



Mitigating Practices and Quality of Water Services of the Sultan Kudarat Water District in Tacurong City

Faith Ezra S. Bilgera^{1*}, Adonis S. Besa¹

¹Sultan Kudarat State University, Philippines

*Corresponding author

DOI: <https://doi.org/10.63680/vter855435435btyu>

Abstract

This study was crafted to analyze the mitigation measures and quality of the Sultan Kudarat Water District (SKWD) water services in Tacurong City. The research specifically sought to address several research questions: the extent of the mitigation practices of SKWD in system assessment, monitoring, management, and communication; the degree of quality management services of SKWD in accessibility, availability, customer satisfaction, reliability of service, and water quality; the significant relationship between mitigation practices and quality management services; the considerable differences among mitigation practices in system assessment, monitoring, and management or communication; the concerns, issues, and opportunities in water service delivery; and the main uses of water among the concessionaires. It underscored the evaluation of SKWD mitigation practices and quality management services focusing on water service delivery effectiveness and sustainability. Using descriptive surveys and random sampling techniques, data was obtained from 285 respondents, including people residing in Tacurong City and SKWD personnel. Moreover, the research quantified the quality of management services at SKWD depending on accessibility, availability, customer satisfaction, service reliability, and water quality. Usability and water quality were also determined through monitoring reports and usability tests. The study established a strong relationship between SKWD's mitigation strategies and the quality of water management services that customers received. The research also mapped out critical concerns and issues that pertain to water service delivery, such as intermittent supply, low-pressure supply, water quality issues, and delayed response times to requests. Areas for improving water service delivery were debated, and insights into the challenges to SKWD and its consumers were offered.

Keywords: System Assessment; Quality of Water Services; Water Safety Plan; Water District

1. Introduction

The world is facing an alarming water crisis, and it is troubling that millions of people still lack access to safe water, even though water is a natural resource. This issue is especially concerning in the Philippines, where, despite having abundant water resources, poor management, pollution, and climate change continue to threaten both the supply and quality of water.

The increased waterborne diseases and recent water deficits in areas such as Metro Manila indicate an acute problem. These are injurious to individuals' health and have economic and environmental impacts. Moved by this sight, the researcher is encouraged to undertake this study on the Sultan Kudarat Water District water management to search for solutions for enhancing water supply and making it sustainable in the coming years. It is most important that we do it now to protect this important resource and serve our communities. Water is essential for sustainable development, poverty alleviation, and healthy ecosystems (Flint, 2010; United Nations-Water, 2010).

More than 2 billion people worldwide depend on aquifers, underground freshwater, as their water source. Yet, the increasing water demand is overdrawing more than half of the world's aquifers, and this situation is likely to worsen with increasing demand (Global Environment Facility, 2019).

When water is scarce, individuals use unsafe sources, raising health concerns. Not having a secure water supply is a nuisance and can cause serious health issues. Immediate action is required to enhance water management and safeguard public health (Weiler, 2020).

Water security is still a major issue in the Philippines. Even though the country has many water resources, there are still issues about scarcity and misuse of water. Sustainable water management should be encouraged to utilize the water properly (Lee et al., 2020). Acute watery diarrhea was among the top 10 causes of death in the Philippines in 2016, with around 139,000 deaths. Since climate change and phenomena like El Niño persist in hitting the nation, water availability has become highly unpredictable, even in large cities like Metro Manila. For example, because of water scarcity, individuals use unsafe water sources, exposing them to severe health concerns (Guerero, 2019).

These developments prompted the Department of Health to recommend a national policy that initiated the implementation of developing a WSP by drinking-water service providers. To implement these elements of enhancing quality water management, all the water supply can identify water systems by monitoring the systems utilized for better operations planning towards a higher level in managing their waters (Department of Health, 2014).

Water service quality monitoring is crucial to ensure clean water and tackle challenges such as accessibility, affordability, and reliability. Various indicators, such as water availability, pricing, and quality, are employed globally to track water service performance (Roaf, Khalfan, & Langford, 2005). New indicators derived from the Human Rights to Water and Sanitation principles, such as accessibility, availability, and quality, assist in quantifying higher service levels (The World Bank, 2017).

The Sultan Kudarat Water District (SKWD) plays a crucial role in providing water to the communities, focusing on performance indicators in terms of water accessibility, availability, customer satisfaction, and reliability of service (SKWD OPCR). The need to watch how the SKWD provides water services is especially needed in such areas as the rural environment because water provision is part of the role of local organizations and government units. Despite the abundant water availability in the nation, there are still issues in ensuring long-term water security. Therefore, sustainable management practices are needed.

The Sultan Kudarat Water District promotes public health by supplying clean water and aiding in sanitation. The district facilitates local agriculture, industry, and commerce by providing water to these. However, as water consumption becomes less efficient and the population grows, water resources are strained, and climate change jeopardizes the water supply.

The study assessed the mitigation practices and quality of water services of the Sultan Kudarat Water District in Tacurong City as the basis for policy enhancement and sustainability. It answered the following research questions:

1. What is the extent of the mitigation practices of Sultan Kudarat Water District in terms of:
 - 1.1 system assessment;
 - 1.2 monitoring; and

- 1.3 management and communication?
2. What is the level of quality of water services of the Sultan Kudarat Water District in terms of :
 - 2.1 accessibility;
 - 2.2 availability;
 - 2.3 customer satisfaction;
 - 2.4 reliability of service; and
 - 2.5 water quality?
3. Is there a significant relationship between the extent of mitigation practices and the quality of water services in the Sultan Kudarat Water District?
4. Is there a significant difference among the mitigation practices regarding system assessment, monitoring, management, and communication?
5. What are the issues, concerns, and opportunities in delivering water services by the Sultan Kudarat Water District?
6. What are the primary uses of water among the concessionaires?

2. Methodology

Research Design

This research employed a descriptive-correlational research design to investigate the connection between the mitigation practices and water management service quality at the Sultan Kudarat Water District in Tacurong City.

The research investigated existing water management practices and determined their impact on water service quality. Major practices such as assessment, monitoring, management, and communication are of particular interest, as are their implications for water service delivery. Descriptive-correlational methods were employed to observe existing conditions without manipulating them.

By understanding how practices such as system monitoring and communication affect water services, the research aims to determine where the Sultan Kudarat Water District can improve and increase service quality (Mertens, 2020; Mackey & Gass, 2020).

Locale of the Study

This study was conducted in Tacurong City, Sultan Kudarat Province, Region XII. According to the 2020 census, the city has a population of 67,117 (PSA, 2020). Tacurong City is a suitable site for research on water management as it experiences difficulties supplying clean and dependable water to its population. The Tacurong folks are engaged in agriculture and business, and as the city expands, the water demand has also risen (PSA, 2020; Carandang & Ramirez, 2021).

This research sought to examine the effectiveness of the city in managing its water resources and identify measures to enhance water service delivery. Tacurong City and surrounding towns, such as Isulan and Esperanza, are served by the Sultan Kudarat Water District (SKWD). SKWD was established in 1982 and expanded in 1986 to accommodate the increasing need for water (Sultan Kudarat Water District, 2023). With the population of Tacurong still increasing, the demand for additional water is also higher, so it is essential to research how effectively the water district serves the city. This study examined the performance of SKWD and how it can be enhanced to better provide water services in the city (Chavez & De Guzman, 2021).

Tacurong City's increasing water demand from urban and rural communities poses challenges to water management. The city's population is heterogeneous, with varying water requirements based on whether residents live in urban or rural barangays (Angeles & Fernandez, 2022).

Respondents of the Study

The study sample consisted of 285 residents of Tacurong City, specifically from the barangays of New Isabela, Poblacion, and San Pablo. The inclusion criteria for participants were as follows: they must have been concessionaires of the Sultan Kudarat Water District (SKWD) for at least 10 years, reside in one of the selected barangays for a minimum of six months, and have no arrears for at least the past three billing cycles.

Table 1 below shows the distribution of respondents from the three barangays covered by SKWD.

Table 1: Population and Sample Size of the Study

Concessionaires	N	n
New Isabela	589	70
Poblacion	1194	142
San Pablo	613	73
Total	2,396	285

Sampling Technique

The researcher employed a stratified random sampling technique. This involved dividing the population of Tacurong City into smaller segments (referred to as strata) by the barangays (villages) covered by the Sultan Kudarat Water District (SKWD). Stratified sampling ensured that various segments of the population were represented in a balanced manner. As Creswell (2020) explains, this approach helped the researcher zoom in on distinct subgroups and ensure that every group's viewpoint was represented within the study.

Research Instrument

The research employed a survey questionnaire developed by the researcher. A 5-point Likert scale, as defined by Nee and Yunus (2020), is a rating scale comprising response categories from which respondents can select to express the degree of agreement or disagreement with a statement or question. The scale is commonly utilized to quantify attitudes, opinions, or perceptions. The survey instrument consisted of the main components:

Part one covered the profiles of the respondents in terms of age, sex, highest educational attainment, and monthly income. Part two consisted of statements intended to measure the extent of the mitigation practices carried out by the Sultan Kudarat Water District in system assessment, monitoring, management, and communication. The participants' responses were judged on a 5-point Likert scale.

Range of Mean	Verbal Description	Interpretation
4.20-5.00	Fully Practiced	Around 80%-100% of the mitigation practices are fully practiced with strong dedication, social responsibility, and long-term sustainability.
3.30-4.19	Satisfactorily Practiced	60%-79% of the mitigation practices are satisfactorily practiced that provides

2.50-3.29	Moderately Practiced	significant consideration in implementing mitigation practices. 41%-59% of the mitigation practices are moderately practiced that provides periodic implementation of mitigation practices.
1.80-2.49	Poorly Practiced	21%-40% of the projects are poorly practiced, more so, provides inconsistent implementation of mitigation practices.
1.00-1.79	Not Practiced	1%-20% no mitigation practices are properly practiced.

Part three contained statements intended to measure the level of quality of water services the Sultan Kudarat Water District provided. The section highlighted accessibility, availability, customer satisfaction, service reliability, and water quality. Similar to Part 2, responses were evaluated with a 5-point Likert scale.

Mean Range	Verbal Description	Interpretation
4.20-5.0	Very High	80%-100% of concessionaires strongly approve of SKWD's quality of water services implementation.
3.30-4.19	High	61%-79% of concessionaires approve of the quality of water services and address challenges promptly.
2.50-3.29	Moderate	41%-60% of concessionaires slightly approve of quality of water services.
1.80-2.49	Low	21%-40% of concessionaires disagree with the implementation of the quality of water services.
1.00-1.79	Very Low	1%-20% of concessionaires strongly disagree with the implementation of the quality of water services.

Parts four and five of the questionnaires utilized frequency analysis to identify and assess the key issues and concerns related to the concessionaires' delivery of water services and primary uses of water. This approach can help understand the distribution and prevalence of various challenges the community faces.

Validity and Reliability

The validity and reliability of the survey were thoroughly validated to ensure that it produced valid and correct data. Experts, such as graduate school instructors who taught Master of Public Administration and had water management and sustainability expertise, examined content validity. Their feedback ensured that the survey addressed all significant sustainability practices and water service delivery issues and that the questions were relevant and understandable (Creswell & Creswell, 2020).

For reliability, the survey was pilot-tested with twenty (20) individuals who did not belong to the main study. The pre-test identified any issues or vague questions, so the researchers were able to correct them before administering the survey to the actual participants. By reviewing the pre-test feedback, the researchers made the survey simple and effective (Kline, 2020).

To ensure reliability further, Item Total Analysis was employed. This tool examined how each survey

question correlated with the overall score. If the questions correlated strongly, it indicated that the survey was indeed measuring what it intended to measure, making the results more reliable. This method ensured that the survey gave consistent and reliable results when applied to the target population (Field, 2020).

Table 2: Reliability Testing Results of Cronbach Alpha for the Consistency of the Measurement

Cronbach Alpha	N of Items
.983	35

Table 2 shows that the Cronbach Alpha result using SPSS is 98.3 %, which implies that the survey questionnaire is reliable.

Data Gathering Procedure

The researcher prepared a process diagram to gain a clearer understanding of the data-gathering procedure, to wit:

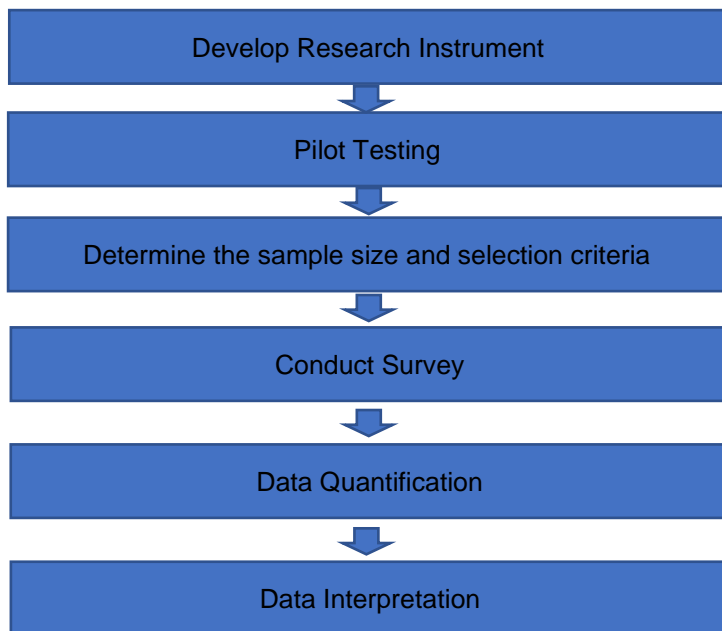


Figure 2. Waterfall Diagram

The data collection process of this research included various steps to ensure that the gathered information was accurate and reliable. The initial step was to develop a research instrument, which was a survey instrument intended to gather data regarding the Sultan Kudarat Water District's mitigation practices and quality management services. In order to make the survey effective, the researcher collaborated with the Thesis Adviser to ensure that the questions were unambiguous and suitable for the study (Creswell, 2020).

The researcher also reviewed the instrument to ensure that all the data was being requested properly.

Finally, a pilot test was carried out. This meant applying the survey to a small sample of individuals similar to those who would participate in the study but were not in it. This was done to identify any flaws in the survey, including unclear questions or problems with the format. Results from this test were utilized to correct any flaws so that the survey was prepared for the main study. The pilot test was also used to determine the survey duration and what issues may arise while collecting the data (Phelan & Wren, 2020).

Once the survey was finalized, the researcher calculated the sample size and sampling criteria. This involved determining the number of individuals from Tacurong City and the Sultan Kudarat Water District to include in the study. The researcher ensured that the sample was representative of the entire population and that various groups of individuals were included. To eliminate bias, a random sampling technique was employed, which implies everyone had an equal opportunity to be chosen to participate. This allowed the researcher to obtain diverse responses that could be generalized to the larger population (Fink, 2020).

The second step was to survey the chosen respondents. The survey was conducted using face-to-face interviews and paper questionnaires. Face-to-face interviews enabled the researcher to clarify any questions the respondents had so that they understood each section of the survey. For the paper questionnaires, the respondents were provided with ample time to respond to the questions thoroughly without any sense of hurry. This made the answers accurate and considered (Dillman et al., 2014).

After the data was gathered, it was quantified using statistical methods. Descriptive statistics were employed to summarize the answers and search for trends in the information. For instance, the researcher computed percentages and averages to obtain an overall impression of the survey responses. This identified patterns and trends, including shared problems or variations in how various groups reacted. Statistical software could have been employed to simplify this and make it more precise (Field, 2020).

Once the data analysis was complete, the researcher interpreted the results according to the research's aims. This involved explaining the findings and their meaning regarding the sustainability of mitigation activities and the delivery of water services in the Sultan Kudarat Water District. The researcher also searched for key findings and how they impacted improvement in water services. This involved suggesting ways to improve the practices. Through this, the study presented useful recommendations for enhanced water management in Sultan Kudarat (Creswell, 2020).

Statistical Treatment

In this study, the researcher used statistical tools to describe, analyze, and interpret the data collected.

Frequency count and percentage distribution were used to determine and ascertain the respondents' age, gender, highest educational attainment, and monthly income.

Mean and standard deviation were used to measure the mitigation practice and assess the level of quality of water services of the Sultan Kudarat Water District. The mean showed the average response for each aspect, such as system assessment, monitoring, and management (Pallant, 2020). The standard deviation showed how much the responses differed from the average, helping to understand how consistent or different people's views were on these practices. According to Field (2018), using the mean and standard deviation together helped understand the average and how spread out the responses were, which was important to understand how effective the practices were.

Frequency counts were used to determine how often the concessionaires encountered certain issues or concerns in the delivery of water services. Percentage distribution then illustrated the relative occurrence of each issue as a proportion of the total reported issues, providing a clearer understanding of their prevalence. Ranking was employed to identify the most and least frequently reported issues or concerns. These same tools – frequency counts, percentage distribution, and ranking – were also applied to identify the primary uses of

water among the concessionaires, revealing both the number of concessionaires reporting each use and the proportion of the total reporting each use, as well as the most and least common water uses.

To examine the relationship between how well mitigation practices were implemented and the quality of water services, the Pearson correlation coefficient (r) was used. This method measured how strongly two factors were related (Field, 2020).

To examine the significant difference among the mitigation practices regarding system assessment, monitoring, management, and communication, the ANOVA Repeated Measures was used. This statistical method examined differences in the means of a dependent variable across three or more related groups.

3. Results and Discussions

Extent of the Mitigation Practices of Sultan Kudarat Water District

The following tables present the extent of Sultan Kudarat Water District's mitigation practices regarding System Assessment, Monitoring, Management, and communication.

Table 3 showed that Sultan Kudarat Water District (SKWD) was generally effective in its mitigation strategies, with the highest mean rating on statement 1, "The physical facilities are well-maintained and in good condition," with a mean of 4.42 and a standard deviation of 0.75, which was interpreted as "Fully Practiced." The findings revealed that SKWD successfully kept its infrastructure intact, which is crucial in maintaining stable water services. Well-managed physical infrastructure avoided water supply interruptions and enabled the system's effective operation.

Table 3: Presents the Mitigation Practices in terms of System Assessment

a. System Assessment	Mean	Sd	Description
1. The physical facilities are well-maintained and in good condition.	4.42	0.75	Fully Practiced
2. The water supply is sufficient to meet the needs of the concessionaires.	4.39	0.73	Fully Practiced
3. Implement measures to reduce water losses and leakage in its distribution system.	4.38	0.75	Fully Practiced
4. Conduct maintenance and repairs on its water infrastructure to ensure reliability and efficiency.	4.38	0.73	Fully Practiced
5. Implement measures to improve quality of water.	4.39	0.77	Fully Practiced
Overall	4.39	0.66	Fully Practiced

The lowest mean is statement 3, "Implement measures to reduce water losses and leakage in its distribution system," and statement 4, "Conduct maintenance and repairs on its water infrastructure to ensure reliability and efficiency," with a mean of 4.38 and standard deviation of 0.75 and 0.73, respectively, interpreted as "Fully Practiced," the SKWD had to focus more on these areas. More than anything else, water loss was an issue that most water utilities worried about, and it could make the system more efficient and save money.

The System Assessment has a total section mean of 4.39 and a standard deviation of 0.66, interpreted as "Fully Practiced," representing a generally positive assessment of the activities of SKWD. This suggests that

SKWD implemented mitigation strategies and effectively conducted system assessments. The comparatively low ratings for the reduction of water loss and infrastructure repairs show that areas could be improved.

Applying these would enhance the system's efficiency, reduce expenses, and make the water supply more consistent. Water saving through minimized loss of water saves water and funds and avoids loss of funds (Sanz et al., 2022), and maintenance of the system avoids future system breakdowns (Lee et al., 2023). Even greater emphasis on these would increase SKWD performance and result in a more sustainable water supply.

Table 4: Mitigation Practices in Terms of Monitoring

b. Monitoring	Mean	SD	Description
1. Regularly checks how well the treatment facilities remove contaminants and maintain water quality.	4.22	0.82	Fully Practiced
2. Programs are put in place to address any water quality problems as soon as they are detected.	4.24	0.85	Fully Practiced
3. Informs the public in advance about water interruptions due to maintenance or pipeline work.	4.28	0.84	Fully Practiced
4. Monitors the system to find potential problems early before they become bigger issues.	4.28	0.85	Fully Practiced
5. Regularly checks if its actions are improving the environment and the water supply system.	4.33	0.84	Fully Practiced
Overall	4.27	0.77	Fully Practiced

Table 4 reveals that the highest mean score was recorded on statement 5, "Regularly checks if its actions are improving the environment and the water supply system," having a mean of 4.33 and a standard deviation of 0.84 and interpreted as "Fully Practiced." It suggests that SKWD cared greatly about checking whether the activities improved the environment and water supply system. It indicates that the water district supplier is effectively tracking its overall performance in improving both environmental outcomes and the water system. This is essential for ensuring sustainability and efficient resource management.

However, the lowest mean score is statement 1, "Regularly checks how well the treatment facilities remove contaminants and maintain water quality," with a mean of 4.22 and a standard deviation of 0.82. Though still rated "Fully Prcticed," this lesser rating indicates that there can be room for improvement in monitoring the treatment facility's performance. A small gap in this area can indicate the need for SKWD to give more attention to the rigorous, frequent assessment of how well the treatment processes maintain the water quality and effectively remove the contaminants.

The mean of the monitoring is 4.27 and a standard deviation of 0.77, which is also interpreted as "Fully Practiced." This means that SKWD monitored work well; most work was established and effectively implemented. Aquino and Garcia (2020) and Dela Cruz (2022) emphasize that monitoring is a vital element of sustainable water management and the protection of the environment. This is aligned with the principle that continuous monitoring, particularly of treatment processes, is important in ensuring long-term water quality and system efficiency (Espino, 2021; Torres & Villanueva, 2023).

Table 5. Mitigation Practices in terms of Management and Communication

c. Management and Communication	Mean	SD	Description
1. The water district effectively supports and manages sustainability initiatives.	4.23	0.83	Fully Practiced
2. There are enough skilled personnel to provide efficient and helpful customer service.	4.25	0.84	Fully Practiced
3. The resources allocated for sustainability initiatives are sufficient to meet goals.	4.23	0.85	Fully Practiced
4. Shows a clear commitment to continuously improving sustainability practices.	4.31	0.88	Fully Practiced
5. Regularly conducts customer satisfaction surveys to gather feedback and improve services.	4.28	0.90	Fully Practiced
Overall	4.26	0.80	Fully Practiced

Table 5 shows the mitigation practices of Sultan Kudarat Water District (SKWD) in terms of Management and Communication. The most highly rated statement was Statement 4, with a mean of 4.31 and a standard deviation of 0.88, 'Shows a clear commitment to continuously improving sustainability practices,' which was described as 'Fully Practiced.' This indicates that SKWD demonstrated a strong commitment to sustainability, aligning with the organization's objective to enhance and sustain sustainability practices in the long term.

Meanwhile, the lowest-rated statements are Statement 1, 'The water district effectively supports and manages sustainability initiatives,' and Statement 3, 'The resources allocated for sustainability initiatives are sufficient to meet goals.' Both statements had a mean score of 4.23, with standard deviations of 0.83 and 0.85, respectively. These statements reflected areas where SKWD's management and communication practices could be improved, particularly in allocating resources and whether they were sufficient to achieve sustainability objectives. Although rated as 'Fully Practiced,' these statements had lower mean scores.

Management and Communication achieves a mean of 4.26 with a standard deviation of 0.80, interpreted as 'Fully Practiced.' These findings indicate that although SKWD was performing well in general management and communication approaches, some areas required further improvement, particularly in resource allocation. Addressing these gaps could help SKWD achieve greater success in sustainability targets and enhance the overall effectiveness of water management. This aligns with the research of Torres (2023), which highlighted that the efficient use of resources and effective management are crucial for the long-term success of sustainability practices.

Summary of the Extent of Mitigation Practices of Sultan Kudarat Water District in terms of System Management, Monitoring, and Management and Communication.

The table presented the summary of mitigation practices regarding system management, monitoring, and management and communication.

Table 6: Extent of Mitigation Practices of Sultan Kudarat Water District

Variable	Mean	Sd	Description	Interpretation
System Assessment	4.39	0.66	Fully Practiced	Around 80%-100% of the mitigation practices are fully practiced with strong dedication, social responsibility, and long-term sustainability.
Monitoring	4.27	0.77	Fully Practiced	Around 80%-100% of the mitigation practices are fully practiced with strong dedication, social responsibility, and long-term sustainability term
Management & Communication	4.26	0.80	Fully Practiced	Around 80%-100% of the mitigation practices are fully practiced with strong dedication, social responsibility, and long-term sustainability.
Total Mean	4.31	0.74	Fully Practiced	

Table 6 summarizes the level of mitigation practices of Sultan Kudarat Water District (SKWD). The most highly rated was System Assessment, which had a mean of 4.39 (SD=0.66), interpreted as "Fully Practiced," to show that the water district has been able to implement practices related to its system assessment.

This reflects that SKWD is assured of its capacity to assess and manage its resources well, a critical capability for long-term sustainability. On the other hand, the lowest-rated area was Management & Communication, with an average mean of 4.26 (SD=0.80). While this still qualifies as in the "Fully Practiced" group, the gap score indicates potential scope to improve communication techniques and handling processes around sustainability initiatives. This means that since SKWD is performing well, improving communication and management could improve results.

Overall, the level of mitigation practices of Sultan Kudarat Water District (SKWD) reached a total mean score of 4.31 (SD=0.74), interpreted as "Fully Practiced." It implies that the water district has effectively implemented around 80-100% of its mitigation practices in all areas. This finding is supported by Dela Cruz and Ramos (2022), who emphasized the need for proper system evaluations and management for the success of water district sustainability practices.

Level of Quality of Water Services of the Sultan Kudarat Water District

The following tables present Sultan Kudarat Water's water quality level regarding district accessibility, availability, customer satisfaction, service reliability, and water quality.

Table 7: Quality of Water Services in terms of Accessibility

a. Accessibility	Mean	Sd	Description
1. Provide easy access to clean and safe drinking water.	4.42	0.85	Very High
2. Provide equitable distribution of water supply across its service coverage areas.	4.40	0.79	Very High
3. Promptly responds to reports of water service disruptions or issues.	4.41	0.78	Very High
4. Offers multiple payment options for water services, making it accessible to all residents.	4.48	0.75	Very High
5. Provide hotlines for water service interruptions.	4.45	0.79	Very High
Overall	4.43	0.72	Very High Level

Table 7 shows the quality of water services level of Sultan Kudarat Water District (SKWD) in Accessibility. The highest-rated statement was Statement 4, 'Offers multiple payment options for water services, making it accessible to all residents,' with a mean of 4.48 and a standard deviation of 0.75, which was rated as 'Very High.' This indicated that SKWD performed well in providing multiple payment options, ensuring residents, including those with limited financial means, could comfortably pay for services.

Statement 2, 'Provides equitable distribution of water supply across its service coverage areas,' scored the lowest, with a mean of 4.23 and a standard deviation of 0.79. It was also rated as 'Very High.' While still rated positively, this lower score suggested that there may be areas where water distribution was less equal or consistent.

The Accessibility section has a mean score of 4.43 with a standard deviation of 0.72, which is rated as 'Very High.' This indicates that SKWD successfully delivered accessible water services to its clients. The findings suggest that effective practices were in place to ensure most residents had access to water services, likely contributing to increased customer satisfaction and public confidence. Aquino et al. (2021) emphasized that accessibility is critical in achieving customer satisfaction, and convenient access to services is essential for maintaining effective water management.

Table 8: Level of Quality of Water Services in terms of Availability

b. Availability	Mean	SD	Description
1. Water supply is sufficient during peak usage times.	4.25	0.75	Very High
2. Conduct prompt repair services to customers' request.	4.31	0.80	Very High
3. Provide advisory for water interruptions through social media platforms and radio for public dissemination.	4.37	0.79	Very High
4. Reopen water services within the day for customers who have paid the reopening fee following a disconnection.	4.41	0.77	Very High
5. Quick Response Team is available during emergency repairs.	4.38	0.78	Very High
Overall	4.31	0.77	Very High Level

Table 8 shows the level of quality of Sultan Kudarat Water District's water services in terms of availability. The highest mean score came from Statement 4, 'Reopens water services within the day for customers who have paid the reopening fee following a disconnection,' with a mean of 4.41 and a standard deviation of 0.77, described as 'Very High.' This implies that the water district effectively restores its service to customers who have paid their bills within a short period.

The lowest mean score came from Statement 1, 'Water supply is sufficient during peak usage times,' with a mean score of 4.25 and a standard deviation of 0.75. Although still rated as 'Very High,' this indicates that there may be occasional difficulties meeting demand during peak periods.

The Availability section achieved a mean score of 4.31 with a standard deviation of 0.77, which was interpreted as 'Very High' in quality of water services. This indicates that SKWD is successfully delivering a very high level of availability in its services, which is crucial for ensuring a stable water supply. It reflects that SKWD is effectively providing water availability to its consumers. The prompt restoration of service following disconnections minimizes customer inconvenience and enhances satisfaction. However, it suggests room for improvement in managing the water supply during peak-demand periods. This finding is consistent with the research of Dela Cruz (2022), which emphasized that the rapid restoration of services following disconnections is key to sustaining customer trust and satisfaction.

Table 9: Level of Quality of Water Services in terms of Customer satisfaction

c. Customer Satisfaction	Mean	SD	Description
1. The water supply in my area is sufficient for daily use.	4.34	0.70	Very High
2. After a water supply disruption, the pressure is usually restored to normal levels within a reasonable	4.25	0.77	Very High

time frame			
3. The water is consistently clean and safe.	4.24	0.84	Very High
4. Responds promptly to reported water service issues or disruptions.	4.31	0.80	Very High
5. The affordability of water rates charged is reasonable.	4.30	0.85	Very High
6. The customer service provided by the staff is courteous and helpful.	4.32	0.83	Very High
Overall	4.28	0.76	Very High Level

Table 9 shows the Level of Quality of Sultan Kudarat Water District's water services in terms of Customer Satisfaction. The highest-rated statement is Statement 1, 'The water supply in my area is sufficient for daily use,' with a mean of 4.34 and a standard deviation of 0.70. This implies that the water district provided customers with adequate water for daily needs, ensuring dependability and customer satisfaction.

On the other hand, the lowest mean score is obtained from Statement 3, 'The water is consistently clean and safe,' with a mean of 4.24 and a standard deviation of 0.84, which was interpreted as 'Very High.' This suggests that occasional issues with water quality could affect customer confidence, highlighting an area for improvement.

The Customer Satisfaction section has a mean score of 4.28 and a standard deviation of 0.76, which was interpreted as 'Very High.' This indicates that Sultan Kudarat Water District generally delivered good services, resulting in positive customer experiences. This finding aligns with Villanueva (2023), who emphasized that customer satisfaction in public utilities is heavily influenced by consistent service quality and reliability.

Table 10: Level of Quality of Water Services in terms of Reliability of Service

d. Reliability of Service	Mean	SD	Description
1. Promptly notifies customers of any planned maintenance or service disruptions.	4.48	0.71	Very High
2. Consistently provide 24 /7 water supply to concessionaires.	4.45	0.70	Very High
3. It has a reliable system to handle emergency situations, such as pipe bursts or leaks.	4.45	0.72	Very High
4. Consumers feel confident in the reliability of infrastructure and distribution network.	4.44	0.71	Very High
5. Communicates effectively with customers regarding any changes or updates to the water supply system.	4.44	0.72	Very High
Overall	4.45	0.66	Very High Level

Table 10 shows the level of quality of water services of Sultan Kudarat Water District in terms of reliability of service. The highest-rated statement was Statement 1, 'Promptly notifies customers of any planned maintenance or service disruptions,' with a mean of 4.48 and a standard deviation of 0.71, reflecting that SKWD is very effective in communication and keeping customers informed about interruptions. This is crucial for preserving trust and minimizing inconvenience.

However, the lowest-rated statements are Statement 4, 'Consumers feel confident in the reliability of infrastructure and distribution network,' with a mean of 4.44 and a standard deviation of 0.71, and Statement 5, 'Communicates effectively with customers regarding any changes or updates to the water supply system,' with a mean of 4.44 and a standard deviation of 0.72. Despite these slightly lower scores, both statements still reflect high customer confidence in SKWD's communication and infrastructure systems.

The Reliability of Service section achieved a mean score of 4.45 with a standard deviation of 0.66, which was interpreted as 'Very High.' This suggests that SKWD is performing well in ensuring reliable customer service. This result aligns with the findings of McCollough and Gremler (2023), who emphasized that service reliability is a key driver of customer satisfaction and trust. The ability to reliably meet customer expectations enhances the overall customer experience.

Table 11: Level of Quality of Water Services in terms of Water Quality

e. Water Quality	Mean	SD	Description
1. Supplies clean and potable drinking water.	4.28	0.81	Very High
2. Ensure safety chlorine level of water supplied.	4.33	0.76	Very High
3. Complies with water sanitation requirements and Meets safety standards for drinking water.	4.34	0.78	Very High
4. Free from foul odors, tastes and supplies clear and visually appealing.	4.24	0.90	Very High
5. Experiences issues such as discoloration or sediment in their water.	4.00	1.20	Very High
Overall Mean	4.24	0.70	Very High Level

Table 11 shows the level of quality of water services in the Sultan Kudarat Water District in terms of water quality. The highest-rated statement was Statement 3, 'Complies with water sanitation requirements and meets safety standards for drinking water,' with a mean score of 4.34 and a standard deviation of 0.78, interpreted as 'Very High.' This indicates that SKWD is performing exceptionally well in adhering to health and safety regulations for drinking water, which is crucial in ensuring public health assurance.

The lowest-rated statement is Statement 5, 'Experiences issues such as discoloration or sediment in their water,' with a mean score of 4.00 and a standard deviation 1.20. While still rated 'Very High,' this lower score suggests that some customers occasionally experience water quality issues, such as discoloration or sediment. This implies that SKWD may need to address the filtration or distribution processes to resolve these problems.

Water quality achieved a mean score of 4.24 with a standard deviation of 0.70, interpreted as 'Very

High.' This indicates that SKWD is doing well in maintaining its water supply quality, which aligns with required safety and cleanliness standards. While the district performs well in this service area, there are still areas for improvement to enhance the customer experience and ensure consistently high-quality water. This finding concurs with Babich et al. (2016), who posited that water quality plays a significant role in customer satisfaction and trust in public utilities. Furthermore, Zeithaml et al. (2006) emphasized that maintaining high water quality standards is essential to fostering long-term customer loyalty and perceptions of service quality. Small improvements in this aspect would help SKWD ensure that every customer's water supply remains safe, clean, and reliable.

Summary of the Level of Quality of Water Services of the Sultan Kudarat Water District in terms of Accessibility, Availability, Customer Satisfaction, Reliability of Service, and Water Quality.

The table summarizes the Sultan Kudarat Water District's quality of water services regarding accessibility, availability, customer satisfaction, service reliability, and water quality.

Table 12: Summary of the Level of Quality of Water Services of the Sultan Kudarat Water District

Variable	Mean	Sd	Description
Accessibility	4.43	0.72	Very High Level
Availability	4.41	0.77	Very High Level
Customer satisfaction	4.28	0.76	Very High Level
Reliability of service	4.45	0.66	Very High Level
Water quality	4.24	0.70	Very High Level
Total Mean	4.36	0.72	Very High Level

Table 12 summarizes the Level of Quality of Water Services of the Sultan Kudarat Water District (SKWD) in various areas. All areas were rated 'Very High Level.' The highest-rated area was Reliability of Service, with a mean rating of 4.45 and a standard deviation of 0.66. This indicated that customers could rely on the water supply being available when needed, which is essential for maintaining public confidence and satisfaction. Aquino et al. (2023) emphasized in their study that the reliability of services is the primary factor of customer satisfaction and loyalty, as it directly impacts users' day-to-day lives.

On the other hand, the lowest-rated area was Water Quality, with a mean rating of 4.24 and a standard deviation of 0.70. This suggests that although SKWD met the necessary water safety and cleanliness requirements, further improvement was needed to enhance customer satisfaction. As noted by Zhang et al. (2023), maintaining good water quality is critical for ensuring consumer health and well-being and maintaining public trust and confidence through consistent monitoring and upkeep of water treatment processes.

The total mean for all areas was 4.36 with a standard deviation of 0.72, which was interpreted as 'Very High Level.' This reflected that the water district had been able to provide services that met the minimum requirements of customer satisfaction, accessibility, availability, reliability, and water quality. According to Villanueva (2024), high-quality performance in several service areas, as seen in this case, is crucial for gaining a solid reputation and trust from public utility customers.

Results of the Significant Relationship Between the Extent of Mitigation Practices and the Level of Quality of Water Services of the Sultan Kudarat Water District

The table presents the results of the significant relationship between the extent of mitigation practices and the level of quality of water services in the Sultan Kudarat Water District.

Table 13: Significant Relationship Between the Extent of Mitigation Practices and Level of Quality of Water Services of the Sultan Kudarat Water District

Extent of Mitigation Practices X Level of Quality Mgt	R	pvalue
	0.64	<0.00001

Table 13 shows the significant relationship between the extent of mitigation practices and the quality of water services of Sultan Kudarat Water District, with a correlation value (r) of 0.64, indicating a moderate to strong positive relationship. The p-value of <0.00001 is much lower than the typical significance threshold of 0.05, which means the relationship is statistically significant.

This indicates that as the level of mitigation practices enhances, the quality of management services in general also rises. Good mitigation strategies, such as effective monitoring, transparent management practices, and effective communication, are associated with improved water service reliability, customer satisfaction, and water quality.

Recent research corroborates this result. For example, Dela Cruz (2022) mentioned that robust mitigation strategies, such as frequent water quality monitoring and customer engagement, increase service reliability and customer trust.

Likewise, Aquino et al. (2021) underlined that an active water management strategy, such as sustainability practices, is crucial to improving service quality. The positive correlation noted in Sultan Kudarat Water District supports this finding, asserting that effective mitigation practices are most important in achieving high-quality services. Thus, the findings indicate the need to enhance and uphold effective mitigation practices to improve customer service quality.

Significant Differences among the Mitigation Practices in terms of System Assessment, Monitoring, Management and Communication

The table presents the significant differences among the mitigation practices regarding system assessment, monitoring, management, and communication.

Table 14: Significant differences among the Mitigation Practices in Terms of System Assessment, Monitoring, and Management and Communication

	Mean	SD	post hoc*
System Assessment	4.39	0.66	A
Monitoring	4.27	0.77	B
Management And Communication	4.26	0.80	B
RM(p)	<0.00001		

*means the same letters are comparable

Table 14 displays the significant variations between the mitigation practices regarding system assessment, monitoring, management, and communication. The mean scores are as follows: system assessment (M=4.39, SD=0.66), monitoring (M=4.27, SD=0.77), and management and communication (M=4.26, SD=0.80). The ANOVA Repeated Measures test shows a significant difference (RM (p) <0.00001); that is, the practices in system assessment are considerably higher than monitoring, management, and communication. The responses in monitoring management and communication are similar; there is no significant difference between these two practices.

This finding implies that SKWD places greater emphasis on system assessment, as indicated by the higher mean score. This may indicate that system assessment takes precedence in maintaining the effectiveness of the water distribution and service systems, which is vital in the identification of potential areas for improvement. Conversely, although monitoring management and communication practices are significant, their similar scores may not be as highly emphasized compared to system assessment. This would imply that SKWD could put the same emphasis on further developing monitoring and communication practices to strengthen the overall mitigation strategy.

Recent research affirms this observation. Aquino et al. (2021) reiterated that system evaluation is essential for determining vulnerabilities and enhancing service reliability, which also resonates with the higher score for system evaluation.

Further, Torres (2023) noted that monitoring and communication are equally important to operational transparency and customer satisfaction, which indicates that SKWD may further improve these aspects to augment its mitigation strategies.

Issues, Concerns, and Opportunities in the Delivery of Water Services by the Sultan Kudarat Water District

The table presents the results of the issues, concerns, and opportunities in the delivery of water services by the Sultan Kudarat Water District.

Table 15: Results of the Issues, Concerns, and Opportunities in the Delivery of Water Services by the Sultan Kudarat Water District

Variables	Frequency	Percentage	Rank
1. Low Water Pressure during Peak Hours	110	38.60%	1
2. Water Quality Concerns such as	75	26.31%	2

Variables	Frequency	Percentage	Rank
discolored or foul-smelling water			
3. Delayed response to service requests, including leaks, burst pipes, and other maintenance issues.	50	17.54%	3
4. Difficulty in accessing the water district's office for inquiries or concerns.	30	10.53%	4
5. Limited Service Expansion	20	7.02%	5

The results revealed that low water pressure was cited as a common complaint, with 110 responses, or 38.60% of the population. This suggests a significant concern regarding the water district's ability to maintain a steady and sufficient water flow during high-demand periods, which can affect daily activities and customer satisfaction.

The second most reported issue was water quality, with 75 responses, or over 26.31% of respondents, revealing concerns such as discoloration or foul odors. This points to potential water treatment or distribution system issues, which could affect public health and customer confidence in the water supply. The 17.54% of respondents reported frustration with the delayed response to service requests. This indicates that maintenance issues, such as pipe bursts and leaks, are not being addressed promptly, which can lead to further damage, higher repair costs, and customer dissatisfaction.

About 10.53% of respondents expressed difficulty reaching the water district's office for inquiries or concerns. This highlights a potential gap in customer service and communication, suggesting that residents may not have adequate access to support or information, which could affect their overall satisfaction.

The last reported issue was related to the limited expansion of services, with only 7.02% of respondents indicating this as a concern. This suggests that while expansion might not be a top priority for many respondents, infrastructure growth is still needed to meet the growing demand for water services.

Primary Uses of Water among the Concessionaires

The table presents the results of the primary uses of water among the concessionaires of Sultan Kudarat Water District.

Table 16: Primary Uses of Water among the Concessionaires

Variables	Frequency	Percentage	Rank
1. Cooking	90	31.58%	1
2. Cleaning	85	29.82%	2
3. Bathing and Personal Hygiene	60	21.05%	3

Variables	Frequency	Percentage	Rank
4. Drinking	30	10.53%	4
5. Gardening and Landscaping	20	7.02%	5

The results presented in Table 16 provide valuable insights into the primary uses of water among concessionaires, revealing the most common ways water is utilized in households. The highest proportion of respondents, 31.58%, identified cooking as the primary water use. This reflects water's essential role in food preparation, emphasizing its importance for daily meals in most homes. Water is crucial for cooking and ensuring proper hygiene during food preparation, making a reliable and clean water supply indispensable.

Following closely, 29.82% of respondents cited cleaning as their primary water use. Cleaning, which includes washing dishes, cleaning floors, and maintaining overall household hygiene, is another fundamental function of water daily. This highlights the broad scope of water use beyond cooking and underscores its importance for sanitation and health.

The 21.05% of respondents reported using water primarily for bathing and personal hygiene, demonstrating that water is essential for personal care routines such as bathing, brushing teeth, and other hygiene-related activities. Given the significance of hygiene in health, a consistent water supply for these purposes is critical.

Although drinking water is essential, only 10.53% of respondents identified it as their primary use. This lower percentage could suggest that, while drinking water is a priority, many households supplement their water needs with bottled or filtered water, especially in areas where tap water quality may be a concern.

Lastly, gardening and landscaping were the least common uses, with 7.02% of respondents citing these activities. While important for maintaining outdoor spaces and growing plants, gardening appears to be a less frequent or urgent water use than indoor household activities.

4. Conclusions

The following conclusions were drawn from the study:

The SKWD conducts scheduled system assessments; in a recent evaluation, its physical facilities were found to be well-maintained and in good condition.

SKWD promptly notifies customers of any planned maintenance or service disruptions.

SKWD mitigation strategies are significantly related to the quality of services.

Some issues with SKWD's services are the unpredictable water supply, low pressure, bad water quality, sluggish customer response to service problems, and high-water bills for low-income households.

SKWD's services are also imperative for public health, businesses, schools, and institutions.

5. Recommendations

Based on this study, the following are recommendations to improve the water services offered by the SKWD:

1. The SKWD may upgrade infrastructure by replacing outdated pipes and upgrading water treatment facilities to stabilize and improve the water supply. This will help address low water pressure, poor quality water, and irregular water supply, particularly during peak seasons.
2. SKWD may establish an on-site laboratory to assess contaminants and monitor water quality. This would enable real-time testing and quick identification of any issues, ensuring that water standards are consistently met.
3. The SKWD may thoroughly evaluate the water distribution network to identify areas with irregular or inadequate water supply, particularly in residential areas.
4. The SKWD may anticipate water demand during peak hours and assess the capacity of its infrastructure to meet these demands. It may then invest in expanding water storage capacities, upgrading pumping stations, and improving distribution systems to ensure a steady water supply during peak periods.
5. Future research may evaluate the long-term impact of upgrading the water supply system, like replacing aged pipes and enhancing water treatment facilities, on water quality, pressure, and availability in the long run.

Acknowledgments

The journey leading to the completion of this study has been long and challenging, marked by numerous obstacles and milestones. Reaching this final phase would not have been possible without the guidance, support, and expertise of many individuals who have stood by me throughout this remarkable journey:

First and foremost, I express my deepest gratitude to **ALMIGHTY GOD** for His divine guidance, wisdom, and grace, which have been my strength throughout this research. Without His presence, this accomplishment would not have been possible;

I would also like to extend my heartfelt appreciation to **ENGR. JOSE D. TABUGA, JR., MPA**, General Manager of Sultan Kudarat Water District (SKWD), for his unwavering support, encouragement, and the resources provided to ensure the success of this study. His visionary leadership and commitment to the organization's growth were instrumental in bringing this research to fruition;

To **ATTY. KYNDELL A. HILARIO, CPA**, Chairperson of the SKWD Board, I am sincerely grateful for his belief in the importance of this study and his support throughout the process;

I am deeply thankful to my thesis advisor, **ADONIS S. BESA, PhD**, for his leadership, expertise, and constructive criticism, which greatly contributed to the quality of this research. His encouragement and insistence on excellence were vital to my academic and research progress;

I also thank **DENNIS M. MERIALES, PhD**, and **ROSALIE IBOT, MPM**, for their valuable guidance and feedback as my thesis committee members. Their insights helped shape the direction of my research;

My sincere thanks go to **DR. MILDRED F. ACCAD**, Dean of the Graduate School at SKSU, for her unwavering support and leadership, which helped me navigate the challenges of this research process;

I extend my gratitude to Sultan Kudarat State University, under the leadership of **SAMSON MOLAO, EdD**, for being a key part of my academic journey. The institution's focus on character and service has provided me with an education beyond my expectations;

I am also thankful to the SKWD personnel for their cooperation and support, which were vital to the success of this study;

I am deeply grateful to the respondents of this research for their time, expertise, and willingness to share their experiences, which formed the foundation of this study's findings;

To my friends, who have stood by me through highs and lows, I am incredibly thankful for your constant support and encouragement. A special mention to JENTS, my soul sisters, whose love and laughter have been a source of strength. To my Kakosa at SKWD, thank you for bringing joy and laughter during stressful times in school and work;

I am also grateful to my Sultan Kudarat Mountaineering family for providing a much-needed escape and stress reliever during difficult moments. The adventures and camaraderie have helped me maintain balance during my academic journey;

To **JUNJIE D. IMPERIO**, whose help was invaluable in so many ways, your support will always be remembered. You were an important part of this success, and I am forever grateful;

Lastly, I extend my deepest appreciation to my family, whose love and support have been the foundation of everything I have achieved. To my dear mother, Mamang **ELVIRA S. BILGERA**, whose strength and wisdom continue to guide me, and to my father, Papang **EMMANUEL S. BILGERA**, for his patience, understanding, and encouragement during challenging times, I am eternally grateful;

I also thank the rest of my family for their unwavering love, support, and belief in me. Your encouragement has inspired me to push forward, knowing that no obstacle is too great with family by my side; and,

Thank you all for sharing this journey. Your contributions, in countless ways, have made this achievement possible.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship and publication of this article.

Funding

The author received no financial support for the research, authorship and publication of this article.

References

- Asian Development Bank. (2016). *Water governance in Asia: Challenges and opportunities*. ADB Publications.
- Bartram, J., & Cairncross, S. (2010, September). The challenges of water sanitation and hygiene in rural areas. *Water & Sanitation Today*, 34(5), 18-21. <https://www.watersanitationtoday.com/articles/2010sept>
- Bartram, J., & Cairncross, S. (2010). *Water, sanitation, and hygiene: The need for a holistic approach*. World Health Organization.
- Cohen, S., & Garcia, R. (2005). *Water infrastructure and governance in urban areas*. Cambridge University Press.
- Cosgrove, W., & Rijsberman, F. (2000). *World water and agriculture: A critical analysis*. Oxford University Press.
- Cosgrove, W., & Rijsberman, F. (2021). *Water resources and sustainable development*. Cambridge University Press.
- Department of Health. (2014). *Guidelines for safe water usage (Pamphlet)*. Department of Health Publishing.
- Douglas, E. (2010). *Managing water resources in developing countries*. McGraw-Hill.
- European Commission. (2023). *Water use efficiency in the EU: A guide for sustainable practices (Pamphlet)*. European Commission. <https://www.eu-water-efficiency-guide.org>
- Falkenmark, M. (2013). *Freshwater resources and sustainable development*. Springer.
- Gleick, P. (2000). *The world's water: The biennial report on freshwater resources (Vol. 6)*. Island Press.
- Gleick, P. (2000). *The world's water: The biennial report on freshwater resources (Vol. 6)*. Island Press. <https://www.islandpress.org/world-water-report>
- Gleick, P. (2003). *Water and conflict: A global perspective*. The World Bank.
- Global Environment Facility. (2019). *Water for sustainable development: A global action plan*. Global Environment Facility. <https://www.gefwater.org/global-action-plan>
- Godfrey, B., et al. (2018). *Monitoring and improving water quality in developing countries*. Elsevier.
- GW. (2019). *Water infrastructure in global cities*. Global Water Intelligence.
- Hering, D., et al. (2016). Assessing water quality in rivers and lakes. *Environmental Science Journal*, 22(8), 45-56.
- Kosek, M., et al. (2003). Waterborne diseases and their impact on health. *Environmental Health Perspectives*, 111(4), 445-450.
- Lee, J., Smith, R., & Kim, A. (2020). *Sustainable water management in urban areas*. Elsevier.
- Lee, J., Smith, R., & Kim, A. (2020). *Sustainable water management in urban areas*. Elsevier.
- Mazzucato, M. (2023). *The economics of water management*. Cambridge University Press.
- Moench, M., in Gleick, P. (2020). *Water management under climate change*. The World Bank.
- Postel, S. (2021). *Water scarcity and solutions*. Oxford University Press.
- Roaf, S., Khalfan, A., & Langford, M. (2005). *Water, health, and sustainable development: A global perspective*. Oxford University Press.
- Seckler, D., et al. (2000). *The role of water in global food security*. International Food Policy Research Institute.
- Serrat, O. (2017). *Water resource management and practices (Doctoral dissertation)*. Asian Development Bank.
- Serrat, O. (2017). *Water resource management and practices*. Asian Development Bank.
- Serrat, O. (2017). *Water, environment, and sustainability (Doctoral dissertation)*. Asian Development Bank.
- Serrat, O. (2017). *Water, environment, and sustainability*. Asian Development Bank.
- Suri, A. (2024). *The future of water usage in urban areas*. Routledge.
- The World Bank Group. (2023). *Global water crisis: Challenges and solutions*. World Bank.
- The World Bank. (2017). *Water security and policy in developing nations*. The World Bank Group.
- UN-Water. (2010). *The United Nations World Water Development Report 3: Water in a changing world*. UNESCO Publishing. <https://www.unwater.org/report/wwdr3>
- UN-Water. (2020). *The United Nations World Water Development Report 5: Water and climate change*. UNESCO Publishing. <https://www.unwater.org/report/wwdr5>
- UN-Water. (2020). *World Water Development Report 2020: Water and climate change*. UNESCO.
- UNFCCC. (2003). *Water and climate change: A framework for sustainable solutions*. United Nations Framework Convention on Climate Change.
- UNFCCC. (2003). *Water and climate change: Policy implications*. United Nations Framework Convention on Climate Change.
- UNFPA. (2003). *Water and population dynamics in developing countries*. UNFPA.

- United Nations World Water Development Report. (2021). Valuing water: Policy solutions for a changing world. United Nations. <https://www.un.org/wwdr2021>
- Waring, R. (2017). Water governance and management. Cambridge University Press.
- Weiler, L. (2020, March). Water resources and management practices. *Global Water Magazine*, 12(3), 23-27. <https://www.globalwatermagazine.com/articles/management-practices>
- World Bank. (2015). Water and climate change in Africa: Mitigation strategies. The World Bank Group.
- World Bank. (2017). Water security and policy in developing nations. The World Bank Group.
- World Health Organization (WHO). (2017). Drinking water quality and health: A global review. WHO Press.
- World Health Organization. (2017). Waterborne diseases and public health. World Health Organization.
- Zhang, H., & Kwon, J. (2021). Water pollution control: Current practices and future trends. *Environmental Science & Technology*, 45(7), 23-30.