

Performance and Service Delivery of Local Water Districts (LWDs) in Western Visayas

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ABSTRACT: This study assessed the operational performance and service delivery of selected Category D LWDs in Western Visayas using the KPIs prescribed by the LWUA. Specifically, it examined the institutional profile of the participating LWDs and determined the differences and relationships between profile variables, operational performance, and service delivery indicators. A quantitative research design utilizing descriptive, comparative, correlational, and trend analyses was employed. Twenty-one (21) Category D LWDs from Aklan, Antique, Capiz, and Iloilo were included in the study. Secondary data from 2020 to 2024 were analyzed using frequency count, percentage, mean, standard deviation, Kruskal–Wallis H test, Fisher’s Exact test, Spearman’s Rank Correlation Coefficient, and trend analysis. Results showed that most participating LWDs had 10 employees and below (47.6%) and primarily relied on wells as their source of water supply (61.9%). Collection Efficiency recorded the highest overall mean ($M = 92.01$), while the Current Ratio ($M = 4.42$) exceeded the prescribed benchmark. However, NRW obtained an overall mean of 47.94%, exceeding the recommended benchmark of 30%. Water quality compliance improved from 33.3% in 2020 to 71.4% in 2024, while 24/7 water service coverage increased from 42.9% to 90.5% during the same period. Significant differences were found in Collection Efficiency when grouped according to population served ($p = 0.026$) and organizational size ($p = 0.030$). Significant relationships were also observed between province and NRW ($p = 0.038$) and between organizational size and Collection Efficiency ($r_s = -0.546$, $p = 0.010$). The findings indicate that while the participating LWDs generally demonstrated satisfactory operational performance and improving service delivery, water loss management remains a critical challenge. Strengthening operational efficiency, infrastructure management, and revenue collection systems is essential for enhancing the long-term sustainability of water utilities.

KEYWORDS: Local Water Districts; operational performance; service delivery; water utilities; Western Visayas; Philippines

I. INTRODUCTION

Water is a vital public utility that plays a crucial role in public health, sanitation, economic development, environmental sustainability, and the overall quality of life. Developing countries continue to face significant challenges in providing reliable access to safe and sustainable water services due to rapid population growth, urbanization, aging infrastructure, and operational inefficiencies. Global reports continue to indicate that many communities still have limited access to safely managed drinking water services, illustrating the persistent governance and operational challenges faced by water utilities (World Health Organization & United Nations Children’s Fund [WHO & UNICEF], 2023; UN-Water, 2024).

In the Philippines, Local Water Districts (LWDs) are mandated under Presidential Decree No. 198 to operate and maintain their water supply systems in their respective service areas. For instance, the Local Water Utilities Administration (LWUA) uses Key Performance Indicators (KPIs) such as Non-Revenue Water (NRW), Collection Efficiency, Market Growth, Water Quality Compliance, Current Ratio, Net Income, Staff Productivity Index, 24/7 Water Service Coverage, and Sanitation Facilities to monitor operational and service delivery performance (LWUA, 2018). These indicators are used to evaluate the operational efficiency, financial sustainability, and service delivery capability of water districts. However, many LWDs are still encountering operational and institutional challenges that affect service reliability and sustainability. Common concerns among water utilities include high levels of NRW, aging infrastructure, operational inefficiencies, poor collection systems, and limited technical manpower. High NRW significantly reduces utility revenues and limits the water suppliers’ ability to sustain and improve water services (Liemberger & Wyatt, 2019). Likewise, condition of infrastructure, operational management practices, and institutional capability have a significant influence on the reliability and operational performance of water services (Alegre et al., 2016; Sakai, 2024).

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Previous studies have examined governance systems and operational issues among water utilities, but only a few empirical studies have comprehensively evaluated the operational performance and service delivery capability of Category D LWDs in Western Visayas using established KPIs and variables of institutional profile. This gap limits the availability of localized evidence needed to enhance operational management and service delivery among water districts in the region. Hence, this study was conducted to assess the operational performance and service delivery of selected LWDs in Western Visayas and determine whether institutional profile variables demonstrate significant relationships and differences with operational performance and service delivery indicators.

Specifically, the study aimed to answer the following questions:

1. What is the institutional profile of the selected LWDs in Western Visayas, in terms of:
 - 1.1 province;
 - 1.2 organizational size;
 - 1.3 population served; and
 - 1.4 source of water supply?
2. What is the performance of the selected LWDs in Western Visayas based on the KPIs for the last five years:
 - 2.1 Non-Revenue Water;
 - 2.2 Market Growth;
 - 2.3 Current Ratio;
 - 2.4 Staff Productivity Index;
 - 2.5 Collection Efficiency; and
 - 2.6 Net Income?
3. What is the service delivery of the selected LWDs in Western Visayas based on the KPIs for the last five years:
 - 3.1 Water Quality;
 - 3.2 24/7 Water Service; and
 - 3.3 Sanitation Facilities?
4. Is there a significant difference in the performance indicators of the selected LWDs in Western Visayas when grouped according to institutional profile?
5. Is there a significant relationship between the institutional profile and performance of the selected LWDs in Western Visayas?
6. Is there a significant relationship between the institutional profile and service delivery of the selected LWDs in Western Visayas?

1.2 Theoretical Framework

The study is anchored on Systems Theory, Production Theory, and New Public Management (NPM) Theory. These theories explain how the institutional characteristics, resource utilization, operational systems, and management practices influence the performance and service delivery of the LWDs.

Systems Theory (Bertalanffy, 1968) sees organizations as interrelated systems, where the efficiency of an organization is dependent on the proper functioning of its various parts. For LWDs, operational performance and service delivery can be affected by factors such as organizational size, population served, water source and location.

Production Theory (Varian, 2014) explains that organizations seek to maximize outputs through the efficient use of available resources. In LWDs, operational performance is reflected in the effective management of manpower, finances, infrastructure, and water supply systems, as measured through key performance indicators (KPIs).

New Public Management Theory (Hood, 1991) emphasizes efficiency, accountability, and performance measurement in public sector organizations. It supports the use of KPIs to assess and improve the operational performance and service delivery of LWDs.

II. METHODOLOGY

This study employed a quantitative research design using comparative, correlational, and trend analysis methods to assess the performance and service delivery of the selected Category D LWDs in Western Visayas.

To determine the institutional profile, operational performance and service delivery of the selected LWDs, the descriptive method was utilized. The descriptive approach was specifically used to present the institutional profile of the LWDs based on province, population served, source of water supply, and organizational size. It was also used to evaluate the performance of the selected LWDs based on the KPIs prescribed by LWUA: NRW, Collection Efficiency, Market Growth, Current Ratio, Staff Productivity Index, and Net Income. While the descriptive method was also used to determine the service delivery of the selected LWDs based on Water Quality Compliance, 24/7 Water Service Coverage, and Sanitation Facilities.

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The study was conducted in Aklan, Antique, Capiz, and Iloilo in Western Visayas, Philippines or also known as Region VI. The provinces were included in the study because they have operational Category D LWDs and they have available operational records and performance reports that are needed in the study.

The study employed purposive sampling in selecting the participating LWDs. Twenty-one (21) out of the forty-one (41) Category D LWDs in Western Visayas were included based on the availability and completeness of the operational and performance records required for the study. LWDs with incomplete or unavailable data were excluded to ensure the reliability and comparability of the data used in the analysis. While the sample provides useful and meaningful insights into the operational performance and service delivery of Category D LWDs in Western Visayas, the reduced sample size may limit the generalizability of the findings to the entire population of Category D LWDs, as nearly half of the total population was not included due to data constraints.

Sources of Data

The study primarily utilized secondary data obtained from the official institutional and operational records of the participating Category D LWDs in Western Visayas covering the period 2020-2024. These records included KPI reports, annual performance audit reports, financial statements, billing and collection reports, production and consumption reports, active service connection reports, water quality compliance reports, and other operational documents that are being submitted by the participating LWDs to LWUA. The reports that were served as the primary sources of data for statistical analysis and evaluation. All the submitted reports were reviewed for completeness and relevance to the study to ensure reliability, consistency, and comparability of the datasets. Records with incomplete or insufficient data were excluded from the analysis.

Data Analysis Procedure

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive and trend analyses were conducted using operational data from 2020-2024, while inferential analyses utilized 2024 data only. Frequency and percentage described the institutional profile of the LWDs, whereas mean and standard deviation measured the level and variability of operational performance and service delivery indicators. Trend analysis examined changes in these indicators over the five-year period. The Kruskal-Wallis H test, Fisher's Exact test, and Spearman's Rank Correlation Coefficient were employed to determine differences and relationships among variables. All statistical tests were conducted at a 0.05 level of significance.

III. RESULTS AND DISCUSSION

Profile of the Selected LWDs in Western Visayas³

The study involved 21 Category D LWDs in Western Visayas. Most respondents were from Iloilo (42.9%), while Aklan, Antique, and Capiz each accounted for 19.0%. Iloilo continues to experience rapid urban growth and increasing demand for public utility services, including water supply systems (Nagaynay & Lee, 2020). This may explain why there are more LWDs in the said province. Nearly half of the LWDs (47.6%) had 10 employees and below. This is supported by DBM (2011) and Velasco (2021), which states that smaller water districts commonly operate with limited personnel and operational resources due to smaller service areas and lower revenue capacity. In terms of population served, most catered to 5,001-10,000 consumers or more than 10,000 consumers (33.3% each). Velasco (2021) noted that increasing population served may result in greater operational and infrastructure demands among water districts. Wells were the primary source of water supply for most LWDs (61.9%), followed by multiple water sources (28.6%). Smaller water districts commonly depend on groundwater systems because of their accessibility and lower operational costs (Brantley, 2024). These findings indicate that the participating LWDs operate under diverse institutional and operational conditions.

Table 1. Profile of the Selected LWDs in Western Visayas

Demographic	Frequency	Percentage
Province		
Aklan	4	19.0
Antique	4	19.0
Capiz	4	19.0
Iloilo	9	42.9
Organizational Size		
10 and below	10	47.6
11 to 20	7	33.3
21 and above	4	19
Population Served		
5,000 and below	6	28.6
5,001 to 10,000	7	33.3
Above 10,000	7	33.3

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No response	1	4.8
Source of Water Supply		
Spring	1	4.8
Wells	13	61.9
Bulk Purchase	1	4.8
Multiple Sources (spring, wells, surface water, bulk purchase)	6	28.6
Total	21	100

Performance of the Selected LWDs in Western Visayas Based on the KPIs for the Last Five Years

The findings indicate varying levels of performance among the participating LWDs from 2020 to 2024. Collection Efficiency showed the strongest performance, with an overall mean of 92.01, suggesting effective billing and revenue collection practices. According to Namaliya (2017), Maziotis et al. (2025), and Murrar et al. (2024), financial and operational efficiency with effective billing and receivable collection systems is important in sustaining the financial stability, operational continuity, and performance of water utilities. The Current Ratio also exceeded the prescribed benchmark, with an overall mean of 4.42, indicating good liquidity and the ability to meet short-term financial obligations. As Julius and Okech (2018) observed in their study, financially stable utilities are more capable of sustaining and maintaining operational activities and infrastructure systems.

The Staff Productivity Index recorded an overall mean of 29.77, reflecting moderate workforce productivity. According to Ablanado-Rosas et al. (2020), operational efficiency among water utilities may be linked to management practices, resource utilization, and institutional capability. Workforce efficiency and labor productivity are important determinants of operational performance among water utilities, and effective operational management and resource utilization contribute to the sustainability and performance of water service providers (Maziotis et al., 2016; Lajqi et al., 2023). Market Growth showed an overall mean of 88.36 but exhibited fluctuations across the five-year period. This is consistent with the study of Chang et al. (2022), which suggests that service quality, infrastructure, and service coverage may contribute to the operational efficiency and expansion coverage of LWDs. According to Sakai (2024), market growth indicators are important in evaluating the long-term sustainability and operational performance of water utilities, but fluctuations may suggest operational and financial limitations among water service providers. Meanwhile, Non-Revenue Water (NRW) had an overall mean of 47.94%, which exceeded the recommended benchmark of 30%, indicating significant water losses among the participating LWDs. High NRW levels were commonly associated with leakages, metering inaccuracies, illegal connections, infrastructure deterioration, and weak monitoring systems (AL-Washali et al., 2019; Şişman & Kizilöz, 2020). Excessive NRW may negatively affect the operational efficiency and financial sustainability of water utilities, which highlights the importance of continuous monitoring and water loss reduction strategies (Amogne, 2025; AbuEltayef et al., 2025). In terms of profitability, most LWDs reported positive net income during the study period, particularly in the later years, suggesting improving financial performance. Positive net income may help LWDs in sustaining their operational activities, maintaining infrastructure programs, and supporting future service development projects (Maziotis et al., 2016; Romano & Guerrini 2019; Velasco, 2021). Overall, the results demonstrate strengths in financial management and revenue collection, while water loss remains a major operational challenge.

Service Delivery of the Selected LWDs in Western Visayas for the Last Five Years

The findings indicate a generally improving trend in service delivery among the participating LWDs from 2020 to 2024. Water quality compliance increased from 33.3% in 2020 to 71.4% in 2024, suggesting enhanced adherence to water quality standards and improved monitoring practices. Similarly, the proportion of LWDs providing 24/7 water service rose from 42.9% in 2020 to 90.5% in 2024, reflecting greater service reliability and continuous water supply for consumers. Compliance with drinking water quality standards and effective monitoring systems is essential in ensuring potable water and protecting public health (Bain et al., 2020). Continuous water quality monitoring and compliance programs are important in ensuring reliable potable water services and minimizing public health risks related to unsafe drinking water. It is important to note that the existence of non-compliance with water quality standards may indicate that there may be challenges on the part of LWDs in terms of water quality monitoring or laboratory testing limitations. Infrastructure conditions, water treatment technology, and operational management are important considerations in water quality performance and service reliability among water distribution systems (Domoń et al., 2024).

Regarding sanitation facilities, the number of LWDs with available facilities increased from none in 2020 to 38.1% in 2024, indicating gradual improvements in sanitation-related services. However, some LWDs still reported the absence of sanitation facilities, highlighting existing operational and infrastructure challenges. Hutton & Varughese (2016) emphasized that sanitation infrastructure and services remain major challenges in developing regions where financial limitations and infrastructure constraints commonly affect sanitation service expansion and sustainability. Mara and Evans (2018) also highlighted that sanitation service provision may be closely associated with institutional capability, infrastructure investment, and operational management systems necessary for sustaining effective sanitation services. Overall, the results suggest that service delivery among the participating LWDs improved over the five-year period, particularly in water quality compliance and continuous water supply.'

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Profile and Performance Indicators of the Selected LWDs in Western Visayas

The results generally showed no significant differences in the performance indicators of the selected LWDs when grouped according to province, source of water supply, population served, and organizational size. Specifically, NRW, Market Growth, and Current Ratio did not significantly differ across any of the institutional profile variables ($p > 0.05$), indicating that operational efficiency, service expansion, and liquidity conditions were relatively similar among the participating LWDs regardless of their profile characteristics.

Similarly, the Staff Productivity Index showed no significant differences based on province, source of water supply, and organizational size. Although a significant result was initially observed for population served ($p = 0.041$), pairwise comparisons revealed no significant differences between groups, suggesting only minimal variation in workforce productivity.

In contrast, Collection Efficiency significantly differed according to population served ($p = 0.026$) and organizational size ($p = 0.030$), but not by province or source of water supply. LWDs serving populations of 5,001-10,000 and those with smaller organizational sizes demonstrated higher collection efficiency. These findings suggest that service population and workforce size may influence revenue collection performance, while most other performance indicators appear consistent across different institutional profiles. Lajqi et al. (2023) found that operational efficiency and organizational management practices are crucial factors in the financial and operational performance of water utilities. Similarly, Walker et al. (2019) observed that operational scale and workload are associated with the financial efficiency and resource management capacity of water utilities. Likewise, Maziotis et al. (2021) discussed that utilities serving larger populations usually face higher operational complexity and service management needs that can affect operational and financial efficiency indicators. Amaral et al. (2023) also observed that management practices and operational coordination are strongly associated with utility performance and resource management efficiency.

Profile and Performance of the Selected LWDs in Western Visayas

The findings generally showed that institutional profile variables had limited influence on the performance indicators of the selected LWDs in Western Visayas. Most performance indicators, including Market Growth, Current Ratio, Staff Productivity Index, Collection Efficiency, and Net Income, were not significantly related to province, source of water supply, population served, and organizational size ($p > 0.05$). These results suggest that operational and financial performance may be influenced more by internal management practices, operational efficiency, and resource management than by institutional characteristics.

However, some significant relationships were observed. NRW was significantly associated with province ($p = 0.038$), indicating that water loss conditions varied across geographical locations. NRW conditions among water utilities are often associated with infrastructure condition, operational management, leakage control systems, and monitoring practices. Variations in operational environment and infrastructure systems may lead to differences in water loss performance among water utilities (AL-Washali et al., 2019; Şişman and Kizilöz, 2020). Collection Efficiency was significantly and negatively related to organizational size ($r_s = -0.546$, $p = 0.010$), suggesting that larger organizations tended to have lower collection efficiency. This finding suggests that LWDs with smaller organizational structures may demonstrate better revenue collection performance compared to those with larger organizational sizes. The findings are consistent with Amaral et al. (2023) who highlighted that organizational structure, management practices, and resource allocation systems are strongly related to the operational and financial efficiency of water utilities. Increasing operational scale and organizational structure does not always lead to better efficiency among water utilities, as larger utilities typically face more operational and administrative challenges that may affect financial and operational performance (Maziotis et al., 2021). Population served also showed significant associations with Staff Productivity Index and Collection Efficiency in some analyses, indicating that service population may influence workforce productivity and revenue collection performance.

Overall, the results indicate that institutional profile variables had minimal influence on most performance indicators, with province affecting NRW and organizational size affecting Collection Efficiency. These findings highlight the importance of operational management, infrastructure condition, and financial practices in determining LWD performance.

Profile and Service Delivery of the Selected LWDs in Western Visayas

The findings revealed that institutional profile variables were not significantly associated with the service delivery indicators of the selected LWDs in Western Visayas. Specifically, water quality compliance and 24/7 water service coverage showed no significant relationships with province, source of water supply, population served, and organizational size ($p > 0.05$). These results suggest that the participating LWDs generally delivered similar levels of service regardless of their institutional characteristics.

The absence of significant relationships indicates that service delivery may be influenced more by internal operational systems, infrastructure capability, maintenance practices, and management efficiency than by profile variables. The findings further suggest that continuous water supply and compliance with water quality standards can be achieved across different organizational settings when effective operational and monitoring practices are in place. The compliance of water utilities with water quality can be linked to operational monitoring systems, treatment efficiency, and regulatory compliance mechanisms (Bain et al., 2018).

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Consistent compliance with water quality standards is strongly related to operational management practices, monitoring capability, and infrastructure reliability (Setty et al., 2017). Overall, the results highlight the importance of operational management and infrastructure reliability in sustaining quality water services among LWDs.

IV. CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

1. The selected Category D LWDs in Western Visayas generally operate under limited organizational and resource conditions, as evidenced by their small workforce sizes and reliance on groundwater sources. Despite these characteristics, they continue to provide essential water services to varying population sizes.
2. The participating LWDs demonstrated satisfactory operational and financial performance, particularly in collection efficiency and liquidity management. However, the consistently high level of Non-Revenue Water indicates that water loss remains a major operational concern that may affect efficiency and long-term sustainability.
3. Service delivery improved over the five-year period, as reflected in increased water quality compliance, wider 24/7 water service coverage, and gradual improvements in sanitation facilities. These findings suggest that the participating LWDs have strengthened their capacity to provide more reliable and accessible water services.
4. Collection Efficiency was the only performance indicator that demonstrated clear and meaningful differences according to population served and organizational size, indicating that service demand and workforce structure may influence revenue collection performance among LWDs.
5. Institutional profile variables generally had minimal influence on operational performance. However, the significant relationship between province and NRW suggests that local operational conditions and infrastructure characteristics may contribute to variations in water loss, while the inverse relationship between organizational size and Collection Efficiency implies that larger organizational structures may face greater challenges in maintaining collection performance.
6. The absence of significant relationships between institutional profile variables and service delivery indicators suggests that effective water quality management and continuous water service provision can be achieved regardless of organizational characteristics when supported by sound operational practices, infrastructure maintenance, and efficient management systems.

Overall, the study contributes empirical evidence on the operational performance and service delivery of Category D Local Water Districts and provides insights for policy formulation, operational planning, and performance improvement initiatives in the Philippine water sector.

V. RECOMMENDATIONS

1. LWDs with high NRW may enhance leak detection programs, pipeline rehabilitation programs, and routine assessment of the distribution system to reduce and prevent water losses and improve operational efficiency.
2. LWDs' management officials and finance personnel may further strengthen the digital billing and collection systems, customer account monitoring, and revenue collection tracking mechanisms to sustain collection efficiency and financial liquidity.
3. Water districts may further enhance water quality monitoring systems, preventive maintenance, and contingency measures to maintain water quality compliance and continuous 24/7 water service delivery.
4. LGUs, water district management, and concerned regulatory agencies may promote the improvement and expansion of sanitation-related infrastructure and wastewater management initiatives to address the limited sanitation facilities found in several participating LWDs.
5. Future researchers may conduct similar research using a larger sample size, more operational and service delivery indicators, and other categories of LWDs to further validate and extend the findings of this present investigation.

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