevant Output group		✓		
3) Store the results in the Database	✓			✓

4.5.3 Activity timeline related to Output 5 in Term-3

The timeline of activities related to Output 5 for Term-3 is shown below.

Table 4.5.7 Timeline of activities related to Output 5 for Term-3

Planned Activities	2024												2025												2026		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
5-1: Identify the training necessary for KUKL staff.			●												●												
5-2: Prepare an overall training program (rough plan) necessary for KUKL staff.			●												●												
5-3: Prepare a database (on Excel basis) on training programs.			●																								
5-4: Prepare a manual for internal training management.			●																								
5-5: Conduct trainings on internal training management targeting for the nominated staffs of Output 5 members and Human Resources Development Section.				●											●	●											●
5-6: Prepare training programs (modules) on the fields that the Project targets in collaboration with staff in the relevant section																											
Sharing of training modules for each output activity			●																								
Reflection on KUKL internal training implementation plan			●																								
Assistance in preparing annual budget review documents			●																								
5-7: Prepare for trainings such as development of training materials, examination of how to measure the effectiveness of training, etc., in collaboration with staff in the relevant section.																											
Creation of training materials			●												●												
Study on how to measure the effectiveness of the training			●																								
Preparation for Training			●																								
5-8: Conduct training of trainers (TOT) in each area.			●	●																							
5-9: Conduct trainings. (Support training implementation as staff in charge of training management)			●	●																							
Enhancing the Training & Support Division at KUKL Head Office			●																								
Clarification of the role of the Training & Support Division			●																								
5-10: Summarize and review the results of trainings.			●	●																							
5-11: Reflect the training results to next training plans.			●	●																							

4.6 The 5th training in Japan

4.6.1 General

The following is an overview of the training programs in Japan to be implemented in Term-3. The theme of this training session is the acquisition of practical techniques that contribute to the reduction of non-revenue water, and there is little room for non-KUKL personnel to reflect this in their daily work. Therefore, the target participants will be selected between the JICA Project Team and the project manager of KUKL, and the trainees will be decided with the approval of JICA Head Office.

Table 4.6.1 Outline of the 5th training in Japan

Item	Contents
Objective	Technical training on non-revenue water reduction will be provided to ensure that the non-revenue water rate remains at a low level after the end of the project and that the water services are sustainable. The aim is to develop practical methods and a broader perspective, which can be applied to day-to-day operations in a manner appropriate to KUKL.
Target	To be selected 7 persons from Output 2 Core Members
Training place	Tokyo Metropolitan Government Waterworks Bureau / Tokyo Water Co., Ltd.
Expected output	Promotion of proactive activities and active involvement of counterparts in the project. The acquisition of knowledge and skills through training, the propagation of awareness through intra-organizational feedback upon return, and the synergies with project output.
Period	September 2024

4.6.2 Tentative schedule

Table 4.6.2 Schedule of the 5th training in Japan

Date	Time	Activities
Day 1		Transfer from KTM to Tokyo
Day 2	AM	Briefing in JICA Training Centre
	PM	Status and operational framework of water services in Tokyo
Day 3	AM	Historical challenges for leakage reduction in Tokyo
	PM	Site visit (Operating & Mapping System in Branch/Customer Call Centre)
Day 4	AM	Lecture about service connection facilities / Management of water tank owned by customer
	PM	Lecture about leakage around service connection and Mechanism of meter test bench
Day 5	AM	Practice in field (Leakage detection)
	PM	Flow control in DMA and minimum night flow
Day 6		Free
Day 7		Free
Day 8	AM	Raising awareness of improvement among staff (5Whys/5S/KAIZEN)
	PM	Training evaluation meeting, Opinion Exchange, Diplomat
Day 9		Transfer from Tokyo to KTM

4.6.3 Main contents of the training courses and aims of the training

Table 4.6.3 Contents of trainings and expected outcome

Contents		Day	Aims of Training
1. Overview of Water Works in Japan		1/4	<p>Although the operational frameworks of KUKL and Japan (Tokyo) are different, by comparing the operational systems, we will identify the common elements that are necessary to optimize the operation of water services in Kathmandu.</p> <p>In order to run the business well, it is important that water companies fully understand the purpose of the system and make the most of it in their operations.</p> <p>In addition, the training will help KUKL learn about systems that are good and unique to Japan and use them to improve the existing framework.</p>
1.1	Status and operational framework of water services in Tokyo (Local public enterprise management)		
	<ul style="list-style-type: none"> ➤ Independently financed system ➤ Beneficiary-pays system operating at the customer's expense ➤ The usefulness of a system that allows residents' representatives to be involved in decisions on important matters such as fees and budgets ➤ System of business management and corporate accounting that takes advantage of corporate efficiency ➤ Cooperate accounting system ➤ System in which the government guarantees the issue of bonds as a financial resource 		
1.2	Status and operational framework of water services in Tokyo		
	<ul style="list-style-type: none"> ➤ Accreditation System ➤ Water Quality Standards and Requirements for facilities ➤ Details of the supply provisions ➤ Facilitating the creation of policies/plans ➤ Induction through subsidy schemes ➤ Regulations on service connection facilities 		
2. Tokyo Waterworks' history of challenges and responses		1/4	<p>To learn about the challenges that Tokyo Waterworks has experienced and good practice in overcoming them over a long span of time, from the post-war reconstruction period. To learn about the challenges that Tokyo Waterworks has experienced and good practice in overcoming them over a long span of time, from the post-war reconstruction period.</p> <p>As a member of the executive staff, it is important to learn about the challenges of sustainable management of metropolitan capital water systems and how to respond to them, and to use this information to improve KUKL.</p>
2.1	Tokyo Waterworks' history of challenges and responses (Water Resource and Facilities)		
	<ul style="list-style-type: none"> ➤ Measures against shortage of water resources (national initiatives (Full Plan, Water Resources Authority), mutual exchange, effective use of dams) ➤ Measures to address shortfalls in water treatment plant capacity (fast-track construction) ➤ Equalization of water distribution ➤ Water pollution (wells/river pollution/advanced treatment) ➤ Measures against ageing of facilities ➤ Measures against disaster ➤ Tasty water 		
2.2	Tokyo Waterworks' history of challenges and responses (Administration/Finance)		
	<ul style="list-style-type: none"> ➤ History of the tariff revision ➤ History of securing financial resources such as bonds ➤ History of the management plan ➤ Organizational structure ➤ Dealing with the particular problem in Tama Rural District ➤ Ground subsidence prevention 		
3. Preventive measure of leakage			<p>To obtain an understanding at this stage of an overview of the physical leakage control measures that will be needed after the project, and to understand the need for remedial and preventive measures.</p>
3.1	Historical challenges of leakage prevention in Tokyo	1/2	
	<ul style="list-style-type: none"> ➤ Historical development of leakage repair ➤ Historical development of leakage detection device ➤ Historical development of leakage reduction planning ➤ Historical development of service connection material ➤ Improvement of distribution network system 		
3.2	Field Trip	1/2	
	<ul style="list-style-type: none"> ➤ Field work of leakage detection work ➤ Observation of training facilities 		
3.3	Field Trip	1/2	
	<ul style="list-style-type: none"> ➤ Field work ➤ Observation of operation system and mapping system in branch and customer call centre 		
4. Service connection and water meter			<p>To understand the importance and content of commercial loss prevention measures and to envisage their application in Kathmandu in detail</p>
4.1	Service connection and metering facilities	1/2	
	<ul style="list-style-type: none"> ➤ Lecture 		
4.2	Meter reading and management of water meter	1/4	

Contents		Day	Aims of Training
	➤ Lecture		
	4.3 Field Trip	1/4	
	➤ Water meter management centre		
5. NRW reduction planning			To learn how to plan for the future need for non-revenue water reduction.
	5.1 Lecture about NRW reduction planning method	1/2	
6. Special Topic			To learn tips on how to raise awareness and encourage staff to take an active role in improving their work.
	6.1 Improvement system "Kaizen"	1/4	
	➤ 5Whys/5S/Kaizen Lecture in Workshop style		

Chapter 5: Issues, ingenuities, and lessons
learned in implementation and operation of the
Project

Chapter 5: Issues, ingenuities, and lessons learned in implementation and operation of the Project

5.1 Project implementation structure

The project implementation structure, including the JICA expert team, is as follows.

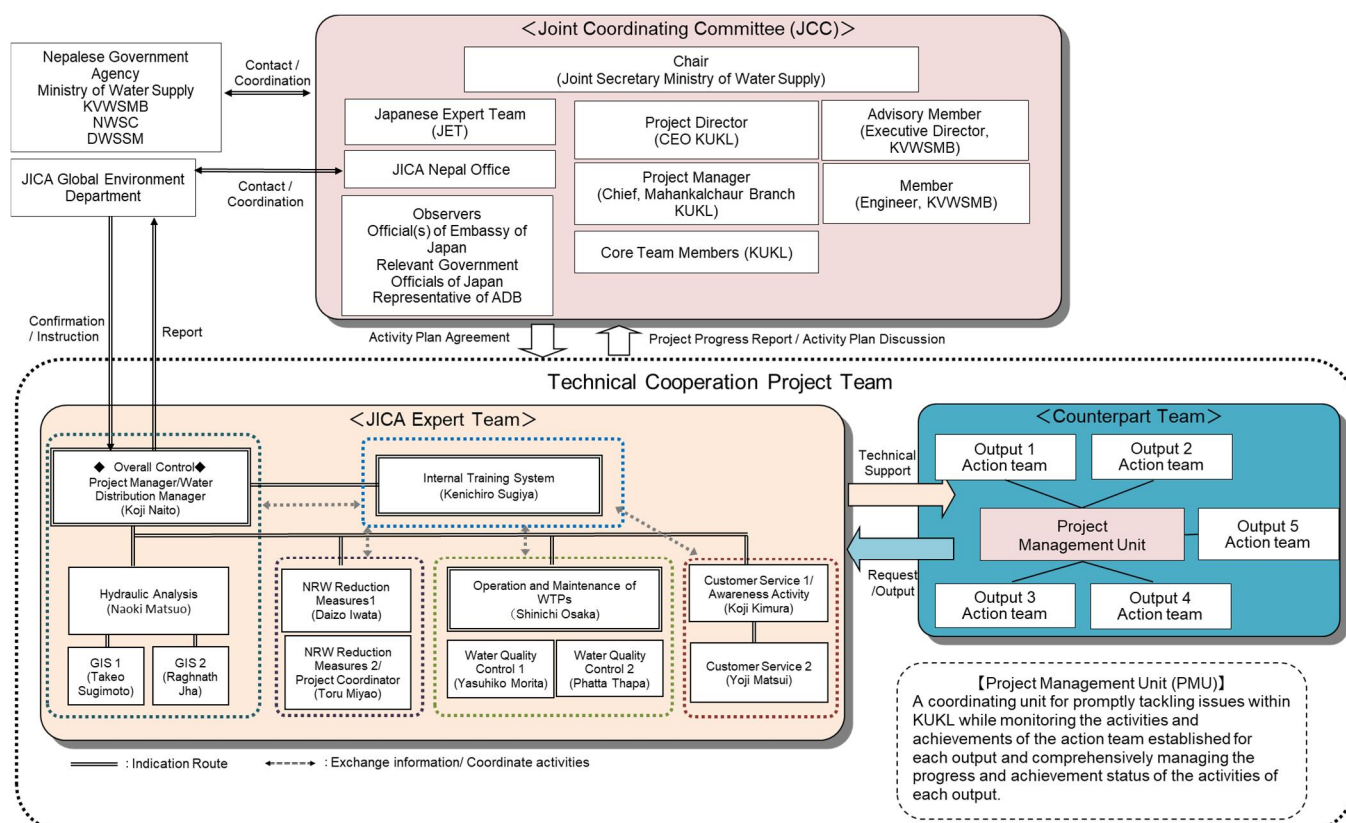


Figure 5.1.1 Project Implementation Structure

[Issues]

This project was initiated in a situation where the spread of Covid-19 infection continued and it was difficult for the JICA experts to travel to Nepal. Under the constraints of remote management, the issues were to ensure that understanding of the technical cooperation project concept and activities was disseminated, to ensure smooth communication and coordination between the JICA Expert Team and Nepalese counterparts, and to clarify the division of roles for various decision-making aspects of the project activities.

[Ingenuities]

The JICA Expert Team requested the Nepalese government agencies and KUKL to appoint appropriate counterpart personnel at the pre-meeting and the kick-off meeting, and built consensus and coordination in the individual meetings with KUKL counterparts (herein after referred to as C/P).

In addition, in order to ensure that this implementation system would continue after the project started and that the C/P would be actively involved in the project activities even when the JICA Expert Team were away from Nepal, several local engineers were employed by the JICA Expert Team to ensure smooth communication between the JICA Expert Team and Nepalese sides.

In particular, the Technical Advisor is a staff member who was working on Kathmandu's water supply projects as the Technical Director of KUKL for many years and plays a major role in liaison and coordination not only with KUKL but also with MoWS and KVWSMB.

Table 5.1.1 Local engineers employed by the JICA Expert Team

No	Name	Position	Supporting Work
1	Tilak Bhandari	Technical Advisor	<ul style="list-style-type: none"> ➤ Liaison with upper management of MoWS and KUKL ➤ Work instructions to KUKL branch offices
2	Pankaj Bhandari	Chief Assistant Engineer	<ul style="list-style-type: none"> ➤ Monitoring of work progress related to Output 1 to 5 ➤ Technical support for JICA experts related to Output 3 to Output 5 ➤ Monitoring of progress of Melamchi Water Supply Project ➤ Technical guidance to KUKL in the absence of JICA experts ➤ Coordination of online meeting
3	Palpasa Prajapati	Assistant Engineer	<ul style="list-style-type: none"> ➤ Technical support for JICA experts related to Output 1 to Output 2 ➤ Management of procured equipment ➤ Local expenses management ➤ Other secretarial work

5.2 Project operation and management structure on the Nepalese side

The structure for operation and management of this project on the Nepalese side is shown below.

[Issues]

In this project, it was considered necessary to create a system that would enable KUKL to tackle the issues by monitoring the activities and performances of the action teams set up for each output, and by comprehensively managing the progress and achievements of the activities for each output.

[Ingenuities]

It was proposed, and agreed by KUKL, to establish a Project Management Unit (PMU), separate from the Joint Coordinating Committee (herein after referred to as JCC), to facilitate the management of the overall project progress and information sharing, as well as to resolve issues quickly. The PMU members consisted of the Action Team Leaders for each output and the Nepalese Project Manager for this project.

The Action Teams for each output consist of core members within KUKL. The Action Teams will develop the activities defined in the PDM in collaboration with the JICA Expert Team, and supporting members selected from the Head Office and each branch office will also participate in the activities for on-the-job training, technical guidance and internal trainings.

The JCC is a decision-making body consisting of upper management from MoWS, KVWSMB, and KUKL, and is responsible for reviewing the progress of project activities and removing impediments to those activities.

On the other hand, the PMU, consisting of core members who actually participate in project activities, functions as a forum for the practical consensus building of the project and a place where the C/Ps of each output can actively exchange opinions.

By establishing a PMU consisting of managerial staff of KUKL, the project members are not only able to take the lead in resolving issues, but are also able to report to JCC members in a timely manner through the PMU.

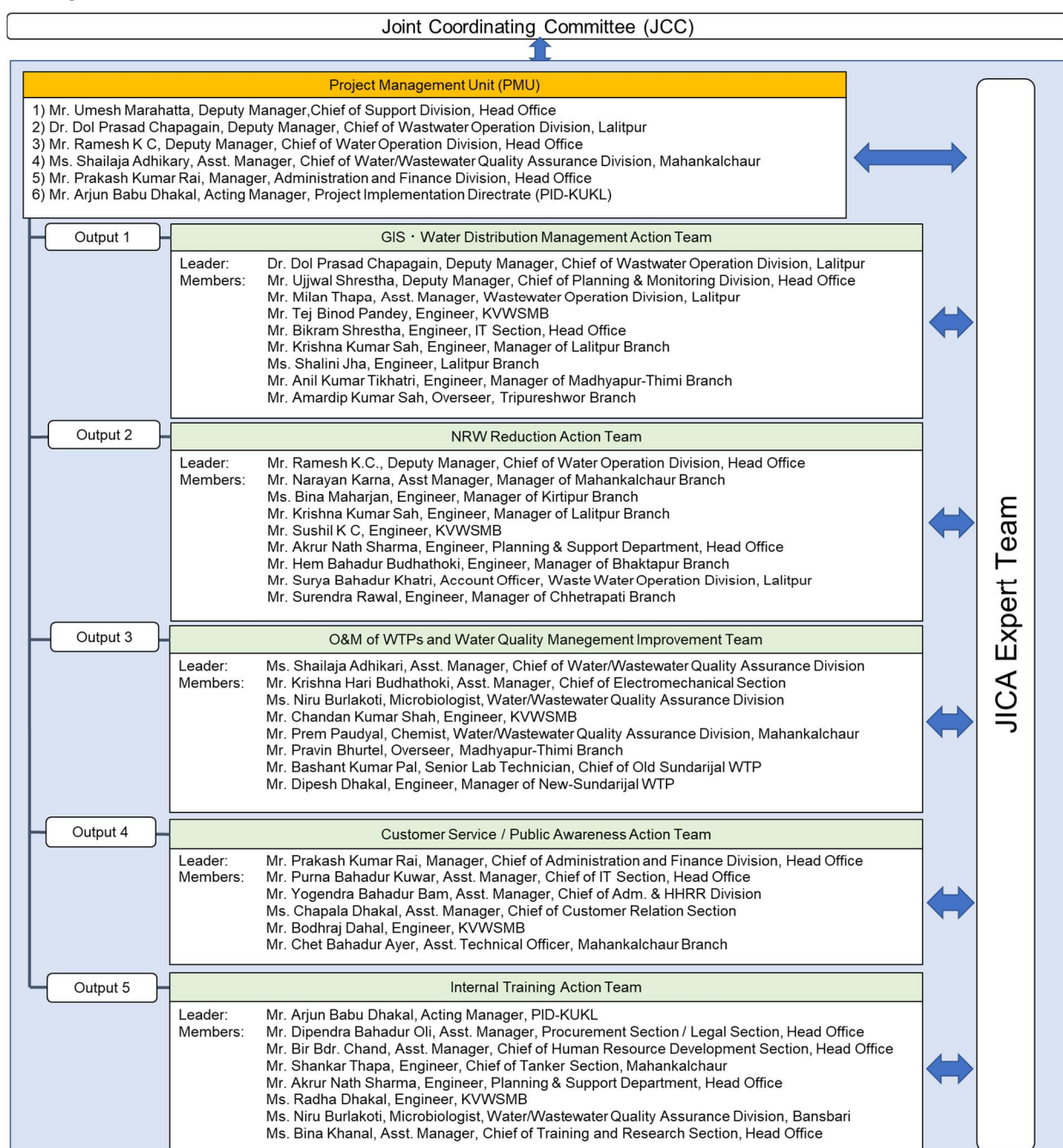


Figure 5.2.1 Project Operation and Management Structure on the Nepalese side

5.3 Various online meetings under the Covid-19 Pandemic


[Issues]

At the start of this project, the global spread of Covid-19 was continuing, making it impossible for the JICA Expert Team to enter Nepal. Therefore, during the period from March to August 2021, the challenge was to use local engineers to gather information from relevant organizations on the Nepalese side, as well as to explain, foster understanding, and build consensus on the draft work plan through teleconferences. The following are some ideas and solutions for this purpose.

5.3.1 Preliminary meeting

The detailed planning study for the project was carried out in 2017 and more than three years had passed since then. Therefore, a meeting was held with the current managerial staff of KUKL to review the background of the project implementation, the overview, the required outputs and the agreement stipulated in R/D.

Table 5.3.1 Outline of the Preliminary Meeting

Item	Contents
Date and time	March 12, 2021, 14:00 - 15:30 (Nepal Standard Time)
Type	Web conference of MS Teams
Purpose	Explanation about an overview of the project, introduction of JET members and a preliminary briefing on the expected timetable, prior to the launch of the project.
Items of discussion	<ol style="list-style-type: none"> 1. Background and outline of the project 2. Project concept 3. Activities of each output 4. Implementation structure of the project 5. Overall schedule 6. The 1st training in Japan 7. Undertakings by Nepalese side agreed in R/D 8. Detail steps after preliminary meeting
Participants	<p>[Nepalese side: 5]</p> <ul style="list-style-type: none"> • Mr. Milan Kumar Shakya (CEO) • Mr. Umesh Babu Marahatta (Deputy Manager/Mahankalchaur Branch Manager) • Mr. Gyanendra Bahadur Karki (Act. Deputy CEO/ Planning and Support Department) • Mr. Satish Kumar Dutta (Act. Deputy CEO/ Water Supply Division) • Mr. Dipendra Bahadur Oli (Asst. Manager/ Human Resource Section) <p>[Japanese side: 11]</p> <ul style="list-style-type: none"> • JICA Nepal Office: 2 • JICA Expert Team: 7 • Local engineer of JICA Expert Team: 2
Photo	

5.3.2 Kick-off meeting

The results of the pre-meeting confirmed that the Nepalese side fully understood the agreements reached during the detailed planning process, and that they had high expectations for the project. To this end, a kick-off meeting was held to formally launch the project activities and to explain the draft work plan prepared by the JICA Expert Team.

At the kick-off meeting, the JICA Project Team explained to the members of the Joint Coordinating Committee (JCC) and the C/Ps of KUKL who are responsible for leading each output. The discussion at this meeting focused on the background of the project formation, the basic policies of the activities, and the composition of the JICA Expert Team.

Table 5.3.2 Outline of the Kick-off Meeting

Item	Contents
Date and time	April 21 st , 2021, 10:15 - 11:45 (Nepal Standard Time)
Type	Web conference of MS Teams
Purpose	Explanation of the Work Plan and confirmation of progress of related projects
Items of discussion	<ol style="list-style-type: none"> 1. Explanation of the Work Plan (draft) <ul style="list-style-type: none"> - Background and outline of the Project - Basic policy for implementation of the Project - Activities of each output - implementation structure of the Project - Total schedule of the Project - Plan of 1st Training in Japan - Undertakings by Nepalese side based on R/D - Steps of activities after kick-off meeting 2. Progress of Melamchi Water Supply Project and its concerns
Participants	<p>[Nepalese side: 16]</p> <ul style="list-style-type: none"> • Mr. Sunil Kumar Das (Joint Secretary, Ministry of Water Supply) • Dr. Sanjeev Bickram Rana (Executive Director, KVWSMB) • Mr. Milan Kumar Shakya (CEO, KUKL) • Mr. Satish Kumar Dutta (Act. Deputy CEO/ Water Supply Division, KUKL) • Mr. Gyanendra Bahadur Karki (Act. Deputy CEO/ Planning and Support Department, KUKL) • Mr. Bijay Timilsina (Deputy CEO, KUKL) • Mr. Prakash Kumar Rai (Deputy Manager, Chief of Administration and Human Resources Division) • Mr. Ramesh K C (Deputy Manager, Manager of Maharajgunj Branch) • Mr. Umesh Babu Marahatta (Deputy Manager, Manager of Mahankalchaur Branch) • Dr. Dol Prasad Chapagai (Deputy Manager, Manager of Lalitpur Branch) • Mr. Purna Bahadur Kuwar (Asst. Manager, Chief of IT Section) • Mr. Dipendra Bahadur Oli (Asst. Manager/ Human Resource Section) • Ms. Chapala Dhakal (Asst. Manager, Chief of General Administration Section) • Ms. Bina Maharjan (Engineer, Chief of New Sundarijal WTP) • Mr. Tires Prasad Khatri (Chairman of KUKL Board and Executive Director of Melamchi Water Supply Development Board) • Dr. Mahesh Prasad Bhattarai (Technical Expert, ADB Advisor) <p>[Japanese side: 19]</p> <ul style="list-style-type: none"> • JICA Headquarters: 4 • JICA Nepal Office: 2 • JICA Expert Team: 11 • Local engineer of JICA Expert Team: 2

Item	Contents	
Photo		

5.3.3 Kick-off meeting with the Action Teams

After the pre-meeting and the kick-off meeting with JCC members, the understanding of the project on KUKL side was deepened and the allocation of the C/P proceeded according to the agreement on R/D. Subsequently, several meetings were held with the action teams of each output in order to distribute the draft Work Plan to the members responsible for the actual project activities and to explain the details of activity policy and concrete implementation methods according to the PDM.

Through a series of meetings, the JICA Expert Team and C/Ps of KUKL exchanged opinions and answered questions, deepened mutual understanding of the content of the work plan and agreed on the content of activities in Term-1.

Table 5.3.3 Comments in the kick-off meetings with Action Teams

Date	Team	Comments
May 9 th , 2021	Output 5	<ul style="list-style-type: none"> ➤ The Training and Research Section has two staff members, Mr. Bir Bahadur Chand and Mr. Kahin Dhoj Adhikari, both of whom are administrative staff. ➤ In most of the past trainings, KVWSMB prepared the training programmes for the KUKL staff and all the expenses related to the trainings were covered by KVWSMB. ➤ The main role of the Training and Research Section was to consult and coordinate with KVWSMB on training for newly employed staff. In 2021, no training has been conducted due to the COVID-19 disaster, but in the past, trainings in construction management, AutoCAD, EPANET (pipe network analysis), etc. were conducted. ➤ One of KUKL's top priorities is training for newly recruited staff. In 2021 we have already recruited 53 staff, who will start work at KUKL within three months. KUKL's task in conducting the internal training is only to list the participants at the moment, and KVWSMB is the main organizer of the training.
June 18 th , 2021	Output 1 /Output 2	<ul style="list-style-type: none"> ➤ The training sought by KUKL is in GIS, hydraulic analysis and non-revenue water reduction techniques. KUKL would like to use this training to strengthen our skills, especially for newly hired staff. ➤ The water diversion tunnel from Melamchi River will be out of operation for approximately two months from Tuesday 15 June 2021 for inspection. However, due to the damage around the intake caused by the record high water levels in the Melamchi River, it is uncertain whether the water supply from the Melamchi can be resumed within the next few months. Fortunately, the water diversion tunnel was temporarily out of operation and thus escaped damage, but delays in the Melamchi water conduction may also affect activities under Output 1 and Output 2. It is possible to carry out the necessary training ahead of schedule and KUKL would like to proceed. ➤ KUKL has high expectations for this project activity, as they understand that training in non-revenue water control, water

Date	Team	Comments
		<p>distribution management (GIS, hydraulic analysis), and improving customer service management and internal training are extremely important issues.</p> <ul style="list-style-type: none"> ➤ We believe that there is a need for a manager-level person at head office who can work with Japanese experts and branch office staff. ➤ The current lack of staff in the Operations Department of KUKL makes it difficult to co-ordinate tasks as diverse as GIS, NRW, hydraulic analysis and planning. Non-revenue water is monitored by the PMU section and there is little control at branch level. In the future, KUKL is working on improving the organization, but after the GIS data of the DNI by PID is handed over, it is necessary to form a non-revenue water unit.
June 28 th , 2021	Output 3	<ul style="list-style-type: none"> ➤ The O&M of the New Sundarijal WTP started on June 6th, 2021, with technical assistance in water treatment technology and operation of the facility. As disinfection using chlorine gas, SCADA, etc. are very different from the manual based operation in existing water treatment plants, KUKL expects technical support through the project. ➤ Support for the operation and management of the New Sundarijal WTP will be the first priority of the project, but support for operational improvements at other plants will also be considered. ➤ JET is aware that there are challenges in the operation and management of the New Sundarijal WTP, but JET hopes that KUKL will work with the contractor to resolve them while JET cannot travel to the site due to Covid-19 pandemic. ➤ JET would like to see through future teleconferences if there is anything possible in the project in solving the problem. ➤ Today's meeting was extremely fruitful because, unlike the kick-off meeting, it was attended by staff actually engaged in the activity. ➤ The JICA project is also considering support for the operation and maintenance of existing WTPs, but it must be understood that the project will not cover all the needs of the water treatment plant operation and management staff identified today. ➤ The issues that have been identified at the New Sundarijal water treatment plant need to be addressed by KUKL and KUKL would like to consider meeting with the Melamchi Water Supply Development Committee and contractors.
June 24 th , 2021	Output 4	<ul style="list-style-type: none"> ➤ Despite being an organization positioned in water service provider, customer service has not been a high priority for KUKL. For this reason, the activities undertaken in the project are extremely interesting. Customer satisfaction surveys should clarify the roles and responsibilities of the different departmental levels (head office and branches), while head office should play a stronger role in dealing with customers. ➤ The IT section can also play an important role in customer satisfaction surveys. Based on the experience/knowledge of the Japanese water utilities and the various ideas from the expert team, JET would like to go on deciding on a specific method. ➤ It is important to involve a wide range of KUKL staff from the first customer satisfaction survey. Once the work plan has been agreed, discussions will begin on specific activities. ➤ With his wealth of experience in the Tokyo Metropolitan Government's Waterworks Bureau, KUKL has high hopes for Mr Matsui, and it is worth considering the use of mobile device applications developed by KUKL. ➤ At present, customer complaints by KUKL are dealt with by telephone, SMS and counter visits, but the number of complaints dealt with is very low. However, there is still a lack of progress in the development of systems for dealing with customer complaints, and the use of IT can be a way of increasing efficiency and saving money. In addition to senior management, capacity building in customer service improvement should be implemented in mid-level and end-level customer-facing departments. ➤ The area covered by the customer satisfaction survey is assumed to be

Date	Team	Comments
		DNI Stage 1, when the DNI project switches to water supply via a new distribution network. As the project is expected to significantly increase customer satisfaction, a customer satisfaction survey to measure baseline values will be carried out in 2021, before the switchover to the new water distribution system.

5.4 Support for the handover of operation and management of the New Sundarijal WTP

[Issues]

The present technical cooperation project by JICA was formulated planned on the assumption that the operation and maintenance of the New Sundarijal WTP would be handed over to KUKL. At the start of the project, however, the process for the handover had not materialized, and the contractor was responsible for the minimal maintenance of the plant from the completion of construction.

[Ingenuities]

Therefore, the JICA Expert Team was required to coordinate with the JICA Nepal office to provide lateral support to ensure the handover of operation and management of this water treatment plant. The following are some ideas and solutions for this purpose.

5.4.1 Confirmation of direction for resumption of operation of the New Sundarijal WTP

With the prospects for early reopening of the Melamchi Water Diversion Tunnel uncertain due to the flooding that occurred in June 2021, utilizing the existing intake from the Bagmati River was sole realistic option to keep the operation and maintenance of the water treatment plant on track.

So far, commissioning after the construction of the water treatment plant has been done by taking water from the Bagmati River, and KUKL believes that during the rainy season from July to November, 40 to 100 MLD of water can be conducted by the existing two pipelines and one water pipeline being expanded.

The JICA-funded Phase 1 facility, named WTP01, has a capacity of 85 MLD, and the JICA Expert Team and KUKL have worked to ensure maximum water conveyance from the Bagmati River and that technical assistance through this project can start as soon as possible, even though operation of this treatment plant will be limited to the rainy season.

KUKL made a request to the KVWSMB for an early handover of operational management under the recommendation of the JICA Expert Team, and also discussed with the KVWSMB to realize the O&M training that has not yet been implemented by the contractor.

5.4.2 Creating a system for taking over the operation and management of the new Sundarijal water treatment plant

While KUKL has been in deliberations with MoWS and KVWSMB to realize the handover of operation and management of the New Sundarijal WTP, the JICA Expert Team assisted KUKL in preparing documents on its staffing and budget plan to ensure the implementation of the operation and management. In particular, the recommendations of JICA Expert Team regarding the job descriptions of the operators, working program in shift, and personnel to be assigned were reflected in the draft plan to be submitted by KUKL to the KVWSMB.

Furthermore, since a strong initiative on the part of KUKL must be demonstrated to the relevant organizations in order to realize the handover, the following scenario was discussed with JICA Expert Team and KUKL.

- Continue contractor-led operations management until KUKL is ready to accept the contractor, and assign existing KUKL personnel to staff the contractor (like a temporary transfer).
- After several months of joint operation, the operation management will be switched to KUKL-led operation management when the KUKL side is fully staffed and material procurement is completed. In that case, the contractor will continue to assign an operations management advisor.
- After the final stable operation and management continues, the operation and management will be shifted to KUKL sole operation and management.

As a result, the water treatment plant resumed operation almost according to this scenario, and the handover of operation and management was completed in March 2023. To make up for the shortage of personnel on the KUKL side, several operators who had previously been engaged in operation and management on the contractor side were switched to employment with KUKL, working as full-time staff. As mentioned below, KUKL has been responsible for the operation and management of the water plant since March 2023, and the personnel assigned to the plant at that time are listed below:

Table 5.4.1 Staff list of the New Sundarijal WTP (as of March 2023)

No	Name	Occupation	Position	職位レベル
1	Mr. Dipesh Dhakal	Electro. Mechanical Dept.	Engineer	7
2	Mr. Jhanak Thapa	IT Section	Ass. Computer Officer	6
3	Mr. Deepak Thapa	Electro. Mechanical Dept.	Overseer	5
4	Mr. Laxman Chaudhary	Civil	Overseer	5
5	Mr. Sudarshan Katri	Civil	Senior Plant Operator	5
6	Ms. Neha Adhikari	IT Section	Overseer	5
7	Mr. Ramesh Khatree	Electro. M	Supervisor	5
8	Mr. Jayaram Parajuli	Electro. M	Plant Operator	4
9	Mr. Puranjan Nepal	Lab	Lab Technician	4
10	Mr. Pradip Adhikari	Civil	Senior Plumber	4
11	Mr. Mod Raj Dahal	Administration	Asst. Admin Officer	6
12	Mr. Sanjeeb Shrestha	General	Driver	Temporary
13	Mr. Amardip K. Sah	Civil	Overseer	5
14	Mr. Bhim Pr. Koirala	Electro. M	Supervisor	5
15	Mr. Sarbagya Pratap Pradhan	Electro. M	Supervisor	5
16	Mr. Dinesh Adhikari	Lab	Senior Lab Technician	5
17	Ms. Sachita Dhital	Lab	Senior Lab Technician	5
18	Mr. Ram Brd. Lama	Electro. M	Senior Mechanics	4

No	Name	Occupation	Position	職位レベル
19	Mr. Kunjan K C	Electro. M	Pump Operator	4
20	Mr. Kiran Brd Khadka	Electro. M	Pump Operator	4
21	Mr. Sumit K. Sah	Electro. M	Senior Mechanics	4
22	Mr. Shyam Bohara	Electro. M	Pump Operator	4
23	Mr. Bahadur Lama	Electro. M	Pump Operator	4
24	Mr. Sita Ram Adhikari	Electro. M	Asst. Pump Operator	3
25	Mr. Kedar Raut	Civil	Valve Operator	1
26	Mr. Binod Sinkhada	Civil	Valve Operator	1
27	Mr. Sujal K. K.C	Civil	Labour	1

Note *1: No. 1 to No. 12 have already been appointed in June 2021

5.4.3 Roadmap for the handover of operation and management of New Sundarijal water treatment plant

The JICA Expert Team was unable to be involved in the creation of a roadmap for the handover of operation and management of the water treatment plant, but provided advice to KUKL and KVWSMB on a series of discussions.

The final roadmap was confirmed by a meeting held at MoWS on December 6, 2022. The meeting was chaired by the Ministry of Water Supply (Secretary: Mr. Maniram Gelal, Joint Secretary: Mr. Tires Khatri) and attended by the Melamchi Water Supply Development Board (MWSDB), Kathmandu Valley Water Supply Management Board (KVWSMB), Project Implementation Directorate (KUKL-PID) and KUKL. The main items identified are listed below.

i. Official Handover of WTP01/02 to KVWSMB (Completed)

MWSDB shall complete the handover of all the completed WTP01/02 i.e. all the related design, Contract documents/ As built drawings / SOP/spares etc. in the next 15 days. KVWSMB will in turn officially complete the further handover process to KUKL within 15 days of taking over from MWSDB

ii. 90 Days Extension of O&M of WTP (Completed)

A triparty MOU between MWSDB, KVWSMB and the Contractor VA Tech Wabag shall be completed for further 90 days i.e. till 10th March 2023. The MOM shall be on the same lines as was agreed previously. The full responsibility of O&M shall be of the Contractor while KUKL staff will learn the job. This is to avoid contractual complications.

iii. Resources for O&M (Completed)

KVWSMB shall ensure the financial part to KUKL for O&M. However, there are other modalities to support KUKL in O&M after 90 days hand holding can be reviewed i.e. either inviting bids for operation or operate WTP fully through KUKL. As of December 2023, KUKL is responsible for the operation and management of the plant with the necessary staffing.

iv. Start of 90 Days on the Job- Learning (Completed)

From 10th December 2022 onwards, the 90 days on the job learning (O&M) by KUKL shall commence. From 11th March 2023, KUKL will start O&M on their own.

v. KUKL Team for On-the-Job Training (Completed)

MWSDB shall organize discussion sessions on 10th December 2022, to brief KUKL regarding the

official process for procurement of liquid chlorine from India and also on the present O&M manpower / WTP SOP of Contractor. KUKL based on the understanding of O&M of WTP, shall work out KUKL manpower list for 24/7 O&M and shall submit to Valley Board/ Ministry by 25th December 2022.

5.4.4 Check of completion documents and equipment inventory for the New Sundarijal water treatment plant

The JICA Expert Team advised KUKL on the following items to be implemented by KUKL in the handover of the operation and management of the water treatment plant.

[Handover of WTP01&WTP02]

- i. Confirmation of complete functional manifestation of the water treatment plant facilities and various equipment. In case of defects, KUKL requests improvements through KVWSMB.
- ii. Compare the inventory of PAC, slaked lime, and chlorine gas with the contracted volumes
- iii. Confirm the condition and quantity of equipment/spares provided by contractor
- iv. Checking the whereabouts of completion documents, instruction manuals, etc.

[Information necessary for future operation and maintenance]

- i. Identification of potential contractors (e.g., SCADA, Mini-hydro, etc.) for equipment that is difficult to be maintained and managed by KUKL itself.
- ii. Identify contact information for procurement of additional spare parts, such as chlorine injection equipment, flocculant injection equipment, etc.

5.4.5 Participation in O&M training conducted by the contractor

(1) The 1st O&M Training

Post-construction O&M training for the water treatment plant was included in the TOR for the water treatment plant construction contract. The first O&M training was conducted in June 2021.

Understanding the content of this O&M training, the technical level of the attendees, and the needs for technical assistance in this project is important for planning the activities for Output 3. However, since JICA experts could not be dispatched due to the travel restrictions caused by Covid-19 Pandemic, local staff contracted by JICA Expert Team was sent to the series of trainings as observers, with permission from the KVWSMB.

Table 5.4.2 Plan of the 1st O&M Training in the New Sundarijal WTP

Item	Contents
PS 1.26 Training O&M	1. General Field Training
PS 1.27 Training WTP General	2. Safety 3. Emergency Procedures 4. Treatment Process 5. Laboratory Process & Monitoring 6. Operation & Maintenance Training 7. Plant Operations 8. Plant Maintenance

Table 5.4.3 Participants from KUKL in the 1st O&M Training

No	Name	Position
1	Bina Maharjan	Civil Engineer
2	Pratigya Thapa	Microbiologist
3	Sunil Kumar Sah	Civil Engineer
4	Laxman Chaudhary	Overseer
5	Tayaram Parajuli	Plant operator
6	Ramesh Khatree	Supervisor
7	Deepak Thapa	Overseer
8	Shiva Basnet	Ass. Accountant
9	Moda Raj Dahal	Officer
10	Jhanak Thapa	Ass. Computer officer
11	Dipesh Dhakal	Electrical Engineer
12	Prem Paudal	Chemist
13	Dinesh Adhikari	Lab Technician
14	Bikram Acharya	Civil Engineer
15	Chaturman Shrestha	Supervisor
16	Bashant Kumar Pal	Superdense
17	Puranjan Nepal	Lab Assistant

The first phase of O&M training, which consisted mainly of an introduction to each facility and a classroom lecture on general technology, began on June 6, 2021 and lasted three weeks. 17 employees from KUKL participated in the training, and upon completion of the training series, they would be assigned to manage operations as full-time employees.




This was the first O&M training since the opening of the water conduction tunnel. As a result, the O&M training consisted largely of site visits, facility inspections, and lectures on design details and water treatment theory, and there was not enough time for training on how to practically use the facilities for operation.

Participants' comments strongly requested training in practical operation and maintenance techniques, confirming the need for training to acquire actual facility operation and management techniques.

In particular, the OJT content of this project was to be fleshed out after additional training was provided by the contractor for equipment such as pumps, chemical dosing equipment, chlorine gas dosing equipment, and SCADA.

Subsequently, the O&M training continued to be interrupted due to the Melamchi River flood damage that occurred shortly after the start of the June 2022 rainy season and the opportunity to operate the plant under its original design conditions was lost. Therefore, JICA Expert Team assisted KUKL in submitting a request to the KVWSMB to materialize the additional O&M training required by KUKL staff and a roadmap for early handover.

[Photograph] The 1st O&M Training by the Contractor

		
Checking supervising monitor in the central control room	Operation of chlorine gas injector facilities	Operation of Electric-powered Gate

(2) The 2nd O&M Training

Operation of the Melamchi Water Diversion Tunnel resumed on November 28, 2022, and the contractor's water treatment plant resumed operation.

Table 5.4.4 Time-series changes in water conduction from the Melamchi River

Date	Water Conduction Status
28/November/2022	Started injecting water into Melamchi Water Diversion Tunnel
3/December/2022	Stopped water conduction from the Bagmati River
6-7/December/2022	Flashing & sludge removal from the tunnel
8/December/2022	Water conduction with the amount of 25.3 MLD from the Melamchi River to New Sundarijal WTP
9/December/2022	Inauguration by MoWS at Mahankalchaur Started water supply to the Kathmandu Valley

The water conduction from the Melamchi River was increased in stages, and as of December 17, 2022, the planned value of 170 MLD was achieved. Considering this situation, the suspended O&M training for the New Sundarijal WTP resumed in December 2022, and the local staff of JICA Expert Team was dispatched again as observers.

Finally, the contract between the contractor (VA Tech Wabag) and the MWSDB was extended until March 10, 2023, during which time the contractor assumed full responsibility for the operation of the water treatment plant, after which KUKL would take the initiative in managing the operation with support from the contractor.

5.5 Support for the handover of completed facilities in the Melamchi Water Supply Project

[Issues]

In order to ensure that the activities of this project will contribute to the improvement of water supply services, it is necessary to ensure that not only the New Sundarijal WTP, as mentioned above, but also the water distribution facilities will be handed over to KUKL.

Therefore, the project was required to monitor the progress of the BDS and DNI projects for which PID is in charge of implementation supervision, consider possible support as the JICA Expert Team, and coordinate with project activities.

In addition to the water treatment plant supported by the Japanese loan, the Melamchi Water Supply Project is constructing water transmission and distribution facilities such as pipelines, service reservoirs, and water distribution networks. However, due to delays in the start of operation of the Melamchi Diversion Tunnel and the New Sundarijal WTP, sufficient water supply cannot be secured, and the test operation and completion inspection of the water transmission and distribution facilities have been delayed significantly.

[Ingenuities]

With the resumption of operation of the tunnel in March 2023, progress was seen in the handover of the water transmission and distribution facilities, but there were delays in the development of the operation and management system on the Nepalese side.

To this end, JICA Expert Team hold a discussion with ADB and Nepalese government officials to explain to ADB and Nepalese government officials the concerns that would affect the results of the project activities, and to confirm the support that the Japanese side could provide.

Of particular concern to the JICA expert team was the delay in the development of KUKL's structure for the completion and delivery of the BDS and DNI. For example, the operation and management of BDS was handed over to KUKL, but the procedures were only documented, and there were delays in the development of the personnel structure and reorganization on the KUKL side. The reasons for this are as follows:

- The recruitment process to be implemented by KUKL was publicly announced through the Public Service Commission twice, in 2020 (for 37 positions) and 2021 (for 27 positions), and although the exam and pre-interview were completed, the process has been suspended due to potential violations of the law identified in the application guidelines.
- The ADB-funded development of Distribution Network Improvement (DNI) has been delayed, and at this time the water is being supplied through the existing pipeline network. Although the distribution reservoirs have been completed, extensions and SCADA are underway at some sites, and the contractor and PID continue to be involved in operation and management.

For the time being, the service reservoirs will continue to be operated by operators hired by the contractor, who will gradually switch to contracts as KUKL employees. However, in order for KUKL

to effectively manage the operation, it is necessary to resume recruitment of KUKL personnel as soon as possible and to reorganize the internal organizational structure.

ADB is also concerned about the maintenance and management of the new facilities, including the water distribution network and SCADA for the water distribution system, which are scheduled to be handed over in the future, and is strongly requesting that KUKL ensure an appropriate management system.

After sharing these concerns with ADB, a joint meeting was held on May 31, 2023, with ADB as the coordinator and Nepalese officials convened. The Secretary from the Ministry of Water Supply (MoWS) chaired the meeting, and the former CEO of KUKL attended as an advisor from the ADB side.

Table 5.5.1 Summary of Joint Consultation on KUKL Structure Development

Items	Contents
Date	May 31 st , 2023, 11:00 - 12:30 (Nepal Standard Time)
Type	Conference room in MoWS
Objective	To develop a facility operation and management system after the completion of the Melamchi Water Supply Project (ADB funded), and to obtain agreement from all parties concerned on the scope of responsibility and performance obligations by KUKL.
Theme of discussion	1. Operation and management system of New Sundarijal WTP 2. Operation and management system of Bulk Distribution System after its handover 3. Operation and management system of Distribution Network after its handover
Participants	[Nepalese side] <ul style="list-style-type: none"> • Mr. Maniram Gelal Tilak Mohan (Secretary, Ministry of Water Supply) • Dr. Sanjeev Bickram Rana (Executive Director, KVWSMB) • Mr. Rajendra Sapkota (Project Director, KUKL-PID) • Mr. Milan Kumar Shakya (CEO, KUKL) • Mr. Umesh Marahatta (Deputy Manager, Support Division, KUKL) • Mr. Saugata Dasgupta (Senior Project Management Specialist, Nepal Resident Mission, ADB) • Dr. Mahesh Bhattarai (ADB Consultant) [Japanese side] <ul style="list-style-type: none"> • Ms. Kumiko Kato (JICA Nepal Office) • Mr. Noboru Ozaki (JICA Nepal Office, Wash Sector Advisor) • Mr. Koji Naito (JICA Expert Team) • Mr. Tilak Bhandari (Technical Advisor, JICA Expert Team)
Main items to be confirmed	1. O&M of New Sundarijal WTP As of March, 37 employees were assigned to the New Sundarijal WTP, but no new employees were hired. In addition to the 12 originally appointed, 16 employees were staffs who transferred from branch offices, and the rest were operators who had been employed by contractors and became KUKL contract employees. As experienced staff have been transferred from the branch offices, the operation and management system of the existing water treatment plants has become vulnerable, affecting the maintenance of the distribution network and the implementation of water quality monitoring. JICA Expert Team strongly urge KUKL to make efforts to resume recruitment during the suspension. Although no major problems have been encountered in the operation and management of the New Sundarijal WTP since March 2023, as assistance has been provided by JICA Expert Team, concerns have been raised regarding the stable supply of chlorine gas. The contractor should procure and deploy the chlorine gas needed for operation for a few months or so, but there have been significant delays. 2. Handover of BDS and its operation and management system Packages 1-4 have already been handed over, but it is not clear which department within KUKL will manage and inspect the facilities and who will be responsible for what responsibilities. Operators employed by contractors will continue to be employed by KUKL, but it is essential to establish an organizational structure within KUKL as soon as possible. JICA Expert Team believes that the New Sundarijal WTP and the water transmission system to the service reservoirs are closely related, and that the departments responsible for managing both

Items	Contents
	<p>should be the same.</p> <p>Managing the water balance in each service reservoir and responding to problems in the pipelines is an extremely critical role. The Production Division, which is in charge of the New Sundarijal WTP, should be responsible for operation and maintenance up to the BDS reservoirs; the staffing of the Production Division is extremely vulnerable, and JICA Expert Team requests KUKL to make efforts to resume recruitment.</p> <p>3. NRW Management System</p> <p>Since the water supply from Melamchi has been in full operation, the commissioning of the water distribution network has been progressing step by step, and it is expected that 75% of the DMA will be ready for delivery by around April 2023.</p> <p>The management of the water distribution network will naturally be the responsibility of KUKL, but a major concern is that the administrative areas of the branch offices do not coincide with the boundaries of the DMAs.</p> <p>DMAs are constructed as water distribution management areas to measure inflow/consumption and manage non-revenue water rates, but if a single DMA is part of the management area of multiple branches, not only will this be a major impediment to future operation and management, but it will also blur responsibility for non-revenue water management.</p> <p>JICA Expert Team requests KUKL to align the boundaries of the branches with the boundaries of the DMA as soon as possible and to reorganize the branches according to the extent of water supply in the distribution basins. A proposal for this purpose will be prepared by the JICA Expert Team and submitted to KUKL.</p> <p>4. Other</p> <p>The ADB fund is in the process of developing a SCADA system to centrally manage the flow control of each service reservoir and valve control of water distribution network, etc. In order for KUKL to take responsibility for this maintenance, it is essential to enhance the organization's structure and increase the number of staff.</p> <p>5. Conclusion</p> <p>All of the concerns identified in 1-3 above were fundamentally caused by KUKL's delay in securing human resources, and strong instruction was given to KUKL's CEO by the Secretary of MoWS.</p> <p>The MoWS also confirmed the means by which the results of the activities of the technical professionals contribute to the improvement of KUKL's performance.</p> <p>The JICA Expert Team explained that the project has established PDM indicators for each output (improvement of turbidity and residual chlorine after water purification, non-revenue water rate, and customer satisfaction), and that these indicators will be used to measure the improvement of KUKL's performance.</p> <p>The committee confirmed that it will continue to hold joint meetings to regularly review these concerns and the progress of actions by KUKL to remedy them.</p>

5.6 Utilization of Portal Web Site of the Project

[Issues]

In some technical cooperation projects for the development and maintenance of water supply facilities, training materials, SOPs, guidelines, and manuals are prepared and provided to C/Ps in electronic or bound form. However, due to staff turnover or taking materials out of the project, the materials are sometimes not continuously utilized after the project is completed. In addition, the recent progress of digitization has made it difficult to manage and utilize documents and drawings created in the past.

[Ingenuities]

In this project, an open website (<http://kukl-jica.sakura.ne.jp/>) was created to store training materials, videos, SOPs, guidelines, manuals, etc., and to make them accessible to all parties concerned from anywhere, with the aim of ensuring that the materials created will be used continuously and effectively by many staff members.

The website consists of program files in html language. During the project activities, the website will be operated and managed on a rental server, but all data will be migrated to the KUKL server once all SOPs and manuals to be used for internal training have been completed and uploaded.

Addresses will be assigned to the corresponding folders on KUKL's servers so that staff members can easily access them. These efforts will ensure an environment in which the project results can be used sustainably by those involved even after the project has been completed.

The image shows a screenshot of the project portal website. The top part displays the project title and navigation menu. Below is a banner for 'Khanepani creates the future of Kathmandu'. A blue arrow points from the 'Internal Training' link in the navigation menu to a detailed page titled 'Internal Training System'. This page includes a description of the training system and a 'Steps towards establishing a training system' section with a circular diagram containing four steps: ACTION, PLAN, CHECK, and DO. To the right, a table titled 'Links to training' provides a list of training materials with download links.

Training Course	Training Module	Material Title	Link
GIS Operation		Name of material	
		Name of material	
	GIS Management	Name of material	
		Name of material	
Hydraulic Analysis		Name of material	
		Name of material	
Water Distribution Management		Basics of Water Pressure Control	Download pdf
		Radinix V1 S1 Installer	Download exe
	Water Pressure Monitoring	Datalogger Loging 450 Brochure	Download pdf
		Official User Guide Loging 450	Download pdf
Flow Measurement		Basics of Flow Measurement	Download pdf
		Video Tutorial of Ultrasonic Flowmeter	
	Operating Guide of Ultrasonic Flowmeter UFP-20		Download pdf
			Download pdf
Basics of NRW Management (Commercial Losses)		Understandings of Non-Revenue Water	Download pdf
		Importance of accurate meter and regular replacement	Download pdf

Figure 5.6.1 Image of the portal web site of the project

5.7 Cooperation with the National Water Supply & Sanitation Training Center (NWSSTC)

[Issues]

In Term-2 (2021-2023), JICA Expert Team has been working to enhance the capabilities of KUKL staff at head office and branch offices through basic training and on-the-job training for each output.

In the case of Output 1, engineers at each branch office interrupted their daily work to participate in GIS training, but the instructional method of visiting branches once a week resulted in individual differences in the degree of retention of skills and knowledge. Furthermore, when urgent requirements overlapped, there was insufficient time for staff to attend training by JICA experts.

[Ingenuities]

Therefore, the JICA Expert Team proposed to conduct an intensive training program at a rented outside training facility to ensure that the technical skills of the engineering class would be further improved with high effectiveness and efficiency, resulting in a five-day consecutive training program.

The training was held at the National Water Supply & Sanitation Training Center (NWSSTC) under the Department of Water Supply and Sewerage Management (DWSSM). The necessary expenses for the training (facility use, accommodation, transportation, etc.) were paid from the budget of the Support Division of KUKL, and JICA experts assumed a role of lecturer in this training.




This intensive training was so effective in improving the skills of KUKL staff that the facility was subsequently borrowed for training in the customer care activities described in Output 4. Although the training was only for a short period of two days, the participants were able to obtain significant training results in an environment that was detached from their daily work.

The director of NWSSTC also participated in the third country training in Sri Lanka conducted in December 2022 with KUKL staff, and the provision of these opportunities also led to the establishment of an interinstitutional cooperative relationship with KUKL.

The NWSSTC has been used as a training site for the staff of DWSSM and the Water User's Supply Committees in different rural cities, but in recent years, MoWS has been looking to use the NWSSTC as a training site for the entire water supply sector in Nepal. MoWS is now expecting to use the NWSSTC as a training center for the entire water and sanitation sector in Nepal.

The NWSSTC is also being actively utilized in the technical cooperation project targeting Nepal Water Supply Corporation (NWSC), which is being implemented by JICA in parallel with this project. The fact that cooperative relationships are being established among institutions related to the water and sanitation sector is a good example created by this project.

[Photograph] Facilities in NWSSTC

		
Appearance of NWSSTC	Dormitory	Lecture Room

