U. G. Manju Malkelum

Recommendations for Guidelines to Manage Water Balance in Capital City and its Suburbs for the Ambathale Water Treatment Plant

Metropolia University of Applied Sciences

Master of Engineering

Industrial Management

Master's Thesis

May 25, 2023

This study marks the end of a challenging but worthwhile journey. It is my privilege to study a business challenge in my workplace. Further, I had the honour of being immersed in a setting that was packed with opportunities for learning, professional challenges, and personal growth.

I would like to express my sincere thanks to the instructors for reviewing and providing constructive feedback on my thesis Dr Thomas Rohweder, and Dr James Collins, for the great guidance given by M.A. Sonja Holappa. Additionally, I want to thank all my classmates for their valuable peer support and for enriching my academic experience.

I would like to express my gratitude to the management for giving me the chance to continue learning while also making a new contribution to the organization's growth. I want to thank everyone who participated in the study, as stakeholders, interviewees, and Informants. Extremely grateful to Mr Akalanka Wikramarathna and Mr Salih Fousdeen for their insightful and delightful ideas to enhance the study.

Further, I extend my heartfelt thanks to my family members including my parents, wife, Buddhika and daughter, Risindi who have given tremendous support with patience. This journey would not have been the same without them.

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U.G. Manju Malkelum

May 25,2023

Abstract

Author:	U. G. Manju Malkelum
Title:	Recommendations for Guidelines to Manage Water Balance in Capital City and Its Suburbs of The Ambathale Water Treatment Plant
Number of Pages:	63 pages + 2 appendices
Date:	25 May 2023
Degree:	Master of Engineering
Degree Programme:	Industrial Management
Supervisors:	Dr Sami Sainio, Head of IM Master's Program Dr Thomas Rohweder, Principal Lecturer Dr James Collins, Senior Lecturer Sonja Holappa, M.A., Senior Lecturer

This study provides guidelines for better management of balancing the supply and demand of water in the capital city area and its suburbs in the Ambathale Water Treatment Plant. Applied research has been used as the research approach.

The study comprises four stages, Current State Analysis (CSA), Literature Survey, Initial Proposal, and Final Proposal. In the initial stage, strengths and weaknesses were identified. Considering the constraints in the study, "undefined roles and responsibilities" were selected as the significant factor to address in this study.

In the Second stage, a literature survey and the conceptual framework were created to define roles and responsibilities based on RACI Matrix.

It was observed that the initial process was deemed unclear and subsequently modified to optimise the potential of the study as co-creation. In contrast to the earlier process, the modified process was enhanced with process verification, analysis, categorization, and documentation.

The initial proposal was created as the third step. In the fourth step, it was subsequently tailored to incorporate stakeholder inputs. Ultimately, a final recommendation for defining roles and responsibilities was formulated.

This study yields twofold outcomes. In the short term, the modified process and clearly defined roles and responsibilities enhance operational efficiency, beneficial for the stakeholders who use the process. In the long term, the study will provide insights into future developments and maintenance. Which will pave the way for forthcoming developmental initiatives and strategy formulations in the organisation.

Keywords: CSA Current State Analysis, RACI Matrix,

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List of Abbreviations

DO Duty Officer

SOP Standard Operating Procedures

QMS Quality Management System

DO Duty Officer

RACI Matrix Responsibility Accountability Consultation Inform Matrix

KPI Key Performance Indicator

PDCA Plan-Do-Check-Act cycle

SOP Standard operating procedure

WBS Work Breakdown Structure

1 Introduction

Water is a scarce resource and water purification requires high cost as well as time. Therefore, optimum utilization of resources, with proper management is essential to maintain the water balance between water scarcity and growing demand.

This study is concerned to provide recommendations for guidelines for better management of the process of balancing the supply and demand of water in the capital city area and its suburbs, which is provided by the Ambathale Water Treatment Plant in Sri Lanka.

The Ambathale Water Treatment Plant is owned by the National Water Supply and Drainage Board of Sri Lanka (NWSDB). It was commissioned in the year 1966 and is the largest of its kind in Sri Lanka. The Present production capacity is about 550,000m3/day and provides more than 60% present of the total supply to the Colombo City the commercial capital of Sri Lanka and suburbs areas. It consists of 200 employees for its operations and maintenance duties.

Business Context of the Case Company

The water supply service area of the Ambathale Water Treatment Plant consists of a high density of consumers, and key organizations, with a rapid growth in demand.

Three main stages can be identified in providing water to consumers in those areas. The first stage is water purification. Then, the second stage is to store purified water temporally and transfer those to regional distribution reservoirs, called internal customers. The third and final stage is distributed to the consumers. Stages one and two are carried out by the Ambathale Water Treatment Plant. The Duty Officer is appointed for the proper and smooth operation of stages one and two.

1.2 Business Challenge, Objective, and Outcome

The demand and supply are highly dependent on several factors such as socio-economic, environmental, status of equipment, and staff competency. Therefore, better management of the process of balancing the supply and demand of water is a complicated process.

Presently, the system is operated in an ad hoc manner, without any properly managed and documented procedure. Therefore, the outcome of the operation depends on the status of the factors and competency of the staff, especially on the skills of the Duty Officer.

Due to the present unmanaged situation, maintaining the water balance in-between supply and demand is a challenge, especially in unusual circumstances.

The objective of this study, provide recommendations for guidelines for better management of the process of balancing the supply and demand of water in the capital city area and its suburbs. The outcome is the recommendations for guidelines that allow the NWSDB to better management of the process of balancing the supply and demand of water in the capital city area and its suburbs.

2 Project Plan

The Previous section introduced the business challenge, objective, and outcome. This section describes the research approach, research design, and then the data collection and analysis method.

2.1 Research Approach

Applied Research

Applied research aims at finding a solution for an immediate problem facing an industrial/business organization (Kothari, 2004:3). The applied research method is selected for this study.

2.2 Research Design

This research design consists of four phases. The phases are current state analysis, Literature review, developing recommendations for guidelines and the last phase is Validating recommendations for guidelines. Figure 1 illustrates the details of the research design.

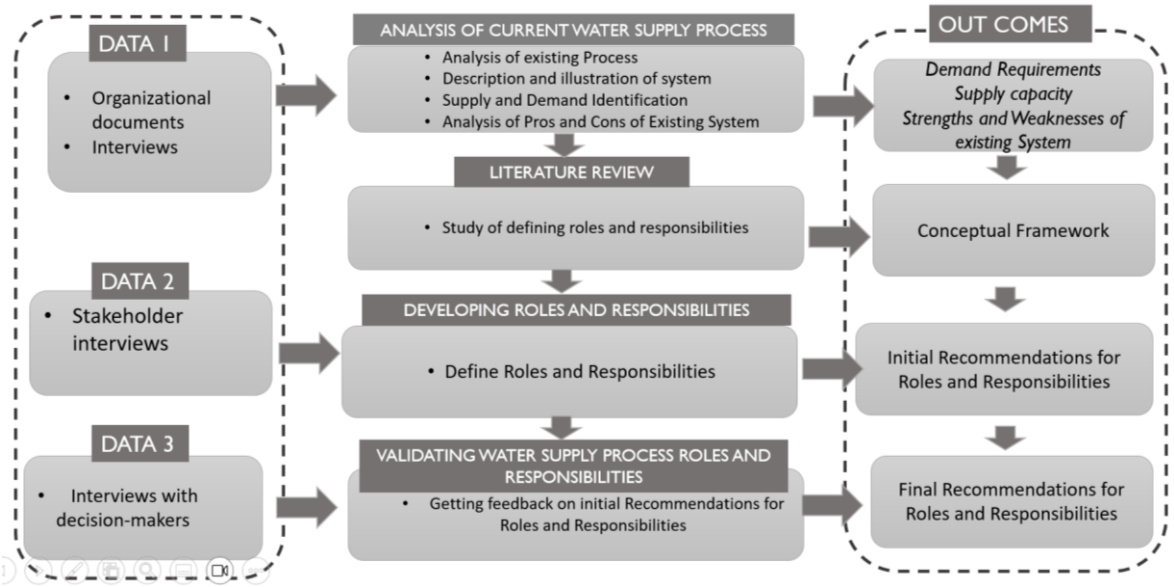

Figure I Research Design

As depicted in Figure 1. The Initial and most crucial phase of the research design is the analysis of the current water supply process. Further, it paves the way to build the foundation of the study and direction to explore the current process. Discussions, and interviews, are used in this phase to get a bird's eye view of the system.

The outcome of this phase can be stipulated as follows: Demand requirements, supply capacity, strengths, and weaknesses of the system.

The second phase of the study is the literature review, following the current state analysis. This stage consists of exploring the best practices used in the industry. The outcome of this stage is the Conceptual Framework.

The third phase of the study is the initial recommendations. In this phase, significant attention was paid to identifying weaknesses and mitigation of those. The outcome of phase three is the initial guidelines.

The fourth and last phase is validation. In this phase, the stakeholders give feedback regarding the initial guidelines. This allows for adjusting the process. The outcome of this phase is the final recommendations for guidelines.

2.3 Data Collection

The data collection consists of several modes of documents, internal documents related to the process, and documented data based on interviews and workshops. The details are stipulated in Table 1 Data 1 Analysis of the current water supply process.

Table 1 Data 1 Analysis of the current water supply process

No	Topic	Source	Informant	Period	Outcome
1	Analysis of existing Process	Kick-off meeting (Online)	stake holders	Jan 2023	Identification of Key stakeholders
2		ISO documents	Management Representative of ISO	Jan 2023	Existing system
3		Water Safety Plan	Team Leader	Jan 2023	
4	Description and illustration of the system	Discussion	Manager Operation, Engineer Operation Chief Engineer Development	Feb 2023	Bird's eye view of the system
5	Supply capacity Identification	Discussion	Engineer operation, DO	Feb 2023	Supply capacity
6	Demand Identification	Discussion	Internal customers, DO	Feb 2023	Demand requirement
7	Analysis of Pros and Cos of Existing System	Interviews and Questionnaire	Stakeholders	Feb 2023	Pros and Cos of Existing System

As shown in Table 1 Data 1 Analysis of the current water supply process. Data was collected from stakeholders. Discussions were categorized based on topic source, informant, and outcome. The final achievement of each stage was tabulated in each row under the outcome column.

After the completion of the first stage of Data collection then, the second stage of data collection started for Developing recommendations for guidelines. Two stakeholders participated, who are directly involved with the process as decision-makers. Details are shown in Table 2.

Table 2 Data 2 Developing water supply initial recommendations for guidelines.

No	Topic	Source	Informant	Period	Outcome
1	Define Roles and Responsibilities	Discussion	Decision making Stakeholders	March 2023	Roles and Responsibilities
2	Comments on Roles and Responsibilities	Discussion	Decision making Stakeholders	March 2023	Initial Roles and Responsibilities

As shown in Table 2 Data 2 Developing water supply initial recommendations for guidelines. Discussions have been carried out with stakeholders who are involved in decision-making. First, discussed defining roles and responsibilities, then as a second stage, comments have been taken on roles and responsibilities to craft the initial roles and responsibilities.

The final stage of data collection is validating the defined roles and responsibilities. This is shown in Table 3 Data 3 Validating recommendations for guidelines.

Table 3 Data 3 Validating recommendations for guidelines

No	Topic	Source	Informant	Period	Outcome
1	Getting feedback on the initial defining of Roles and Responsibilities	Discussion	CE Process	April 2023	The Final Roles and Responsibilities
2		Discussion	CE Development	April 2023	

As shown in Table 3 Data 3 Validating recommendations for guidelines. Feedback has been taken on the initial proposal, of defining roles and responsibilities to create the final Roles and Responsibilities.

The project plan has been explained in the previous section. The next section follows the current state analysis and its findings.

3 Current State Analysis

This section describes the current state analysis of the process of balancing the supply and demand of water in the capital city area and its suburbs. Further, discussed the findings on strengths and weaknesses in the process. The previous section states the data to be collected to proceed with the current state analysis (CSA).

The current state analysis is the initial and most crucial part of the study. Further, it paves the foundation and direction for the study.

3.1 Overview of the Current Stage Analysis Stage

As the first and foremost activity, stakeholders were identified. Then a kick-off meeting was held with them. Three categories of stakeholders were identified, based on their role in the process. Key categories were identified as the users, the workers, and the management.

Users - One internal customer was selected to represent the user party.

Worker - One officer was selected from duty Officers (DO). Since DO is responsible for all activities related to the process.

Management- Chief Engineer Development and Chief Engineer Process have joined the study representing management. Further, this study leads to development. Therefore, it is directly related to their scope, and they have decision-making power within this scope.

3.1.1 The Process

The water purification process is continuous and operates 24 hours a day. The role of the DO is a 24-hour shift duty therefore, three officers were assigned on a shift basis to operate continuously. Out of them, one representative was selected, and he is responsible for conveying the messages to the co-workers.

The most active, energetic, knowledgeable, and experienced person was selected as the representative for each category.

The interviews and discussions were carried out remotely and WhatsApp telephone conversations were used in this phase to get the information. The questionnaire was filled with their answers to get information on their status.

All stakeholders involved in the process and certain key concerns were identified.

It was found that a scientific analysis had never been carried out about the process. Other than that, key concerns were stipulated below.

- Analysis of existing Processes,
- Description and illustration of the system with a bird’s eye view.
- Supply and Demand Identification
- Analysis of strengths and weaknesses of the existing System

Based on the above key concerns the CSA was carried out. Details were discussed below.

3.2 Analysis of Existing Process

Analysing the existing process, the following findings were obtained.

The existing process is operated in an ad hoc manner. A Documented, standard operation procedure (SOP) or instructions were not available. But, whenever an abnormal situation occurs, all staff get together and try to handle the situation collectively. The time taken to resolve is dependent on the competency of the DO, other supportive staff, and the status of the equipment. The synergy gained due to this teamwork, mitigated the lack of instructions or the SOPs.

In the process, three significant stages were identified. The first stage is water purification. Then, the second stage is storing purified water temporally and transferring it to regional distribution reservoirs. The third and final stage is the distribution to the consumers.

Stages two and three are the responsibilities of the Ambathale Water Treatment Plant and the key components of the process.

In each stage, updated and accurate drawings were not available. Therefore, related drawings were updated in the CSA. Figure 2 illustrates the updated plan of the integrated Water Purification System of the Treatment plant.

3.3 Description and Illustration of the System

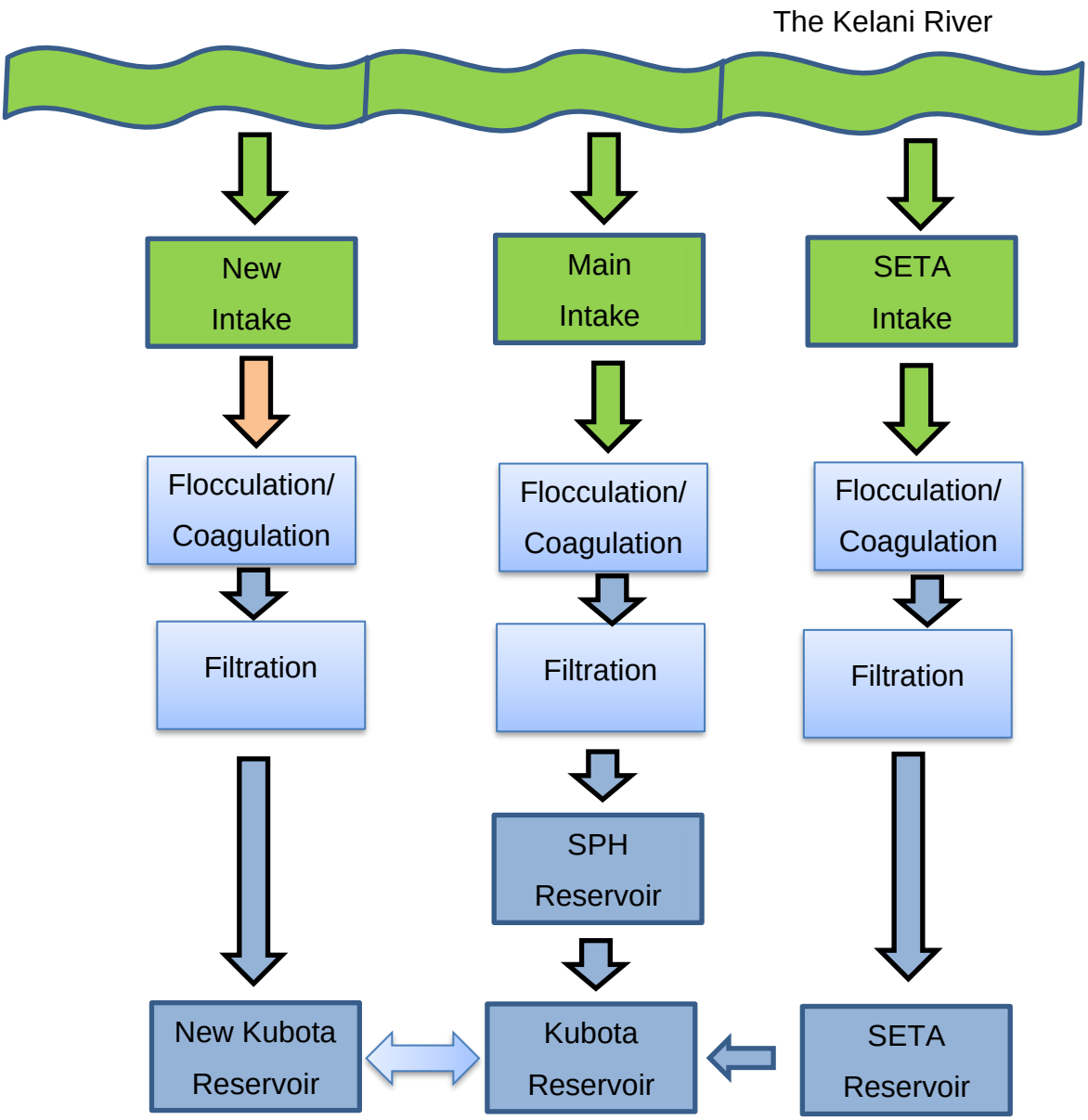

Figure 2 Updated integrated plan of the Water Purification System of the Treatment plant.

As shown in Figure 2, the Ambathale Water Treatment plant consists of three water purification units named, The Main Plant, the new plant, and the SETA plant. All units are purifying water extracted from the Kelani River and then treated and stored temporally in the reservoirs as shown in Figure 2. Each unit is operated parallelly and independently under the supervision of a dedicated officer in charge. They are responsible for providing the requested capacity by the DO. Since water treatment is out of the scope of this study, further details are not

discussed in this study. The scope of the study and Reservoirs and their interactions in the process is shown in Figure 3.

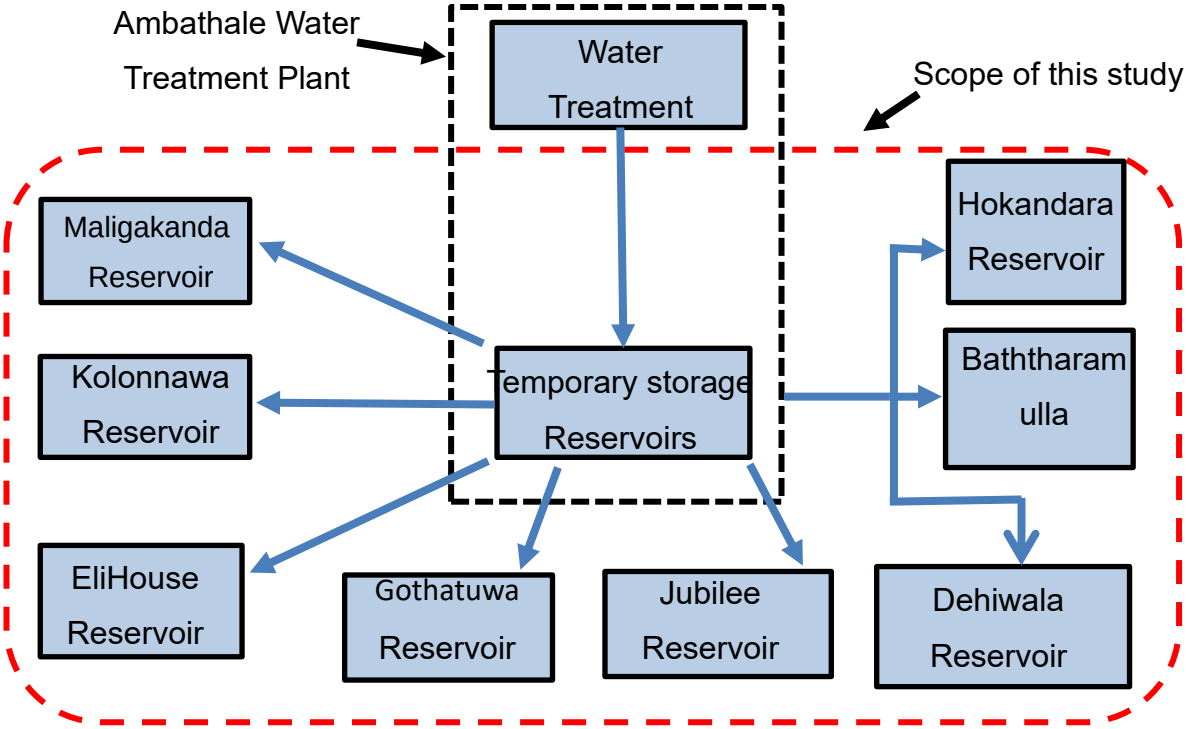

Figure 3 Scope of the study and Reservoirs and their interactions in the process

As shown in Figure 3, after the water treatment process, treated water will be temporally stored in the reservoirs. Those two steps will be occurred in within the Ambathale Water Treatment Plant Premises. As shown in the black dashed area in Figure 3.

The water distribution process to the internal customers begins from this point forward. The demarcation area shown in the red dashed square in Figure 3 is the scope of this study. It consists of temporary storage of the treated water in the reservoirs within the premises to distribute those to remote internal users based on their demand.

The system consists of a collection of temporary storage reservoirs in the Ambathale Water Treatment Plant Premises (Details are shown in Figure 2

Updated integrated plan of the Water Purification System of the Treatment plant) and eight reservoirs located in remote areas.

Each reservoir location has an officer in charge who is responsible for its operations those are called internal customers. Those internal customers make requests for their demand requirements to the Duty officer stationed in the Ambathale Water Treatment Plant. The DO releases water to the internal customers.

The third stage is the distribution from internal customer reservoirs to end consumers. The officer in charge of each remote reservoir is responsible for the third stage. It is out of the scope of this study. Therefore, it is not mentioned in Figure 3.

The scope of this study covers the process of water distribution from temporary storing of purified water to distributing it to internal customer reservoirs.

3.3 The Existing Process

In the process, the Duty officer is responsible to provide the required demand of the internal customers from the production of the Amabathale Water Treatment Plant.

In the existing system, the process was not mapped, updated, and documented. Therefore, the existing process was mapped in the CSA and shown in Figure 4

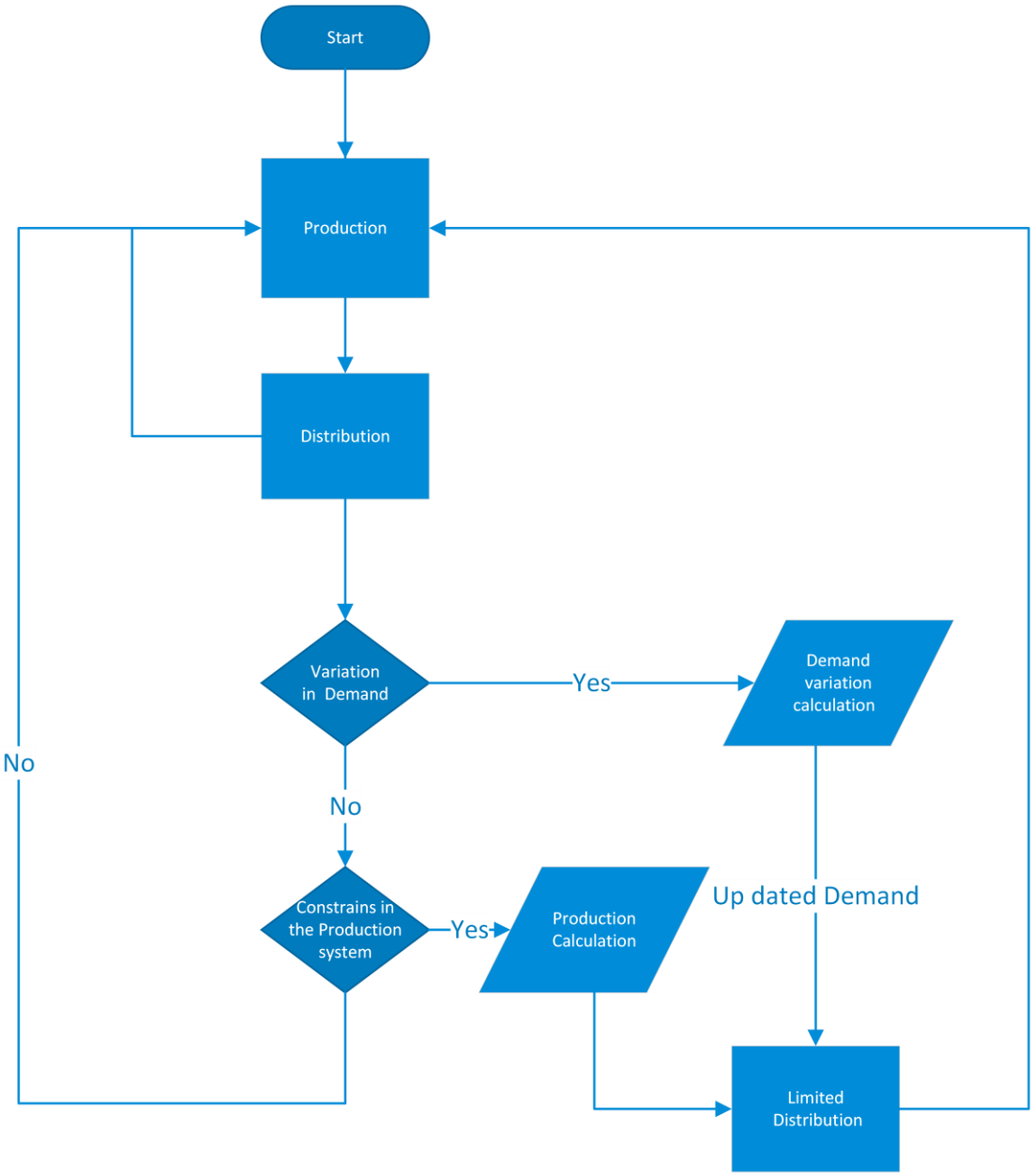

Figure 4 The existing Process map

As shown in Figure 4 - The existing process map, Production continuously distributes to the internal customers. Until the DO receives any feedback massage from the supply or demand side.
If a feedback message is received from internal customers, about demand variation, DO start to calculate the demand with internal customers. On the other hand, if it comes from the production side, regarding production constraints, DO consider the limited distribution as shown in Figure 4 of the existing map.

In the CSA, several interviews have been carried out. Interview participants consist of Management, Operation staff, internal customers, Staff, and who are involved in development. All of them were given a questionnaire and filled with their answers. Answers summarised especially, focussing on strengths and weaknesses. Further, Interview questions and answers during the current state analysis were attached in Annex 1. Key concerns of them were mentioned below for reference. The summary was tabulated in “Table 7 Summary of Strengths and Weaknesses”.

All the stakeholders were informed that the competency of the staff is in satisfied level. Their experience and dedication are also at a satisfactory level. Some of the experiences were summarized below.

> Engineer Operation is responsible for sudden failures and water transmission line bust rectification. She has shared about two experiences. One was a pipeline burst in the Dehiwala reservoir. The second was a pipeline burst in the Jubilee line. Both occurred at night, and roads and some buildings were severely damaged. Observing the incident most of the observer’s guest was, it may take 3 to 4 days to repair the damage, because of its severity. But most of the staff were gathered there and started to repair it in the night. They worked on it continuously for 34 hours and they did it. She has shared her experience with staff competency.

Manager operations also confirmed that incident, further he added that due to the failure of the bridge, one pipeline began to leak. Since the pipe diameter is one meter, leakage was critical, and the bridge is in the administrative capital. Therefore, remedies need to take as soon as possible. “Anyhow our staff was competent to handle it.

It was informed that the Water treatment plant has been practising ISO 9001, and some of the staff have exposure to it. Therefore, it is easy to introduce and share the practices.

In the CSA it was noticed that management has a keen interest to improve the system. Further, in all the above severe cases management gave their best support.

Stakeholders were informed that a systematic analysis had never been carried out about the process.

The Operational staff and users were informed that the documented procedure is not available. Especially for sudden and unexpected situations. Those experiences are not shared with others, therefore it’s very hard to face such a situation, further unclear who needs to be informed and what are actions to be taken immediately.

Engineer Development added in his interview “When it comes to the preparation of development proposals accurate and updated Data is not available.” It includes demand and supply Data” due to the lack of proper record-keeping practices.

Officers in the remote locations informed that they don’t have training on the system and proper preventive maintenance practice is not available. Further, they added that in some situations they don’t have an idea who is responsible for some duties.

3.4 Supply and Demand Identification

It was observed that production and storage capacities in stages one and two above, all were updated and documented in the CSA.

A discussion has been conducted with Engineer (Operation) regarding the production capacities and daily demand requirements. Since she has been responsible for preparing monthly production reports. Required details were extracted from the mailed production report, attached as annexe 1.

The first step was to update the production capacities and it was tabulated in Table 4.

Table 4. Production capacities of the Ambathale Water Treatment Plant

	Treatment plant	Capacity (m3)/Day
1	Main Treatment Plant	280,195
2	New Treatment Plant	167,489
3	SETA Treatment Plant	50,254

Table 4. shows the production capacities of the Ambathale Water Treatment Plant. It consists of three water purification units. Daily average production capabilities were shown in the table unit is cubic meters per day.

Then, as the second step, the capacities of the temporary storage were tabulated in Table 5.

Table 5 Capacities of the temporary stages within the Water Treatment Plant

	Temporary storage reservoir Name	Capacity (m3)
1	SPH	6,600
2	Kubota	15,300
3	New Kubota	4,200
4	SETA	2,000

Table 5 shows the details of the reservoirs used as temporary storage in the process. Four numbers of storage have been used and details are shown with their respective capacities in cubic meters.

Details of the internal customer demand details were collected from the Engineer operation and then updated and documented in Table 6.

Table 6 Capacities of the internal customer demands

No	Reservoir Name	Average Demand (m3/Day)
1	Gothatuwa	35,829
2	Kolonnawa	31,786
3	Jubilee	140,975
4	Dehiwala	118,932
5	Maligakanda	119,156
6	Eli house	74,596
7	Batharamulla and Hokandara	25,897

Table 6 shows the details of the internal customer demand details. It consists of seven reservoirs. The demand unit was cubic meters per day.

3.5 Summary of the Current State Analysis Findings

The key findings of the CSA can be divided into two categories as strengths and weaknesses based on their impact on the process, as shown below in Table 7 Summary of strengths and weaknesses. The Source of Detail column shows the source of the fact, and the text is coloured as strengths in green and weaknesses in red.

Table 7 Summary of strengths and weaknesses

No	Strength and Weakness
Strengths	
1.	Human Resource – Competent, experienced, and Dedicated staff.
2.	Assets – Sufficient level of Plant and Equipment
3.	Committed Management team
4.	Practices of QMS systems in other sections
Weakness	
1.	Lack of Analysis of the System
2.	Undefined Roles and Responsibilities
3.	Unavailability of updated Demand and Supply capacities
4.	Undefined KPI`s
5.	Lack of Documented SOPs.
6.	Unavailability of proper Record Keeping Practices.
7.	Lack of system-related accurate information.
8.	Lack of training
9.	Lack of preventive maintenance programs

Observing the findings of the CSA, Strengths can be utilized to leverage the process. Weaknesses need to be identified and mitigated.

The first fact in the weakness list is `Lack of Analysis of the system` has been completed in the CSA stage.

The weighted scoring method was used as a decision-making tool to identify the parameter to be prioritized. In the following table (Table 4 The weighted scoring index table) selected parameters, the highest value and the scale of the values are shown.

Table 8 The weighted scoring index table

Parameter	Description	Highest	Scale value
Time taken	Time is taken to complete the task	Least time	5
Financial	Financial requirement for completion	Least cost	5
Skills needed	Skills needed to complete the task	Less	5
Competency	Competencies required	Less	5
Priority	Priority in the viewpoint of the process	Impotency	5

As shown in above Table 8. Scale Value was given based on the process view, the Highest value was given, if the parameter is beneficial for the process. The key is 1 to 3 and the colours are Red, Orange, and Green respectively. Scored values of each parameter are shown in Table 9 Weighted scored weakness table.

Table 9 Weighted scored weakness table

No	Weakness	Time taken	Financial	Skills needed	Competency	Priority	Sum
1.	Undefined roles and responsibilities	3	3	3	3	2	**14**
2.	Unavailability of updated demand and Supply capacities	2	2	2	2	2	**10**
3.	Undefined KPI`s	1	2	2	2	3	**10**
4.	Lack of documented SOPs.	1	1	1	1	2	**6**
5.	Unavailability of proper record Keeping Practices.	1	1	2	2	2	**8**
6.	Lack of system-related accurate information.	2	1	2	2	2	**9**
7.	Lack of training	1	1	1	1	2	**6**
8.	Lack of preventive maintenance programs	1	1	1	1	3	**7**

According to the above Weighted scored weakness Table 9 the highest scored factor was `Undefined roles and responsibilities `.

Therefore, concerning the time, resource, and competency constraints in this study, it was selected to define the roles and responsibilities.

This section considered the Current state analysis of the process. The next section provides a conceptual framework based on the key findings of the CSA.

4 Process Improvement Concepts from Relevant Literature

This section intended to formulate a conceptual framework for the study. The previous section described the current state analysis. Then the most significant factor from the weaknesses `Defining roles and responsibilities` was selected as the topic for the literature survey, by using the weighted score method.

Then the conceptual framework was implemented based on the findings of the literature survey in this chapter. First, discussed the impact and benefits of it, then, focus on concepts, and methods, followed by a discussion. Finally, the summary of the study and conceptual framework.

4.1 Defining Roles and Responsibilities

Impact of clearly defined roles and Responsibilities among Stakeholders in the Process

According to (House 1996; Yukl 2010) Role clarification is a task-oriented leader behaviour that is targeted toward providing cognitive structures to subordinates about how they can attain their job goals. Further, it leads to making sure stakeholders in the process what are their work activities and setting task objectives.

According to (Jackson and Schuler 1985; Tubre and Collins 2000) High levels of role ambiguity have detrimental effects on the cooperative attitudes and behaviours of employees. Further, (Jackson and Schuler 1985; Schaubroeck et al. 1993; Tubre and Collins 2000) Role ambiguity increases stress because concerns about how to perform job roles and obtain valued outcomes (both material and social) often cause frustration and anxiety among employees. It can also lead to, as previously noted, a lack of employee commitment and involvement and diminished employee performance. Based on the above fact or organizations indirectly get long-term benefits such as employee performance and mental health.

The process in an organization needs to assign roles and responsibilities to respective members that must be carried out by them. Each stakeholder in the process needs to have an action plan to perform for each activity, with a global view.

This can be done using a Responsibility Assignment Matrix (RAM), also known as the RACI matrix or Linear Responsibility Chart (LRC). This kind of matrix provides a way to plan, organize and coordinate work and consists of representing certain associations for each activity, such as who oversees performing the activity and who must be informed when the activity is done. (Conchúir, D., 2011)

4.2 RACI Matrix

According to (Cabanillas C Resinas M Ruiz-Cort´es A 2012) RACI matrices pave the way for the assignment of responsibility to the members of the organization. In their standard modality, members can be utilized to associate activities with resources, by using organizational roles. The members of an organization play within given a specific context.

According to (Susanto, N. and Putranto, T., 2018.) Five processes are used to implement RACI. The first process is to describe every activity that occurred. The second process is to make a phrase to show the result based on the decision. Decisions and activities need to be applied to role functions rather than individuals is the third process. The fourth process is to create a matrix illustrating the roles and activities and the corresponding letter R / A / C / I. In the final process, any discrepancies must be resolved after all pertinent data has been gathered and entered into the matrix.
Their findings were focused on stakeholder interactions, therefore other studies highly deviate from this study.

-Responsible (R): the person who must perform the work, responsible for the activity until the work is finished and approved by an accountable. There is typically only one person responsible for an activity.

– Accountable - also Approver or Final Approving Authority - (A): a person who must approve the work performed by the person responsible for an activity, and who becomes responsible for it after approval. There must be one and only one accountable for each activity.

– Consulted - (C): this role involves the people whose opinion is sought while performing the work, and with whom there is two-way communication.

– Informed (I): a person who is kept up to date about the progress of an activity and/or the results of the work, and with whom there is just one-way communication. There may be more than one informed person for an activity.

RACI has a significant impact since it makes it simple for the project manager and his team to communicate their responsibilities for the project. Other than that, the following benefits are also significant.

a) Ease of communication in the teams - RACI facilitates communication among the team members. With this approach, the duties assigned to each team are clearly defined, making it simpler for team members to communicate because they are all aware of their respective responsibilities.

b) Decide how many teams will complete one task. - According to the position held by the candidate in charge, the RACI matrix can decide who is the most qualified to perform a task. As a result, the RACI Matrix makes it simple to divide up roles effectively so that no one position has an excessive number of employees.

C) Balancing the workload- Balancing the task for each team member such that no one becomes overburdened. When an employee is overloaded, it leads to getting stressed and reduced performance due to the high workload pressure.

Considering the above facts RACI Matrix was selected to define roles and responsibilities in the process. Most of the literature was considered on project management using RACI Matrix.

Based on the likely hood and compatibility with this study, findings from (Suhanda, R. and Pratami, D., 2021.) are in line with this study.

According to the research paper(Suhanda, R. and Pratami, D., 2021.), the Statement of Work, Stakeholder identification, Activity list, and work breakdown structure have been suggested to implement the RACI Matrix design. They have focused on project management, and considering similarities, their findings can be mapped to this study. Therefore, their findings have been selected as the foundation for this study and customised to the requirements of this study.

4.3 Statement of Work (SOW)

According to the (Martinelli, R. and Milosevic, D., 2016.) Three types of Statements of Work (SOW) have been mentioned the first one is Design/Detail SOW. The Second one is the Level of effort or time, and materials SOW The last one is Performance-based SOW. Among them, the last one is the most related SOW. It defines work agreements based on what must be accomplished. Intended results from the work are specified in precise, objective terms that may be measured. Intended results from the work are specified in precise, objective terms that may be measured.

4.4 Stakeholder Identification

Stakeholder identification is an integral part of the process. It attempts to build a “correct” picture of stakeholder involvement in the process based on their requirements and contribution. The preparation of the stakeholder Registry is a paramount important matter in this process. (Aaltonen, K. 2010.)

4.4.1 Stakeholder Registry

The Stakeholder Register is a document used in project management to identify; an overview of each stakeholder's involvement can be found in the Stakeholder Registry. Further, it is the output of the stakeholder identification stage. (Riahi, Y.).

It consists of the following details.

Identification information: name, organizational position, location, role in the project, and contact information.

Assessment information: major requirements, main expectations, potential influence in the project, phase in the life cycle with the most interest

Stakeholder classification: internal/external, supporter/neutral/resistor.

4.5 Activity List

According to (Suhanda, D. and Pratami, D. 2021,) Data that describes the project activities is called an "activity list." The Activity List also provides a detailed explanation of the work scope and job descriptions for each work package, making it simpler for the project team to comprehend how the work will be completed.

4.6 Work Breakdown Structure

The work breakdown structure (WBS) is an outcome-oriented grouping of project elements that organizes and defines the total scope of the project (Harold Kerzner, Ph.). Further, it is a family tree structure that is product-oriented that breaks down the hardware, services, and data needed to create the final product. The WBS is designed to reflect how the work will be carried out, as well as how project expenses and data will be compiled and subsequently reported. Scheduling, configuration management, contract funding, and technical performance standards are among the other elements that must be considered when creating the WBS. The WBS is the sole piece that is crucial since it offers a shared foundation from which, the overall program can be thought of as the accumulation of divided components. Goals and corporate resources can be connected logically, and Each element's responsibility allocations can be determined.

The work breakdown structure serves as a tool for dividing the task into more manageable components, increasing the likelihood that each significant and insignificant behaviour will be recorded.

Although there are many different work breakdown structures, the six-level indented structure that is shown below is the most popular.

Table 10 shows that, Relationship between breakdown structure Levels and tasks.

Table 10 Relationship of Work Break Down Structure Levels and Tasks.

Category	Level	Description
Managerial levels	1	Total program
	2	Project
	3	Task
Technical levels	4	Subtask
	5	Work package
	6	Level of effort

According to Table 10, levels 1 to 6 are divided into two levels called Managerial and Technical. The summation of the activities and costs associated with each project must equal the total program. Each project (level 2), can be broken down into tasks (level 3), where the summation of all tasks equals the summation of all projects, which, in turn, comprises the total program. The reason for this subdivision of effort is simply the ease of control.

4.7 RACI Matrix key components

Implementation of the RACI matrix consists of four numbers of key significant steps. Those need to be completed sequentially from start to finish. The first stage is the statement of work which define the scope of the process. Then stakeholder identification for identifying interested parties, their expectations, and contributions. The Third stage is Activity list preparation which identified the activities in the process. The last and fourth stage is the work breakdown structure to define the levels of the tasks in the process. Finally, tabulate the data with key tasks and roles with the following roles Responsible, Accountable, Consulted, and Informed.

4.8 Summary of Conceptual Framework

According to the literature described in this section, key findings can be combined into a visual display as follows in Figure 4.

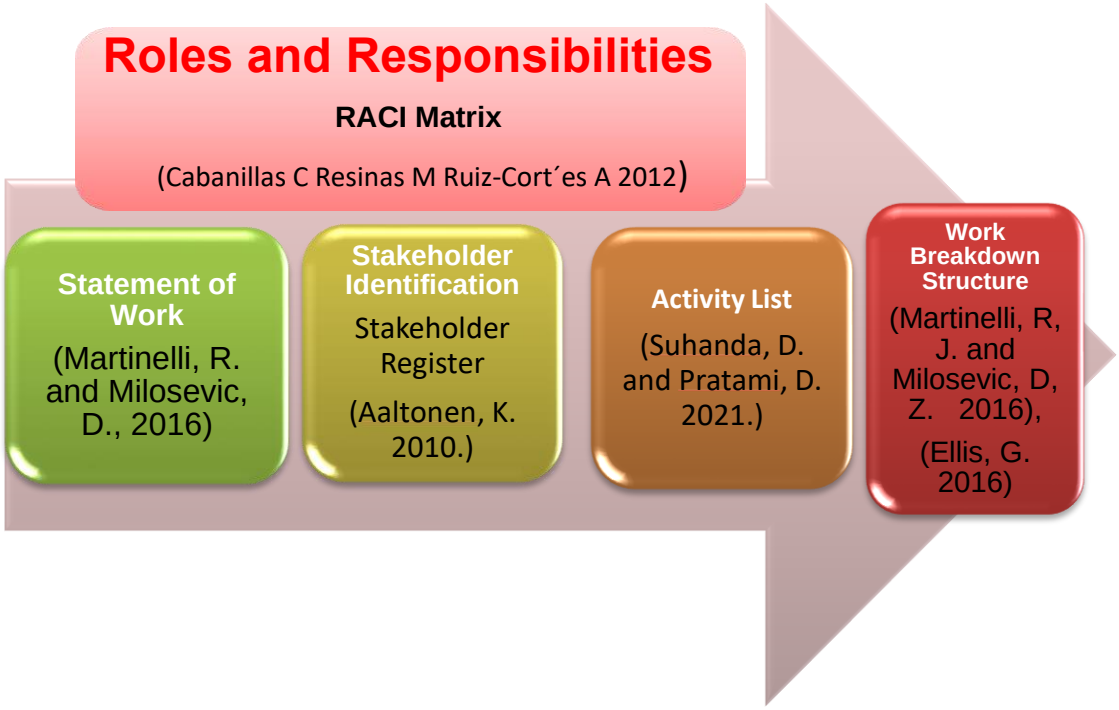

Figure 4 The Conceptual Framework

According to Figure 4, Defining Roles and responsibilities have been identified in the current state analysis as the most significant finding. To implement it RACI Matrix has been identified.

The conceptual framework is based on project management principles. Key persons involved in the process are Engineers or with an engineering background. Therefore, they are familiar with project management theories and practices. It paves the way for ease of deployment. On the other way, the process doesn't have a limited time duration as projects. Those factors need to be considered in the customization.

Section five considered the formulation of the conceptual framework for the initial improvement proposal. Further, the conceptual framework is utilized to mitigate the significant weakness and integrate the strengths found in the current state analysis.

5 Initial Recommendations

This section describes the Initial recommendations for guidelines for better management of the process of balancing the supply and demand of water in the capital city area and its suburbs of the Ambathale water treatment plant. Further, this section provides a comprehensive synopsis of the methodology employed in conducting the study. Then, details of the initial recommendations. The previous section described the formulation of the conceptual framework.

5.1 Overview of the Recommendation Building Stage

The objective of the study is to propose recommendations for guidelines for better management of the process of balancing the supply and demand of water in the capital city area and its suburbs of the Ambathale water treatment plant. The outcome is the recommendations for a guideline that allows the NWSDB to manage the water balance between supply and demand in the capital city and its suburbs.

The initial recommendations for guidelines were based on the conceptual framework formulated in section 4. It was customized based on the stakeholder's comments on the process, considering the limitations and requirements of the organization. Considering the limitations of the study by the means of time, resources, and number of stakeholders in the process and the study leads to development in the process, Chief Engineer Development (CE Development) coordinated the stakeholders on behalf of the organization. Further, Chief Engineer (Process) also contributed. Both are decision-makers in the development process and scope of the study. They have been involved in the stages of customization of recommendations, documentation, and validation.

It was observed, that to get the maximum benefit from the study, the existing processes need to modify. Therefore, Chief Engineer (Development) and Chief Engineer (Process) joined to co-creation of modifying the existing process. It was decided to after the modification of the existing process, the initial

recommendation can be customised. The stakeholder suggestions were coordinated by the Chief Engineer (Development).

5.2 Illustration and Description of the Initial Recommendation

The way of formulation of the Initial Recommendation is illustrated below in Figure 5.

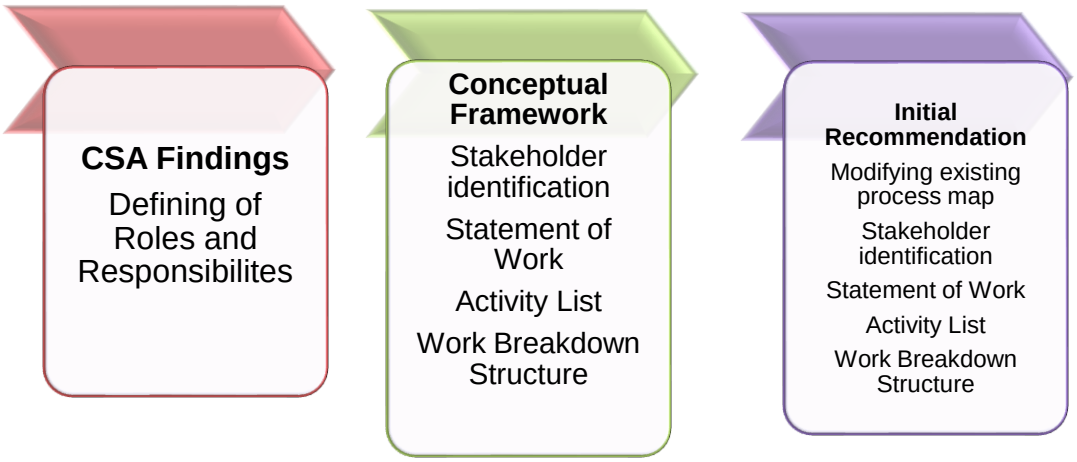

Figure 5 The way of formulation of the initial recommendation

Figure 5 depicts the way of formulation of the initial recommendation from CSA findings. Initially In the CSA stage existing process was studied, and then identified defining roles and responsibilities was the significant matter according to the Weighted scored weakness table (Table No 9). Based on that finding, the Conceptual Framework has been created under the literature survey stage. Considering the findings of the previous two stages initial recommendation was stipulated. Stakeholder recommendations for Initial recommendations were tabulated in Table 11stakeholder suggestions for initial recommendations.

Table 11 Stakeholder Suggestions for Initial Recommendations

No	Key concern areas from CSA and CFW	Stakeholder Suggestions	Description
1.	Existing Process	Stakeholders suggested modifying the existing process by integrating the following steps. 1. Pre-Analysis 2. Post verification 3. Emergency analysis 4. Identification of variations and Documentation	The existing process is incapable of analysing the situation, and further not providing data for improvement and Development. Therefore, need to introduce the following steps. Analysis needs to integrate the following three stages, initialising stage, after-the production stage-verification, identification of significant variations, in search of emergencies.
2.	Statement of Work (SOW)	All steps need to include.	It is required to include all steps and actions which are in the scope of the process.
3.	Work Breakdown structure	In the categorization process, the relationship needs to be the key linking factor.	In categorising all process-related actions, related actions need to cluster together. It leads to increase clarity in assigning roles and responsibilities.
4	Defining Roles and Responsibilities	Priority needs to be given to the Organizational hierarchy in assigning Roles and Responsibilities.	Tasks and activities are assigned to section heads based on organizational hierarchy. Therefore, assigning roles and responsibilities need to follow the existing hierarchy to avoid frustrations.

Suggestions for Initial Recommendations from stakeholders were depicted in Table 11. The table was prepared by categorising key concern areas identified by CSA and CFW, and stakeholder suggestions and descriptions

5.2.1 Modifying Existing Process

Initial discussion was held with Chief Engineers Development and Process, it was identified that to get the maximum benefit of defining roles and responsibilities under this study, the existing process needs to modify. Therefore, in the discussion, it was told to modify the existing process as co-creation with the support of the Chief Engineers of Process and Development. Then after defining roles and responsibilities for the modified Process. The key concerns for modification were identified and stipulated as follows.

1. Pre-Analysis
2. Post verification
3. Emergency analysis
4. Identification of Significant Variations and Documentation for Best Practices and Developments.

The above steps were integrated into the modified process. The modified process map is shown in Figure No 6.

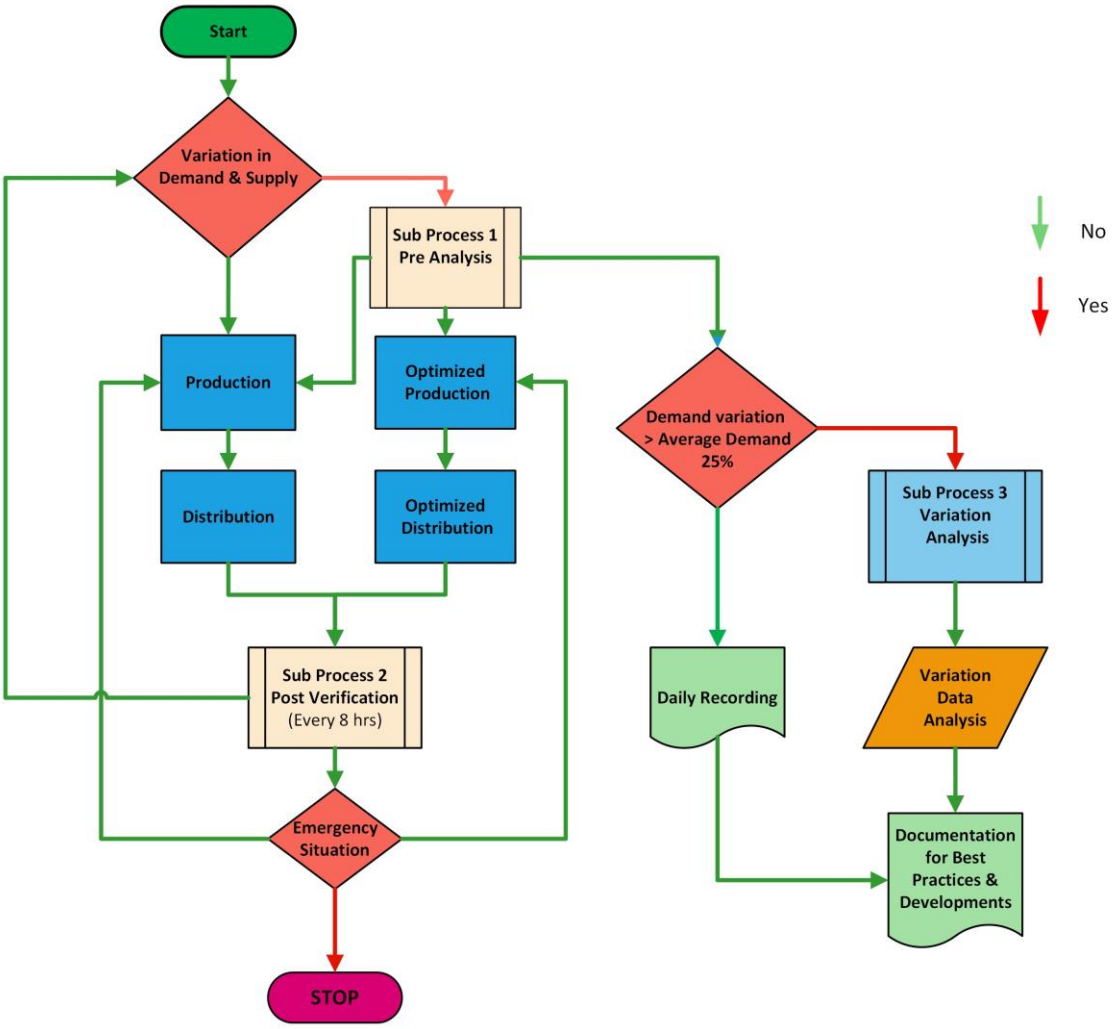

Figure 6 The Modified Process Map

According to the modified process map (Figure 6), after starting the process, system initialization has been conducted as the first and foremost activity. Demand variation analysis needs to carry out with considering demand and production capabilities in the initialization stage. In this sage, if the answer is “No” it proceeds to production and then distribution to the internal customers based on their requirements.

If the result is “Yes” then need to proceed to Pre analysis stage named subprocess 1 as shown in Figure 7.

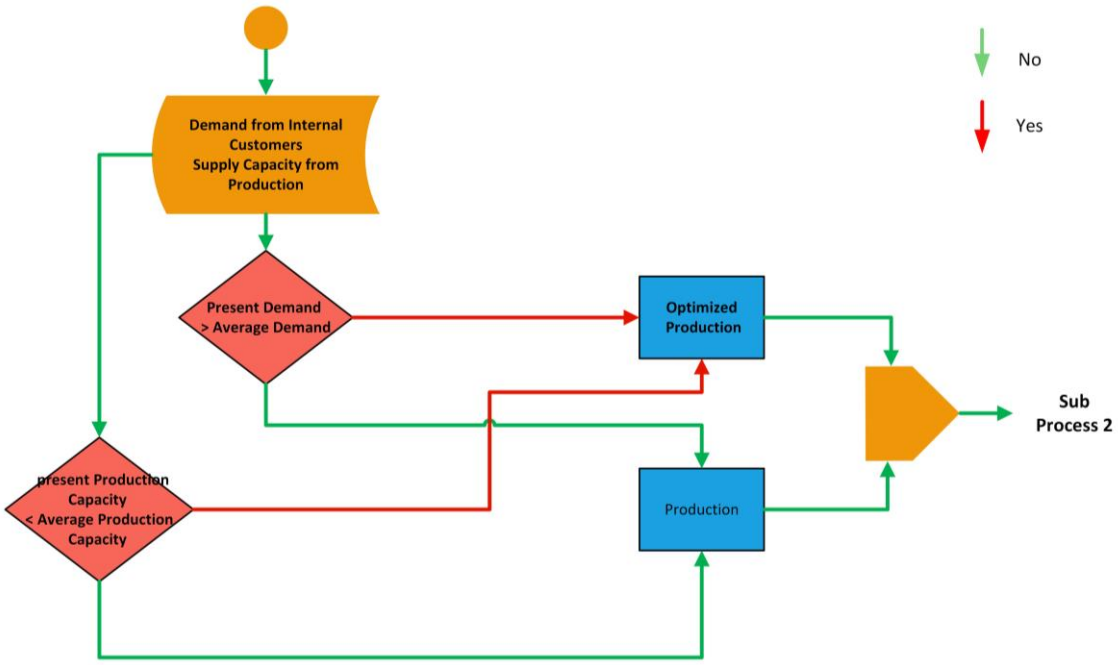

Figure 7 Pre-Analysis (Sub-process 1)

Pre-Analysis – As depicted in the illustration Figure 7. In this stage, demand variations and production constraints were detailly analysed. Then, if the variation is manageable with existing resources, the process proceeds with the normal procedure. Otherwise, proceed with optimized production and optimized distribution.

Optimum production is determined by considering the maximum production capabilities and considering priorities optimum distribution is determined. Then proceed to the next stage of the post-verification stage (Sub-process 2) as shown in Figure 8.

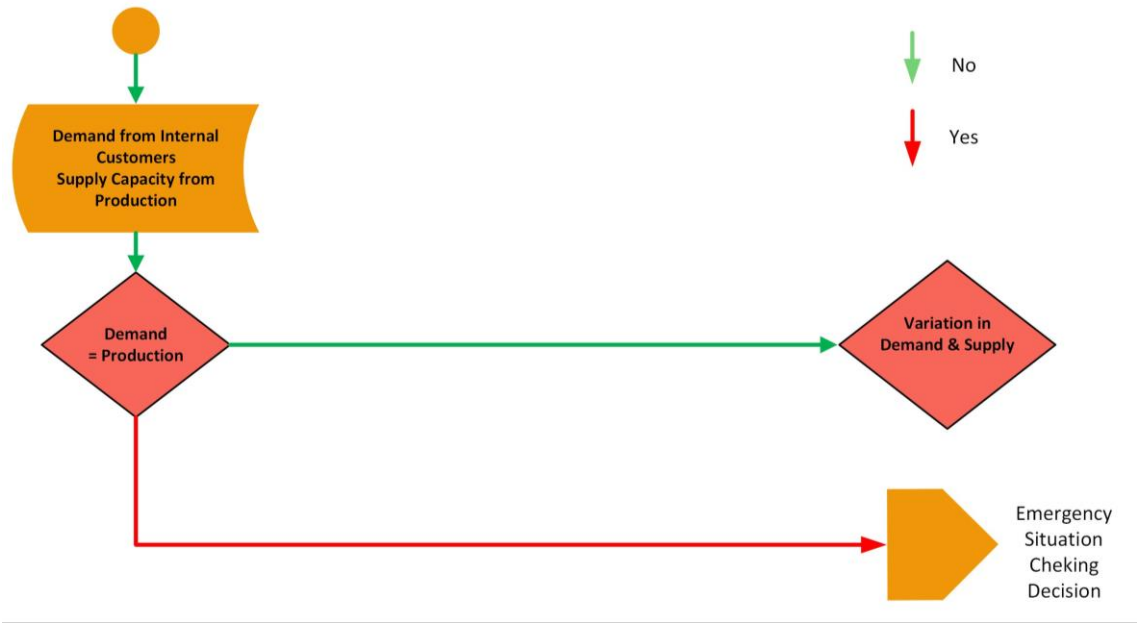

Figure 8 Post-verification stage (Sub-process 2)

Post Verification stage (Sub-process 2) –As per Figure 8 of post verification stage (sub-process 2). In this stage, verification is carried out after every 8 hours. It paves the way to identify system variations and take corrective measures.

The water Purification procedure is a continuous process, further shift of the Duty officer is changed on every 8 hours basis. Therefore, it needs to verify every 8 hours basis. Then proceeds to check if any emergencies occurred.

Emergency-Situation Check, in this stage, the process proceeds if the situation is normal. If an abnormal condition occurred or an emergency is found, the system will be stopped, irrespectively to the present process stage.

Significant Variation Analysis stage

This stage is the most important stage, added to the process, it leads to identifying, analysing, and documenting the important data for best practices and future development.

Variations which exceed more than 25% of the average production capacity is considered a significant variation. The significant variation is processed under the

Variation analysis process (Sub-Process 3) as shown in Figure 9 otherwise data will be documented as a daily record.

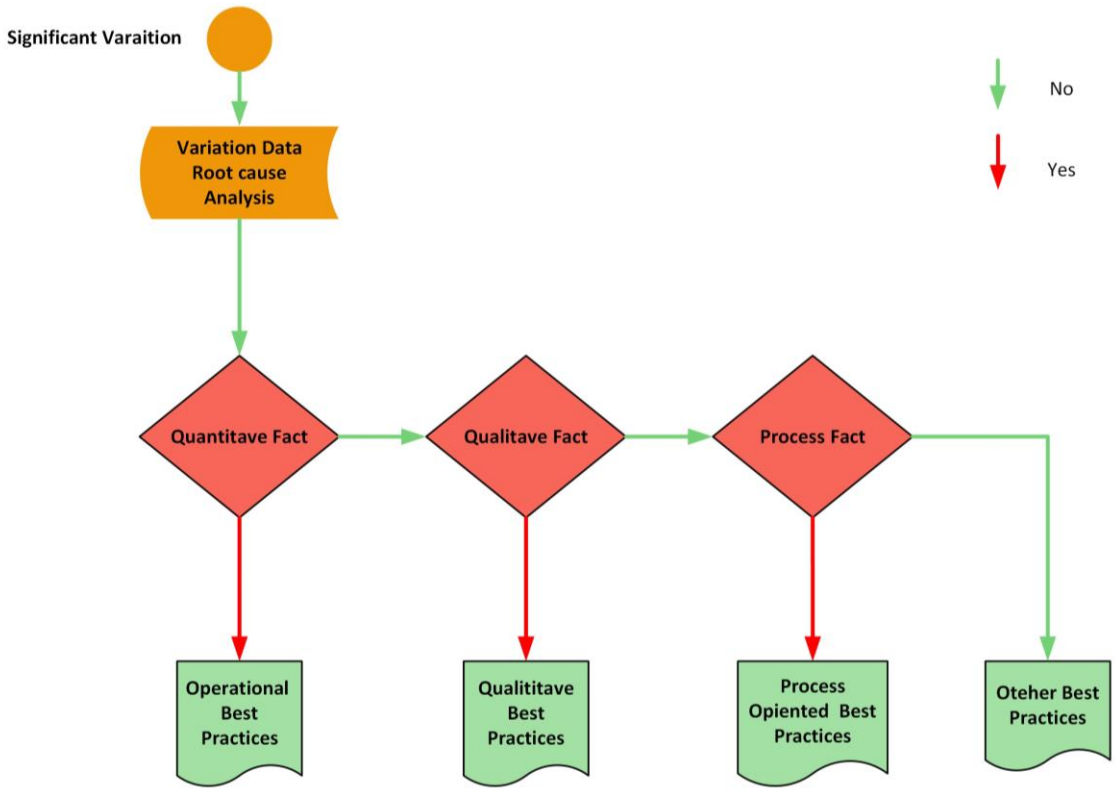

Figure 9 Variation Analysis (Sub-Process 3)

As depicted in Figure 9, variation data will be processed if the variation is higher than 25% of the average production capacity. Then, it will be categorised by using the classification procedure.

First, check whether the variation is quantitative. If yes, then it is forwarded to the quantitative analysis team consisting of operation experts. If it is not, then proceed to check if it is a qualitative issue. If the result is yes, it will be forwarded to the qualitative expert team consisting of quality experts including chemists. If the answer is not, then proceed to process the expert team if it is process-related then they analyse the data. If it is not related to the process, then passed to another multi-disciplinary expert team.

Each expert team analyses the data and identifies the root cause for it. After the analysis, the respective team prepare a document for the root cause, and solutions and document it as a best practice and future development.

5.2.2 Solution for Statement of Work

Statement of work is an integral part of the process. It defines the scope of work in the process. It consists of what are the items included in the process and excluded. The statement for the process was not defined for the process. Therefore, it was defined as below.

5.2.3 Initial Statement of Work

Supplying the water requirement in the capital city and its suburbs from the production of the Ambathale Water Treatment Plant. It includes extraction of water from the Kelani River then, purification in, and temporary storing in the Ambathale Water Treatment Plant premises. Then temporarily stored water is released at the request of internal customers. Maintaining water balance between water purification and demand by managing the process. Distribution from internal customer reservoirs is excluded.

5.2.4 Solution for Initial Stakeholder Identification

Stakeholder identification is also an important part of the process. It builds a “correct” picture of stakeholder involvement in the process based on their requirements and contribution. Based on the findings, the stakeholder registry was prepared.

Initial Stakeholder Registry

The Stakeholder Register is a document used in project management to identify; an overview of each stakeholder's involvement can be found in the Stakeholder Registry. The stakeholder registry is shown in Table 12.

Table 12 Initial Stakeholder Registry

No	Name	Position	Location	Requirements/Roles
1.	Engineer Operation	Engineer Operation	Ambathale	Operations
2.	OIC Main Plant	OIC	Ambathale	Production
3.	OIC New Plant	OIC	Ambathale	Production
4.	Duty Officer	DO	Ambathale	Transmission operation
5.	Pump Operator	Pump Operator	Ambathale	Pumping
6.	Pipeline Maintenance Team	Workers	Ambathale	Maintenance
7.	Manager Kotte	Manager	Kotte	Management of Distribution
8.	OIC Hokandara	OIC	Hokandara	Full fill the requirement of the area
9.	OIC Dehiwala	OIC	Dehiwala	Full fill the requirement of the area
10.	OIC Batapotha	OIC	Batapotha	Full fill the requirement of the area
11.	OIC Jubilee	OIC	Jubilee	Full fill the requirement of the area
12.	OIC Eli House	OIC	Eli House	Full fill the requirement of the area
13.	OIC Gothatuwa	OIC	Gothatuwa	Full fill the requirement of the area
14.	OIC Kolonnawa	OIC	Kolonnawa	Full fill the requirement of the area
15.	OIC Maligakanda	OIC	Maligakanda	Full fill the requirement of the area
16.	DGM Production	DGM Production	Ambathale	The smooth operation of the whole process
17.	AGM Production	AGM Production	Ambathale	The smooth operation of the whole process
18.	Manager Operation	Manager Operation	Ambathale	Uninterrupted operation
19.	Chief Engineer Process	Chief Engineer Process	Ambathale	The smooth operation of the process
20.	Chief Engineer Development	Chief Engineer Development	Ambathale	Developments
21.	Chief Chemist	Chief Chemist	Ambathale	Quality Monitoring

The table of the initial stakeholder registry is shown in Table 12. All stakeholders in the process are listed. Then their Name, Position, Location, and Requirements/roles are listed respectively to the process.

5.2.5 Solution for Initial Activity List

The activity list is a major contributor to the process it includes activities that need to carry out in the process. Further, it plays a critical role for the project team to comprehend how the work will be completed. The activity list was not available in the process. Therefore, it was created as depicted in Table 13 Activity List.

Table 13 Initial Activity List

Activities	Stage	Responsibility
Water Treatment/Production	Initial	OIC
Distribution/Transmission	Initial	OIC
Pumping	Pumping stage	Pump operator
Line maintenance	Maintenance	Line Maintenance Team
Process Controlling	Distribution	Duty Officer
Process owner	All stages	Manager Operation
Development and Improvement Design	Developments	CE Development
Development and Improvement Implementation	Developments	Eng Development
Operation	All stages	Eng. Operation
Requesting	Final stage	Internal Customers
Preventive Maintenance of the Treatment Plan	All stages	Manager Maintenance
Operational Monitoring	All stages	Duty Officer
Analysis - Qualitative	Final stage	Chief Chemist
Analysis - Quantitative	Final stage	Manager Operation
Analysis - Process	Final stage	Chief Chemist
Analysis - Other	Final stage	Manager Operation

According to the Activity list as tabulated in Table 13. All activities are listed, and stage and responsibility were included accordingly.

5.2.6 Solution for Initial Work Breakdown Structure

A project work breakdown structure is an outcome-oriented grouping of project elements that organizes and defines the total scope of the project work. The work breakdown structure was created according to the process requirement and shown in Figure 10 Work Breakdown structure.

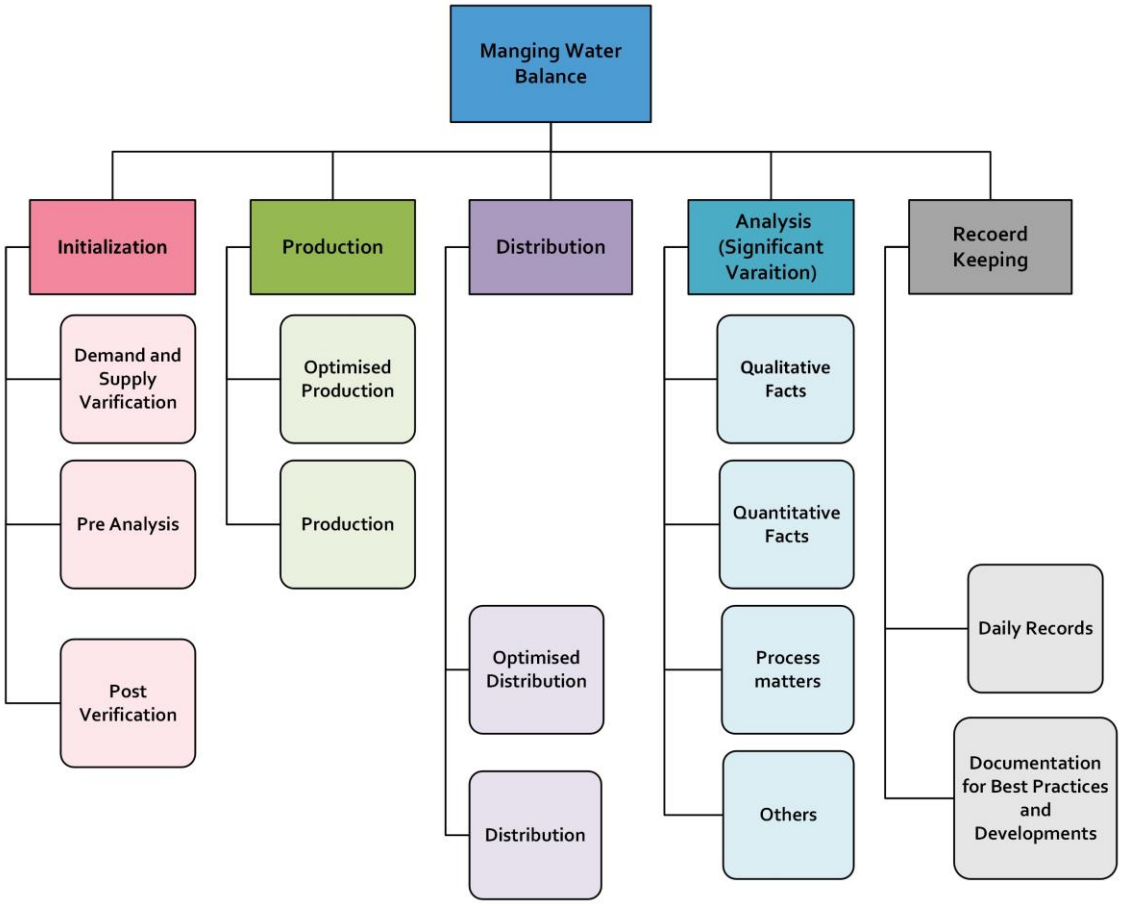

Figure 10 Initial Work Breakdown Structure

As shown in Figure 10 Work Breakdown structure. Tasks in the process were categorized into five groups Initialization, Production, Distribution, Analysis, and record keeping. All tasks are then lined up under each category according to

their relativity. Then move forward to defining the “Roles and Responsibilities “as shown in Table 14.

5.2.7 Solution for Defining Initial Roles and Responsibilities

Defining roles and responsibilities is the paramount important matter in this study. roles and responsibilities have been created because of studies and findings throughout the study.

It directly assigns the authority to dominate the tasks in the process. One officer will be responsible for one task and another higher officer in the organizational hierarchy as accountable. Informed, and consulted roles were assigned as per the requirement. There may be several officers will be assigned to those matters based on the task. The defined roles and responsibilities table is shown in Table 14.

Table 14 Initial Roles and Responsibilities

Activities	DGM Production	AGM Production	Manager Operation	Engineer Operation	Duty Officer	Manager Kotte	OIC Main Plant	OIC New Plant	OIC Dehiwala	OIC Batapotha	OIC Hokandara	OIC Jubilee	OIC Eli House	OIC Gothatuwa	OIC Kolonnawa	OIC Maligakanda	Pump Operators	Manager Maintenance	Pipe Line Maintenance Team	Chief Process Engineer	Chief Development Engineer	Chief Chemist
Distribution/Transmission		C	A	I	R																	
Production							R	R														
Requesting - Based on their Location		C	I	I		A			R	R	R	R	R	R	R	R						
Process Controlling		C	A	I	R															C		
Operation		C	A	I	R																	
Operational Monitoring		I	A	I	R															C	C	C
Daily Documentation		I	C	A	R																	
Process owner	A	C	R	I																		
Line maintenance		C	I	A														C	R			
Development and Improvement Design	I	A	I	I	I													I	I	I	R	I
Development and Improvement Implementation	I	C	I															I	I		A	
Analysis - Qualitative	I	C	I																	C		A
Analysis - Quantitative	I	C	A	R															I	C		
Analysis - Process	I	A	I																	R		C
Analysis - Other	I	A	R																	C	C	C

R Responsible A Accountable I Informed C Consulted

5.3 Discussion on Initial Roles and Responsibilities Defining

The paramount important goal of this study is, to define roles and responsibilities, Therefore, the highest attention has been paid to it. On the other hand, in the process, several tasks play crucial roles. Tasks are as follows,

I. Pre and Post verifications,
II. Emergency,
III. Analysing,
IV. Documentation for best practices and Development.

Therefore, for crucial steps in the process, a more in-depth explanation has been added.

5.3.1 Pre-Verification

Pre-analysis is carried out in the starting stage of the process as the initialisation of the system. It was depicted the Figure 11 of pre-verification.

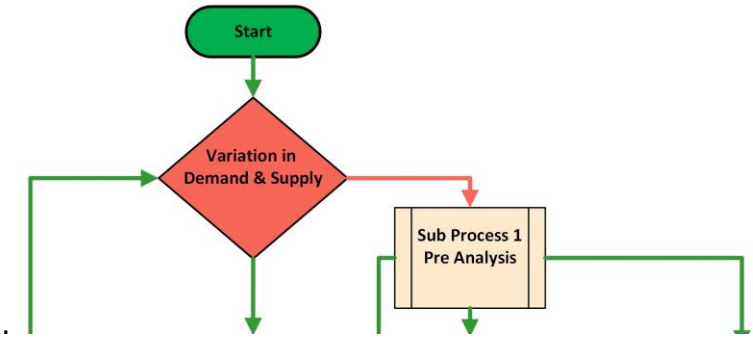

Figure 11 pre verification

As shown in Figure 11, Demand is checked whether it can be fulfilled by existing production capacity. If the variation has been found, a calculation has been carried out for both demand and production.

This task is carried out by Duty Officer, it was assigned as his responsibility. The duty officer is working under the supervision of the Manager Operation. Therefore, he is Accountable.

5.3.2 Post verification

When production is proceeding continuously, a cyclic procedure is required to verify the smooth operation of the system. Post-verification is introduced to fulfil that requirement, and it proceeds on every 8 hours basis. Figure 12 Post Verification shows details.

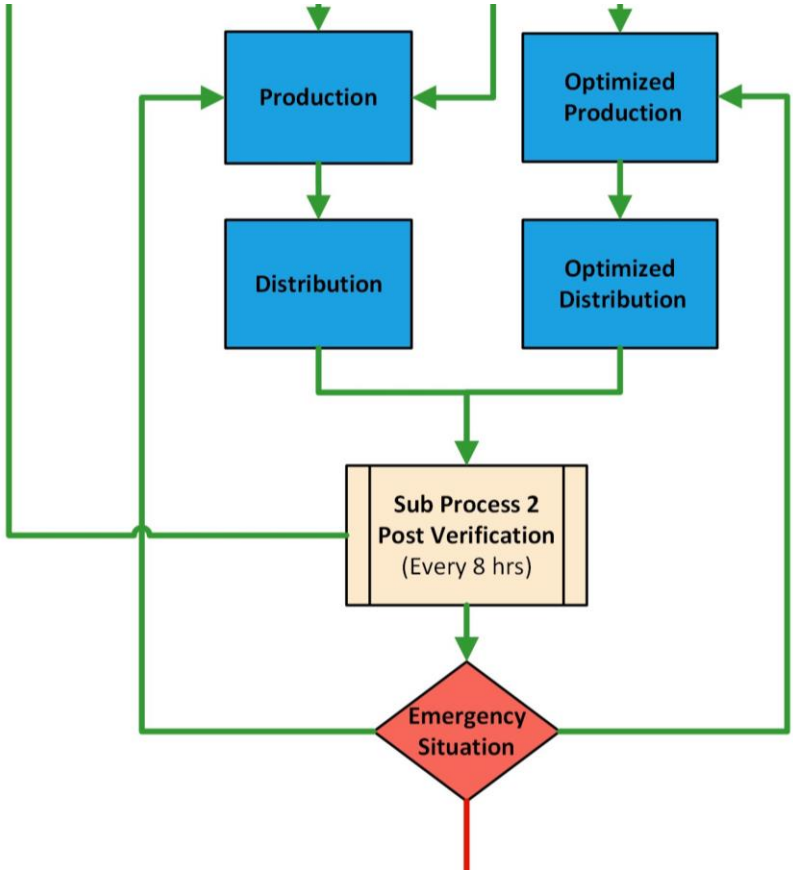

Figure 12 post verification

As depicted in Figure 12. after the production stage post verification has been carried out. Then proceeds to the Emergency checking stage.

5.3.3 Emergency

In this stage, the process will be stopped irrespectively its operating stage. It was checked in every cycle of the operation.

For the steps of pre, post verifications and Emergency, the Duty officer needs to verify and take necessary actions, therefore, the responsible Manager Operation is accountable.

5.3.4 Analysing

Analysing has been carried out if and only when variation is identified. If the variation is more than 25% of the average deviation, then it was identified as a significant variation and proceeds to subprocess 3 Significant variation analysis stage.
Since variation identification is a task of the Duty officer, he is responsible for it and Manager Operation is accountable.

5.3.5 Documentation for best practices and Development.

A sorting procedure was introduced for identification and It was shown in Figure 13.

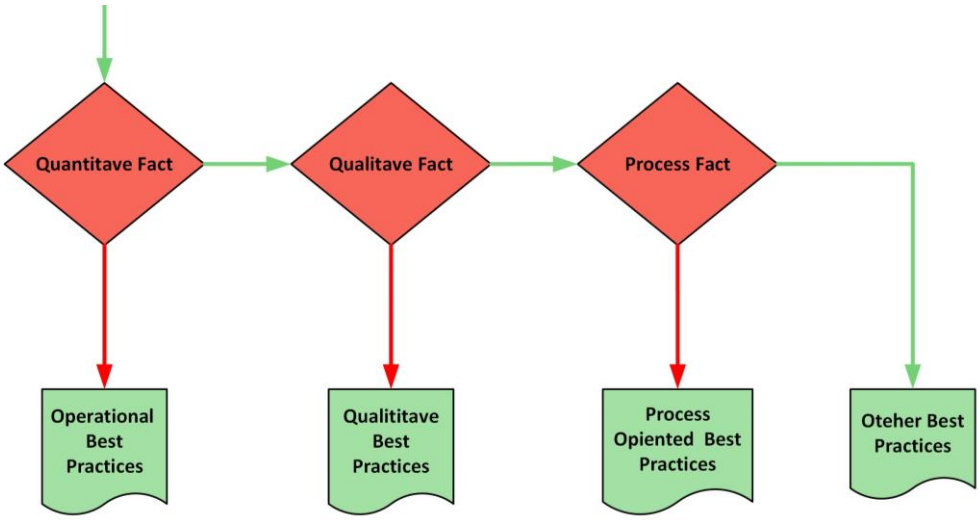

Figure 13 Variation Analysis (Sub-Process 3)

As depicted in Figure 13 Variation Analysis (Sub-Process 3) first stage checks for quantitative variations, if found Details are provided to the operational management team to analyse and provide best practices and facts for future Developments.

Assigning of Roles and Responsibilities are as follows,

Responsible - Duty Officer

Accountable - Manager Operations

If the variation is not due to quantitate, then forwarded to the qualitative expert team. They analyse the issue and provide best practices and facts for future Developments.

Assigning of Roles and Responsibilities are as follows,

Responsible - Chief Chemist

Accountable - AGM (Production)

If the variation is not due to qualitative, then forwarded to the Process expert. They analyse the issue and provide best practices and facts for future Developments.

Assigning of Roles and Responsibilities are as follows,

Responsible - Chief Engineer Process

Accountable - AGM(Production)

If the variation is none of the above, then forwarded to another expert team. They analyse the issue and provide best practices and facts for future Developments.

Assigning of Roles and Responsibilities are as follows,

Responsible - Manager operation

Accountable - DGM (Production)

The assignment of Roles and Responsibilities for key roles in the process was explained in a detailed manner. Other roles in the process were also assigned following the same procedure.

The proposed initial proposal was discussed with the stakeholders who have decision-making power, Chief Engineer Development and Chief Engineer Process. Created tables and figures were sent to the decision-making team as an initial proposal for their comments and the practicality of the proposal. Based on their comments the final proposal of roles and responsibilities is planned to be prepared. The initial proposal creation was completed in section 5.

The next chapter represents the final proposal, for roles and responsibilities created, based on feedback received from the decision-making stakeholders.

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6. Validation of Initial Proposal

This section describes the validation of initial guidelines for recommendations for better management of water balance in the capital city and its suburbs for the Ambathale water treatment plant. Other than that, this section provides an overview of how the feedback was integrated into the final proposal. Followed by the details of the final recommendations. The previous section described the formulation of the initial recommendation.

6.1 Overview of the Validation Stage

The initial recommendation was mailed to Chief Engineer Development and Chief Engineer Process. They have submitted their comments for improvements. They have provided comments on the itemized manner under the two main aspects of the process view and development views. Feedback was integrated into the initial proposal and the final proposal was prepared.

6.2 Adjustments to the Initial Proposal

Integrating maintenance and development activities in the roles and responsibilities was the key concern of the feedback, in contrast to the initial proposal.

Feedback was tabulated based on each factor and depicted in Table No 15.

Table No 15. Feedback received.

No	Key concern areas from CSA and CFW	Stakeholder Suggestions	Description
1.	Statement of Work (SOW)	The initial SOW was changed.	The SOW precision was improved by adding details. Therefore, the Initial SOW was replaced with the detailed SOW.
2.	Stakeholder Registry	New Stakeholders were added	The registry was updated respectively to the added functions
3.	Activity List	New Activities were added	Development and Maintenance of Pumps, Civil structures, and equipment were added
4.	Work Breakdown structure	Modified by adding new functions	Adding Maintenance and Development functions with related activities was a significant difference from the initial proposal.
5.	Defining Roles and Responsibilities	Roles and responsibilities were updated.	In contrast to the initial proposal, development and maintenance functions were integrated into the roles and responsibilities.

6.3 Final Proposal

The final proposal was created based on the Feedback received for the initial proposal.

The feedback received from the stakeholders consists of two key concerns, integrating Maintenance activities and Developments in the process in contrast to the initial proposal.

Therefore, required updates were integrated into the items in the initial proposal Stakeholder registry, Activity List, and WBS. Then, the Final Proposal was prepared.

The Final Statement of Work

Production & Supplying of the drinking water requirement of Colombo city and its suburbs from the Ambathale Water Treatment Plant. The process includes the abstraction of raw water (Low lifting) from the Kelani River, water Purification, storing purified water and pumping (High Lifting) to towers and reservoirs in Colombo city and suburbs from Ambathale Water Treatment Plant premises. The purified stored - water is released as per the request of internal customers (Towers and Reservoirs). Managing the water balance between water production and demand is the key process. Distribution from the internal customer to the consumer is excluded.

The Final Stakeholder Registry

As shown below in Table 16 The final stakeholder registry was prepared. Each stakeholder, Name, position, location, and requirements and roles were tabulated respectively.

Table 16 Final Stakeholder Registry

No	Name	Position	Location	Requirements/Roles
1	Engineer Operation	Engineer Operation	Ambathale	Operations
2	Engineer Development	Engineer Development	Ambate	Developments
3	Chemist	Chemist	Ambathale	Quality Monitoring
4	OIC Main Plant	OIC	Ambathale	Production
5	OIC New Plant	OIC	Ambathale	Production
6	Duty Officer	DO	Ambathale	Transmission operation
7	Pump Operator	Pump Operator	Ambathale	Pumping
8	Pipeline Maintenance Team	Workers	Ambathale	Maintenance
9	Manager Kotte	Manager	Kotte	Management of Distribution
10	OIC Hokandara	OIC	Hokandara	Full fill the requirement of the area
11	OIC Dehiwala	OIC	Dehiwala	Full fill the requirement of the area
12	OIC Batapotha	OIC	Batapotha	Full fill the requirement of the area
13	OIC Jubilee	OIC	Jubilee	Full fill the requirement of the area
14	OIC Eli House	OIC	Eli House	Full fill the requirement of the area
15	OIC Gothatuwa	OIC	Gothatuwa	Full fill the requirement of the area
16	OIC Kolonnawa	OIC	Kolonnawa	Full fill the requirement of the area
17	OIC Maligakanda	OIC	Maligakanda	Full fill the requirement of the area
18	DGM Production	DGM Production	Ambathale	The smooth operation of the whole process
19	AGM Production	AGM Production	Ambathale	Smooth operation of the whole process
20	Manager Operation	Manager Operation	Ambathale	Uninterrupted operation
21	Manager Maintenance	Manager Maintenance	Ambathale	Maintenance
22	CE Process	CE Process	Ambathale	The smooth operation of the process
23	CE Development	CE Development	Ambathale	Developments
24	Chief Engineer (Electronics)	Chief Engineer (Electronics)	Ambathale	Monitoring system maintenance
25	Chief Chemist	Chief Chemist	Ambathale	Quality Monitoring

New stakeholders were added and orange-coloured to differentiate from the initial proposal, As shown in Table 16.

The Final Activities List

New activities have been added to the final activities list as shown in Table 17 Final Activity List.

Activities	Stage	Responsibility
Water Treatment/Production	Initial	OIC
Pre-Analysis (Sub Process 1)	Initial	DO
Distribution/Transmission	Initial	OIC
Post Verification (Sub Process 2)	Pumping stage	DO
Emergency Checking	Pumping stage	DO
Pumping	Pumping stage	Pump operator
Line maintenance	Maintenance	Line Maintenance Team
Pump Maintenance	Maintenance	Manager Maintenance
Civil Structures Maintenance	Maintenance	Eng. Operation
Process Controlling	Distribution	Duty Officer
Process owner	All stages	Manager Operation
Development and Improvement Design	Developments	CE Development
Development and Improvement Implementation	Developments	Eng Development
Operation	All stages	Eng. Operation
Requesting	Final stage	Internal Customers
Preventive Maintenance of the Treatment Plan	All stages	Manager Maintenance
Operational Monitoring	All stages	Duty Officer
Variation Analysis (Sub Process 3)	Final stage	Duty Officer
Daily Documentation	All stages	Duty Officer
Analysis - Qualitative	Final stage	Chief Chemist
Analysis - Quantitative	Final stage	Manager Operation
Analysis - Process	Final stage	Chief Chemist
Analysis - Other	Final stage	Manager Operation
Documentation for Best Practices and Developments	Final stage	Responsible Officer

Newly added activities were blue coloured to differentiate from the initial proposal.

Final Work Breakdown Structure

The WBS has been updated by adding new branches under maintenance and development. Details are shown the Figure 14 Final Work Breakdown Structure

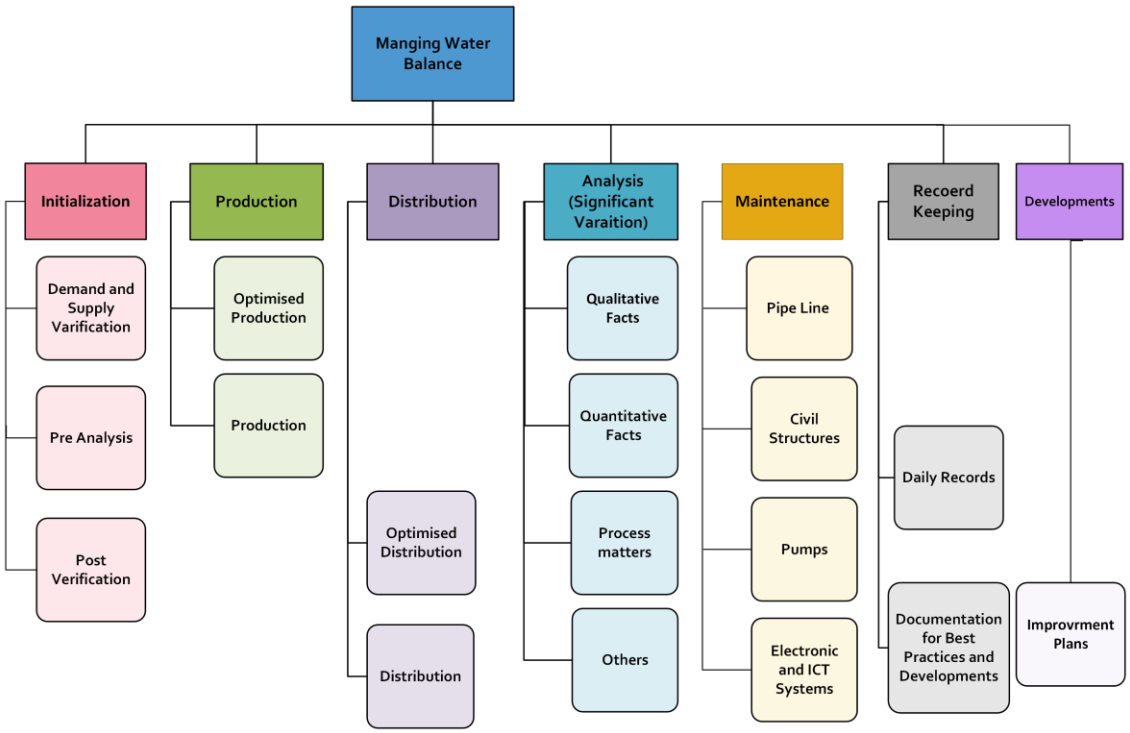

Figure 14 Final Work Breakdown Structure

As depicted in Figure 14 Final Work Breakdown Structure. Maintenance duties (Shown in Orange Colour), Development section (Shown in violet Colour) were added to the WBS.

The Final Roles and Responsibilities

Thus far, previous sections have shown updates to the items in the initial proposal, to craft the final proposal of the Roles and Responsibilities. Consequently, the modified final Roles and Responsibilities have been tabulated in Table 18. Shown below.

Table 18 The Final Roles and Responsibilities

Activities	DGM Production	AGM Production	Manager Operation	Engineer Operation	Engineer Development	Chemist	Duty Officer	Manager Kotte	OIC Main Plant	OIC New Plant	OIC Dehiwala	OIC Batapotha	OIC Hokandara	OIC Jubilee	OIC Eli House	OIC Gothatuwa	OIC Kolonnawa	OIC Maligakanda	Pump Operators	Manager Maintenance	Pipe Line Maintenance Team	Chief Engineer Process	Chief Engineer Development	Chief Chemist	Chief Engineer (Electronics)
Pre-Analysis (Sub Process 1)			A				R																		
Water Treatment/Production-Main Plant			I	A					R													C			
Water Treatment/Production-New Plant			I	A						R												C			
Distribution/Transmission		C	A	I			R																		
Post Verification (Sub Process 2)			A				R																		
Requesting - Based on their Location		C	I	I				A			R	R	R	R	R	R	R	R							
Pumping		C		I			A												R	C					
Variation Analysis (Sub Process 3)				A			R																		
Process Controlling		C	A	I			R															C			
Operation		C	A	I			R																		
Operational Monitoring		I	A	I		C	R															C	C	C	
Daily Documentation		I	C	A			R																		
Process owner	A	C	R	I																					

ICT & Electronic Equipment Maintenance			I																	A					R
Line maintenance		C	I	A																C	R				
Pump Maintenance		A																		R					
Civil Structures Maintenance		C		R	A																				
Preventive Maintenance of the Treatment of their Plants	C	I	C	A					R	R										I					
Development and Improvement Design	I	A	I	I	I		I													I	I	I	R	I	I
Development and Improvement Implementation	I	C	I		R															I	I		A		
Analysis - Qualitative	I	C	I			R																C		A	
Analysis - Quantitative	I	C	A	R																	I	C			
Analysis - Process	I	A	I																			R		C	
Analysis - Other	I	A	R																			C	C	C	
Documentation for Best Practices (By Responsible Officer)	C	A	R																			R	R	R	

R Responsible A Accountable I Informed C Consulted

As shown in Table 18. Final Roles and Responsibilities have been updated and modified rows and columns are shown in light blue colour.

6.4 Recommendations

Reviewing the Final proposal following comments received from the Chief Engineer Development.

> "Went through the Final proposal for Roles and Responsibilities to manage water Balance in Capital City and its suburbs and observed that all comments were integrated.
>
> Presently, We are at a turning point in automating the total plant operation, it is been in progress. Other than of that it includes a state-to-the-art monitoring system for remote reservoirs monitoring. That automation will lead to introducing drastic changes in the water Treatment Process.
>
> Therefore, this newly proposed, modified process and defined roles and responsibilities are accepted and they are very much important as an initial step.
> Further, initiatives in this study will direct the way we need to move forward in the future. "

This section has explained the development of the initial proposal to the final proposal. The next part of this paper will be on discussions and conclusions.

7 Discussions and Conclusions

The previous chapter has described the creation of the final proposal. This section has attempted to discuss and conclusions about the study.

7.1 Executive Summary

The objective of the study is to propose recommendations for guidelines for better management of the process of balancing the supply and demand of water in the capital city area and its suburbs. The study comprises four key stages, Current State Analysis (CSA), Literature Survey, Initial Proposal, and Final Proposal.

Other than that, the existing process was modified to optimise the potential of the study, as a co-creation with decision-making stakeholders in the organization

In the first stage, in the Current State Analysis, the existing process was examined. The outcome of this stage was Stakeholder identification and the strengths and weaknesses of the system.

Considering the constraints within the study, a significant factor to address from the weaknesses list, “defining roles and responsibilities” was selected, by the weighted average method.

Subsequently, in the second stage, the literature survey has been carried out and as an outcome, a conceptual framework was identified for defining roles and responsibilities based on RACI Matrix.

It was observed that the existing process was simplistic and lacking in clarity. Subsequently, it was modified to optimise the potential of the study as co-creation with decision-making stakeholders in the organization. In contrast to the earlier process, the modified process was enhanced with process verification, analysis, categorization, and documentation. As a result of that, a methodology for data collection for analysis has been introduced in a rational and procedural manner. Pre and Post verification was introduced as a short-term measure. Long-term

measures encompassed the Identification of significant variations, systematic analysis procedures with an expert team, and documentation practices.

The third stage involved the creation of an initial proposal based on the conceptual framework. The RACI Matrix was employed to define the roles and responsibilities. To achieve that, the following items were developed, Stakeholder Registry, Activity list, and Work Breakdown Structure. Consequently, initial Roles and Responsibilities were defined using the RACI Matrix.

Feedback was sought from decision-making stakeholders regarding the initial roles and responsibilities. The feedback highlighted the need of integrating the maintenance team and the development activities, into the process.
Ultimately, the final recommendation for defining roles and responsibilities was formulated, incorporating the necessary modifications based on the feedback.

This study yields twofold outcomes. In the short term, the modified process and clearly defined roles and responsibilities enhance operational efficiency, beneficial for the stakeholders who use the process. In the long term, the study will provide insights into future developments and maintenance for the stakeholders who manage the process. These will pave the way for the forthcoming developmental initiatives and strategy formulations in the organisation.

7.2 Recommendations for Next Steps

This study focuses on implementing recommendations for guidelines to manage the water balance between supply and demand in the capital city and its suburbs. It paves the way for a win-win situation for all stakeholders in the process. Further, the cooperation, understanding, and commitment of all stakeholders are essential. Therefore, the following steps are recommended to gain the full benefits of the study.

Recommendations are categorized into two groups as long-term and short-term measures.

Short-term measures need to implement with priority as lined up below, consequently, the long-term measures need to implement after the short-term measures.

7.2.1 Short-term Measures

I. Comprehensive awareness programs need to conduct for the stakeholders in the process.

II. A versatile ease of use communication method needs to introduce to all stakeholders. For example, a WhatsApp group. To communicate and share their experience without delay.

III. Then step by step functional units or stakeholders can be added to the process as stipulated in the WBS, and RACI Matrix.

IV. Continuous dialogue needs to maintain among stakeholders to increase the liveness of the modified process and the roles and responsibilities. It is recommended to introduce a mechanism such as Demings PDCA cycle for continuous improvement of the process.

7.2.2 Long-term measures

1. The study was conducted within a short period. The performance of the system depends on several parameters. Seasonal variations such as in demand side, weather conditions, demand patterns, weekends, holidays periods, etc. On the other hand, the production side, water quality in the river, condition of the water treatment plant equipment, Staff etc. To consider the impact on the process at least one year of monitoring period

is required. Findings in the study need to review considering the data for at least one year.

2. Progress review meetings

   It is recommended to closely monitor the process according to the Final Roles and Responsibilities and update. Further, it is recommended to keep this document as a live document by calling progress review meetings for share knowledge and experience sharing. The meeting needs to be held according to the following guidelines.

   a) All stakeholders need to participate.
   b) Meeting needs to be chaired by the process owner.
   c) After the implementation, within the first three months, the meetings must be held at least once a month.
   d) Then after, the occurrence of each significant variation, meeting with related stakeholders as an experience-sharing session.
   e) Biannual meeting with all stakeholders.

3. It was observed that real-time data on water distribution is essential for decision-making. Therefore, the organization has taken measures to automate the Water Treatment Plant and introduce a state-to-the-art remote data monitoring system. It is recommended to revise and update proposed roles and responsibilities, After the deployment of new automation of the process.

7.3 Self-Evaluation of Thesis Project Credibility

The objective of this study was complex since it linked with drinking water which is a scarcity of resources globally and it spread out to several locations. A systematic approach paves the way to obtaining the expected outcome in section 6. Further, it was validated by decision-making stakeholders in the organisation.

The key focus of the study was on defining “Roles and Responsibilities “which was selected from the weakness list as the most prioritized matter. In the current

study analysis, there is no assurance that all potential strengths and weaknesses will be noted. Due to the following reasons, highly diversified stakeholders were interviewed even in different locations and functions. Since data collection was conducted remotely, it was difficult to contact all stakeholders, therefore most experienced and interested person was selected to represent the sample. communication gaps and inability to analyse the facts and express them properly. If the survey would have been done physically, this can easily been eliminated.

Since the author of the study was also involved in the process as an infrastructure facilities provider, it helped to understand the process and contact the stakeholders. It was a major plus point to complete the study. Further, the author hasn't in-depth knowledge about the process if there had, it would be easy to complete the study.

7.3.1 Validity

According to a definition provided by Taylor (2003), validity is an adjective, always associated with claims such as the validity of conclusions drawn from the research results. These claims being sound, justified, logical and supported by evidence helps to evaluate the validity of the item in question.

Internal validity was achieved in Current State Analysis by, gathering Data 1 from multiple methods and a variety of sources. It consists of stakeholders from diverse functions and their interviews and further review of internal documents. Stakeholders have different perspectives on the same process. In the initial recommendation stage, Data 2 consists of discussions, E-mails. Reviews were obtained in a detailed manner on each item basis.

7.3.2 Reliability

According to Shenton (2004) promotes triangulation is a method of increasing the trustworthiness and creditability of research. Triangulation is described as using multiple different methods for gathering evidence, using a wide range of informants and sources, and using diverse informants and sources (Shenton 2004: 63-66).

The reliability of the study was maintained by presenting details on the research design under section 2.2. In Section 3, Current State Analysis, Cocreation, and customization of the initial proposal were detailed under Sections 5 and 6. Other than of that under the section 7 self-evaluation has been included.

7.3.3 Trustworthiness: Credibility

Shenton (2004) promotes triangulation as a method of increasing the trustworthiness and creditability of research. Triangulation is described as using multiple different methods for gathering evidence, using a wide range of informants and sources, and using diverse informants and sources (Shenton 2004: 63-66).

The Credibility of the study has been maintained by using different methods for gathering evidence from diversified stakeholders, and various internal documents used as resources in the CSA stage. The Developing Roles and Responsibilities stage consists of discussions, E-mails. Feedback was obtained in a detailed manner on each item basis.

7.4 Relevance

The relevance of the study to the organization has been shown from the initial stage because the selected topic is its own business problem. Stakeholders are directly involved in the process. The conceptual framework stage was related since the literature survey topic was a weakness of the process. In the initial recommendation stage feedback given by decision-making stakeholders confirmed the relevance of the topic to the organization.

7.5 Closing Words

Water is scarcity resource. Proper management leads to serving more users. In this study, initial steps have been taken. Based on the findings, continuously moving forward is essential until reach the shore of a sustainable future.

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Interview Questionnaire Used in the Current State Analysis

A common format of the questionnaire as shown below, asked interviewees, to get their responses and entered them into the document in Appendix 2. The same question was given to the total sample to maintain the integrity of the study and the interviewees consisted of process owners to workers at the grassroots level.

Interview Record Sheet (Sample format)

Interviewee:

Role in the process:

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process?
2. Is there a documented procedure/SOP for the process?
3. What is the scope of the Process?
4. Who is responsible for controlling activities in the process?
5. How are different ideas or suggestions accepted?
6. How are the decisions/actions verified after the changes?
7. What are the strengths in the process in your perception?
8. What are the weaknesses in the process in your perception?
9. What are the improvement ideas in the process in your perception?
10. Other than of those a free word about the process?

Summary of Key Concerning Points from the Interview

Questionnaire and Answers in the Current State Analysis

Interview Record Sheet 1

Interviewee: Engineer Operation

Role in the process: Providing facilities for the process, Transmission line maintenance, Recordkeeping, and Preparation of the monthly Production report.

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No
2. Is there a documented procedure/SOP for the process? No
3. What is the scope of the Process? Provide drinking water to the main city for distribution to their customers. Concerning quantity and quality.
4. Who is responsible for controlling activities in the process? Duty Officer
5. How are different ideas or suggestions accepted? Yes
6. How are the decisions/actions verified after the changes?

   Yes, but no proper procedure.
7. What are the strengths in the process in your perception?

   We have competent staff, they are ready to face any challenge in the system. Sufficient resources are available. Committed and supportive management.
8. What are the weaknesses in the process in your perception?

   Lack of documented SOPs, Poor record-keeping practices,
9. What are the improvement ideas in the process in your perception?

   System Analysis for Improvement, More training for ground-level workers, and more preventive maintenance activities for outstation transmission lines.

10. Other than of those a free word about the process?

    Updates and changes in the system especially in the lines need to report immediately.

Summary of Key Concerning Points from the Interview

Lack of Analysis of the System, Lack of documented SOPs, Competent, experienced, and Dedicated staff, Committed and supportive management, training for ground-level workers, more preventive maintenance activities for outstation transmission lines.

Interview Record Sheet 2

Interviewee: Engineer Development

Role in the process: Implementation of Developments in the Regional Support Centre (Production).

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No
2. Is there a documented procedure/SOP for the process? No
3. What is the scope of the Process? Providing water to the distribution centres with optimum level.
4. Who is responsible for controlling activities in the process? Duty officer
5. How are different ideas or suggestions accepted? Yes
6. How are the decisions/actions verified after the changes?

   Yes, concerning the effect on the system.
7. What are the strengths in the process in your perception?

   supportive management, ISO 9001, and QMS system are implemented in the other sections,
8. What are the weaknesses in the process in your perception?

   Lack of documented SOPs, Poor record-keeping practices, Hard to get system-related accurate information, Difficulty in finding the updated Demand and Supply capacities in the system, and More training needed to introduce modifications or developments. KPIs need to define for operational excellence.
9. What are the improvement ideas in the process in your perception?

   Systematically Analysis for further Improvement,
10. Other than of those a free word about the process?

Real-time information systems need to introduce.

Summary of Key Concerning Points from the Interview

Supportive management, ISO 9001, QMS system is implemented in the other sections, Lack of documented SOPs, Poor record-keeping practices, Lack of system-related accurate information, Difficulties in finding the updated Demand and Supply capacities, lack of training. KPI´s need to define, Systematically Analysis for further Improvement.

Interview Record Sheet 3

Interviewee: CE Process

Role in the process: Monitor and consult the process in the water treatment plants in Regional Support Centre (Production).

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? study based on daily demand.
2. Is there a documented procedure/SOP for the process? There may be work instruction.
3. What is the scope of the Process? Ensure uninterrupted water supply to the Colombo suburb with sufficient pressure, quantity, and quality.
4. Who is responsible for controlling activities in the process? Duty officers are employed 24/7 and they are directly under manager operation.
5. How are different ideas or suggestions accepted? Different ideas are discussed and analysed and even trial tested to see their applicability.
6. How are the decisions/actions verified after the changes? Performance evaluated Based on operational data and customer feedback.
7. What are the strengths in the process in your perception?

   Duty officers are well-experienced employees, and they have real-time information on all targeted towers and sumps there is also established communication 24/7 between all stakeholders.
8. What are the weaknesses in the process in your perception?

   The reliability of the real-time information is not very high, and the flow meters are to be verified.
9. What are the improvement ideas in the process in your perception?

A more reliable system is to be established soon through an energy project with high reliability on all real-time information necessary for the operation.

10. Other than of those a free word about the process?

The existing process is validated through experience and deemed optimized considering the presently available technology and customer satisfaction survey. There may be an opportunity for improvement but any proposal to improve the system need to be discussed in detail and agreed upon.

Summary of Key Concerning Points from the Interview

The study only, No analysis, Work instructions, well-experienced employees, reliability of the real-time information is not very high, A more reliable system is to be established soon, There may be an opportunity for improvement.

Interview Record Sheet 4

Interviewee: Manager Operation

Role in the process: Responsible for operations of Ambathale, Labugama, and Kalatuwawa water treatment plants in the Regional Support Centre (Production).

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No
2. Is there a documented procedure/SOP for the process? No
3. What is the scope of the Process? Treat the raw water extracted from the Kelani River and transmit it to the relevant internal customers based on their demand.
4. Who is responsible for controlling activities in the process? Duty officer
5. How are different ideas or suggestions accepted? Yes,
6. How are the decisions/actions verified after the changes? Yes. Case by case with a study.
7. What are the strengths in the process in your perception?
   Highly Competent staff prepared for any challenges, ISO QMS practices implemented in other sections.
8. What are the weaknesses in the process in your perception?
   Staff training is needed for sophisticated systems. Requirement of SOPs.
9. What are the improvement ideas in the process in your perception?
   Finding space for modification by proper analysis.
10. Other than of those a free word about the process?

15(8)

Systems need to automate by using modern technologies.

Summary of Key Concerning Points from the Interview

Highly Competent staff prepared for any challenges, ISO QMS practices implemented in other sections. Staff training is needed for sophisticated systems. Lack of SOPs Finding space for modification by proper analysis.

Interview Record Sheet 5

Interviewee: DO

Role in the process: Responsible for Activities of the water transmission process from Ambathale to related internal customers' reservoirs.

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No Idea
2. Is there a documented procedure/SOP for the process? No
3. What is the scope of the Process? Treated water is transmitted to the remote reservoirs based on their demand.
4. Who is responsible for controlling activities in the process? Duty officer
5. How are different ideas or suggestions accepted? Yes,
6. How are the decisions/actions verified after the changes? Don't Know
7. What are the strengths in the process in your perception?
   Competent and supportive staff
8. What are the weaknesses in the process in your perception?
   Lack of Staff training for emergencies.
9. What are the improvement ideas in the process in your perception?
   Clearly defined roles and responsibilities especially for emergency or abnormal situations, including SOPs.
10. Other than of those a free word about the process?
    A modern system is needed for real-time information.

Summary of Key Concerning Points from the Interview

Competent and supportive staff Lack of Staff training for emergency situations, clearly defined roles, and responsibilities especially for emergency or abnormal situations, lack of SOPs.

Interview Record Sheet 6

Interviewee: Internal Customer 1 -Batapotha Reservoir

Role in the process: Responsible for Activities of the internal customers' reservoir.

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No Idea
2. Is there a documented procedure/SOP for the process? No
3. What is the scope of the Process? Treated water is transmitted to our reservoir based on our demand.
4. Who is responsible for controlling activities in the process? Duty officer
5. How are different ideas or suggestions accepted? Yes,
6. How are the decisions/actions verified after the changes? Don't Know
7. What are the strengths in the process in your perception?
   No idea
8. What are the weaknesses in the process in your perception?
   In emergencies who are responsible for actions is not clearly defined.
9. What are the improvement ideas in the process in your perception?
   In emergencies who are responsible for actions is not clearly defined.
10. Other than of those a free word about the process?

Summary of Key Concerning Points from the Interview

In emergency situations who are responsible for actions is not clearly defined. Lack of Roles and responsibilities (Emergency situations)

Interview Record Sheet 7

Interviewee: Internal Customer 2 Dehiwala - Reservoir

Role in the process: Responsible for Activities of the internal customers' reservoir.

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No Idea
2. Is there a documented procedure/SOP for the process? No Idea
3. What is the scope of the Process? No Idea
4. Who is responsible for controlling activities in the process? Duty officer
5. How are different ideas or suggestions accepted? Yes,
6. How are the decisions/actions verified after the changes? Getting feedback
7. What are the strengths in the process in your perception?
   Uninterrupted supply of treated water
8. What are the weaknesses in the process in your perception?
   The system can be handled in normal scenarios. When an emergency started It is hard to identify the next step and who needs to inform and responsible.
9. What are the improvement ideas in the process in your perception?
   In emergencies who are responsible for actions is not clearly defined.
10. Other than of those a free word about the process?

Summary of Key Concerning Points from the Interview

The system can be handled in normal scenarios. When an emergency started It is hard to identify the next step and who needs to inform and responsible. In emergency situations who are responsible for actions is not clearly defined.

Interview Record Sheet 8

Interviewee: Internal Customer 3 Jubilee - Reservoir

Role in the process: Responsible for Activities of the internal customers' reservoir.

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No Idea
2. Is there a documented procedure/SOP for the process? No Idea
3. What is the scope of the Process? Providing drinking water to the main city
4. Who is responsible for controlling activities in the process? Duty officer
5. How are different ideas or suggestions accepted? No Idea,
6. How are the decisions/actions verified after the changes? Our manager
7. What are the strengths in the process in your perception?
   Friendship
8. What are the weaknesses in the process in your perception?
   In the case of an emergency or panic situation, decision-making is essential. Clearly defined methods and persons needed for quick actions are currently not available
9. What are the improvement ideas in the process in your perception?
   In emergencies who are responsible for actions is not clearly defined.
10. Other than of those a free word about the process?

Summary of Key Concerning Points from the Interview

In the case of an emergency or panic situation, clear decision-making is essential. Clearly defined methods and persons needed for quick actions currently it is not available In emergency situations who are responsible for actions is not clearly defined

Interview Record Sheet 9

Interviewee: CE Development

Role in the process: Design and Consultation of Developments in the Water Treatment Plants managed by the Regional Support Centre (Production).

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? Daily demand study
2. Is there a documented procedure/SOP for the process? Work instructions in pump houses
3. What is the scope of the Process? Providing safe water supply to the Colombo suburb with sufficient quantity, and quality in an uninterrupted manner
4. Who is responsible for controlling activities in the process? Duty officers and their supporting staff
5. How are different ideas or suggestions accepted? New ideas are discussed and even tested for acceptability.
6. How are the decisions/actions verified after the changes? Results are evaluated using operational data.
7. What are the strengths in the process in your perception?
   Highly competent, well-experienced staff, Helpful and supportive stakeholders
8. What are the weaknesses in the process in your perception?
   Lack of training to introduce modifications or developments. Unavailability of KPIs. Difficulty in finding the updated Demand and Supply capacities in the system.
9. What are the improvement ideas in the process in your perception?
   Creation of standard SOP, Record keeping practices, Defining of roles and responsibilities, especially in emergencies, preventive maintenance programs

10. Other than of those a free word about the process? Knowledge management system for sharing experience.

Summary of Key Concerning Points from the Interview

Highly competent, well-experienced staff, Helpful and supportive stakeholders. Lack of training, Unavailability of KPIs, Difficulty in finding the updated Demand and Supply capacities, Lack of SOP , lack of Record keeping practices, Defining of roles and responsibilities especially in emergency situations, preventive maintenance programs

Interview Record Sheet 10

Interviewee: Worker

Role in the process: Responsible for Activities of the internal customer reservoir.

Topics General / Process/Facilities/Improvements

1. Are there any previous analysis of the process? No Idea
2. Is there a documented procedure/SOP for the process? No Idea
3. What is the scope of the Process? Pumping water into the city
4. Who is responsible for controlling activities in the process? Officer in Charge
5. How are different ideas or suggestions accepted? No Idea,
6. How are the decisions/actions verified after the changes? No Idea
7. What are the strengths in the process in your perception?
   Working together with strength
8. What are the weaknesses in the process in your perception?
   It is not clear, what to do in an emergency at some times.
9. What are the improvement ideas in the process in your perception?
   In emergencies who are responsible for actions is not clearly defined.
10. Other than of those a free word about the process?

Summary of Key Concerning Points from the Interview

Working together with strength. Lack of SOPs, Roles and responsibilities are not clearly defined.