

Original Research

Municipality Scoping Assessment of Urban Water, Sanitation, and Hygiene in Ethiopian Secondary Cities Using Modified WASH Systems Building Blocks Framework

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2026, volume 7, issue 3

doi:10.21926/aeer.2603032

Received: April 06, 2026**Accepted:** September 18, 2026**Published:** September 28, 2026

Abstract

The research aimed to assess the urban water, sanitation, and hygiene (WASH) systems enabling environment in ten selected Ethiopian secondary cities. It comprises Adama, Bahir Dar, Bishoftu, Dessie, Dire Dawa, Harar, Hawassa, Kombolcha, Mekelle, and Shashemene cities. The study used a two-phase assessment, integrating the USAID Urban WASH Activity with the modified WASH Systems Building Blocks Framework adapted from the Sustainable Services Initiative (SSI), Agenda for Change (AfC). A cross-sectional mixed-methods municipal scoping assessment was carried out from March 6 to April 16, 2023, using desk reviews, field evaluations, and stakeholder mapping. Semi-structured key informant interviews were also



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conducted with representatives from water utilities, municipal administrations, and all concerned sector offices, as well as community stakeholders. Nine WASH system building blocks containing 54 indicators were used for assessment and evaluation, applying a predefined three-point scoring scheme (0, 0.5, and 1). The results showed that the overall WASH-enabling environment was rated moderately in most cities, with significant institutional capacity differences between them. Bishoftu showed the highest overall enabling environment (70.13%), while Mekelle scored the lowest (49.03%). All cities received excellent ratings for having defined institutional mandates and roles for all municipal stakeholders, specific WASH sector policies, legal frameworks and standards, methods for users to complain, and inclusive planning. The absence of bylaws, inadequate cross-sectoral coordination among WASH stakeholders, a lack of technical and administrative capacity to manage sanitation and hygiene, and limited budgeting resulted in poor assessment outcomes in all cities. The study concluded that systems-thinking approaches are a promising tool for diagnosing governance challenges and directing policy decisions in rapidly growing cities in a developing country (Ethiopia) that faces WASH challenges.

Keywords

Building blocks framework; Ethiopia; municipal scoping assessment; secondary cities; urban WASH; governance

1. Introduction

Ethiopia is Africa's second-most populated country, whose population mostly lives in small and medium-sized towns. It is expected to cross 40% of the total population by 2050 [1-3]. Nowadays, the country is facing challenges due to insufficient urban Water, Sanitation, and Hygiene (WASH) infrastructure, poverty, inequality, and informal service delivery in urban settlements [4-6]. These factors spread diseases and infections, threatening the country's Sustainable Development Goals [7-9]. The WHO/UNICEF joint monitoring report [10] showed that only 52% of Ethiopia's population has access to drinking and domestic water, sanitation, and hygiene services, significantly affecting females, children, and elderly people, increasing health and well-being risks due to a lack of clean and safe water [11-13].

Ethiopia has implemented a number of policies under its long-term development plan, the Ten Years Perspective Development Plan (2021-2030), as well as phases I and II of the One WASH National Programme [14, 15]. Some international organizations like World Bank's Second Urban WASH project (March 2017-December 2022), City wide Inclusive Sanitation (October 2022-June 2024), and UNICEF's Urban WASH programs have taken major initiative to enhance urban WASH coverage in Ethiopia. However, all programmes mostly focused on increasing physical infrastructure and expanding service coverage. Although these investments have enhanced access to WASH facilities in several urban parts of the country, experience has revealed that infrastructure expansion alone is inadequate to ensure sustainable service delivery [16].

Several studies demonstrated that worldwide WASH systems fail drastically because of inadequate institutional provisions, insufficient investment, weak governance, unsuitable

monitoring systems, and fragmented stakeholder coordination [17-19]. In this context, several global WASH communities have progressively moved from infrastructure-based interventions to systems-strengthening methods that identify WASH facilities as dynamic socio-technical schemes that demand harmonized institutional, financial, environmental, and governance capabilities [20-22]. Thus, to meet Sustainable Development Goal 6 (SDG 6), WASH infrastructure investment, along with strengthened governance scheme capability, needs to be taken care of for long-term service delivery [23, 24].

To tackle urban WASH concerns, Municipality Scoping Assessment (MSA) using a systems-thinking method is vital in establishing successful, sustainable, and comprehensive urban WASH services in Ethiopian secondary cities [25]. Thus, systems-based approaches examine the institutional enabling environment that supports long-term service delivery, rather than evaluating infrastructure alone [24, 26, 27]. These methods diagnose that sustainable WASH results rely on a multi-sectoral approach that combines governance, funding, water resources management, inclusive planning, service delivery infrastructure, and technical innovation [28, 29]. The USAID Urban WASH Activity and modified WASH Systems Building Blocks Framework adopted from the Sustainable Services Initiative (SSI) and the Agenda for Change (AfC) are among the most powerful systems-based frameworks.

WASH Systems Building Blocks Framework has been widely used by international WASH development partners like United States Agency for International Development (USAID) to director division diagnostics, institutional enabling environment, and investment planning [30, 31]. In contrast to conventional infrastructure-based assessments, this framework assesses nine interconnected building blocks [32, 33]. By combining qualitative institutional assessment with an organized multi-criterion grading context, the study offers an all-inclusive sympathetic of the systematic aspects manipulating municipal WASH performance [34-36].

Previous studies carried out in Ethiopia primarily concentrated on infrastructure functionality, customer satisfaction, and WASH coverage [37]. Though, these studies have produced useful service provision, but comparatively lesser importance was given to evaluate the institutional enabling environment that regulates sustainability of urban WASH systems [38, 39]. Besides, most of the previous studies also examined individual cities for specific service components, which makes cross-city comparison very difficult [40, 41]. Thus, there remains incomplete empirical indication concerning the comparative strengths and weaknesses of WASH institutional enabling environment across Ethiopian secondary cities [32, 33, 42].

To fill this research gap, this study focused on the USAID Urban WASH Activity with a modified WASH Systems Building Blocks Framework combined to comparatively measure the institutional enabling environment of urban WASH systems in ten Ethiopian secondary cities. The study results could develop a baseline against which upcoming institutional-enhancing investment programs and strategy contributions can be assessed. Therefore, the research examines the relative position of the urban WASH enabling environment across different cities, which WASH building blocks constitute systemic bottlenecks disturbing long-lasting WASH services, and how it can strengthen WASH planning, budgeting, and service delivery oversight in selected secondary urban cities.

2. Materials and Methods

2.1 Analysis Methods and City Selection Criteria

The study followed a two-step evaluation framework, integrating the USAID urban WASH activity city evaluation methodology with the Modified WASH Building Blocks framework that delivers an all-inclusive evaluation of the Urban WASH systems in secondary cities in Ethiopia. However, both frameworks contribute to the general assessment for different and complementary purposes. The USAID urban WASH activity evolution framework has been applied for city screening and a contextual evaluation approach. In the framework, the first-phase assessment delivers the background baseline and permits comparison of the growing features of the nominated municipalities. The Modified WASH Systems Building Blocks Framework was originally established by the Sustainable Services Initiative (SSI) and the Agenda for Change framework. It adapted the principal indicative framework for evaluating the performance of urban WASH systems within the selected secondary urban cities. This framework evaluates the institutional and systemic dimensions essential for sustainable WASH service delivery, consisting of institutional arrangements, financing, regulation, service delivery infrastructure, monitoring, water resources management, learning and adaptation, inclusive planning, and demand creation. In fact, the two frameworks touch distinct analytical problems.

2.1.1 USAID Urban WASH Activity (2020) Assessment Framework

In the first step, the USAID urban WASH activity procedure has been implemented to characterize the nominated secondary cities based on their best potential strategic geography, targeting the integrated USAID program consideration and investment readiness. This framework assesses the cities using a core and key indicator approach to identify active and investment-ready secondary cities that may serve as “urban anchors” for surrounding rural areas. The core and key indicators were originally established by USAID to provide strategic choice for secondary cities under urban WASH investments. In this study, this framework has not been applied to nominate the secondary cities, as the ten municipalities had already been nominated by the USAID Urban WASH Activity. However, it was used to develop a reliable contextual baseline for associating the socioeconomic and institutional features of the participating cities that offer contextual evidence for understanding WASH system performance. Under this consideration, the core and key indicators were used to assess the city’s capability and potential for development and investment (Table 1 and Table 2). The evaluation and findings are presented in a scoring format, emphasizing the most feasible solutions.

Table 1 Core indicators to analyze status of secondary cities.

Core Indicators (Criteria)	Measurement Mechanism	How Scored	Max Point
Projected population of 100,000 or more	Yes/No	Yes = 1, No = 0	1
Major transport corridor	Yes/No	Yes = 1, No = 0	1
Center of higher education (University)	>10,000 students	Yes = 1, No = 0	1
Presence of a major health center (hospital)	Referral hospital	Yes = 1, No = 0	1
Presence of an industrial park	Yes/No	Yes = 1, No = 0	1
Regional capital/important administrative hub	Regional or zonal capital Yes/No	Yes =1, No = 0	1

Table 2 Key indicators to analyze status of secondary cities.

Thematic Area	Key Indicators (Criteria): Yes = 1, No = 0	Weight	Maximum Points
Geography	Disruptive climatic event (Y/N)	10%	3
	Major transport corridor (Y/N)		
	Geographic clustering potential (Y/N)		
Demography	Population >100,000 (Y/N)	10%	3
	Growth rate (Positive)		
	IDP population <10%		
Economy	Industrial Park employment	20%	4
	Bank presence		
	Presence of major markets		
	Unemployment rate		
Governance	Regional/Zonal capital (Y/N)	20%	4
	Administrative capacity (World Bank ULGDP II)		
	Financial capability (World Bank ULGDP II)		
	Own source revenue		
Health	Referral hospital (Y/N)	10%	1
Education	Large public university (>10,000 students)	10%	1
Infrastructure	Rail network (Y/N)	20%	4
	Commercial airport (Y/N)		
	Industrial Park (Y/N)		
	Network (internet & phone) (Y/N)		

The core indicators include a projected population of 100,000 or more, a significant transportation corridor, a center of higher education (university), a large health facility (referral hospital), an industrial park, and a regional capital or important administrative hub (Table 1). The key indicators were employed in a second-round study, which included six core indicators and a theme area of investigation. The key indicators include geography, population, economics,

government, health, education, and infrastructure (Table 2). Urban WASH used these parameters as first- and second-round MSA measures. Cities with the highest ratings in the analysis are recommended for more investment in urban WASH activities.

2.1.2 Modified WASH Systems Building Blocks Framework

The Modified WASH Systems Building Blocks Framework is the second stage in this study, applied as the primary diagnostic framework for analyzing the urban WASH enabling environment. The framework was adopted from the Sustainable Services Initiative (SSI) and the Agenda for Change systems-strengthening approach, which identify sustainable WASH service delivery based on the collaboration of several institutional, financial, technical, and governance mechanisms rather than infrastructure alone.

Modified WASH Systems Building Blocks Framework evaluates nine interconnected building blocks, namely institutional arrangements, regulation and accountability, finance, service delivery infrastructure, water resources management, monitoring, learning and adaptation, inclusive planning, and demand creation and behavior change.

2.1.3 Weighting of Assessment Indicators

The weighting of the nine WASH systems Building Blocks was adopted in the study from the Sustainable Services Initiative (SSI) and Agenda for Change Systems Strengthening Framework, as adapted by the USAID Urban WASH Activity. It was considered for the funding ranking of secondary cities for urban WASH investment. The weighting scheme designated internationally recognized systems-thinking ideologies and was not subjectively given by the research team. In contrast to the traditional infrastructure-based evaluations, systems-strengthening methods identify those various institutional components that contribute different values to the long-term sustainability of WASH services. As a result, weighting is planned to illustrate the comparative systemic effect of each building block rather than suggesting that lower-weighted components are less important.

The weights were developed through wide-ranging international expert consultation and wide-ranging real-world application in numerous low- and middle-income countries to reproduce the comparative involvement of different system components in sustainable WASH service delivery. It was developed to indicate the comparative contribution of each system constituent to sustainable service delivery. Under this framework, the highest weight was given to institutional arrangements and coordination, because they coordinate and integrate the operations of all other building blocks.

Service delivery infrastructure, demand, behavior, and political will were also given comparatively high weights because they directly impact service delivery and application. Intermediate weights were given for monitoring, regulation, inclusive planning, and water resources management mostly due to their essential roles in ensuring accountability, sustainability, and adaptive management. Relatively lower weights were assigned for finance and learning and adaptation, though crucial for long-term system resilience, because their impacts are usually understood through developments in other building blocks.

2.2 Study Design and Study Area

The municipality scoping (MSA) evaluation was conducted in ten urban WASH-active targeted cities between 6th March and 16th April, 2023. The MSA included ten urban WASH activities, namely Adama, Bahir Dar, Bishoftu, Dessie, Dire Dawa, Harar, Hawassa, Kombolcha, Mekelle, and Shashemene (Figure 1). A qualitative descriptive study was used to investigate the municipality's scoping assessment. Furthermore, stakeholder mapping, service mapping, desk review of relevant documents, and key informant interviews (KII) in the targeted cities were conducted to collect secondary data, and verified data were collected during the baseline assessment. All these complementary data sources have been chosen to confirm that each assessment indicator was reinforced by numerous lines of evidence, thereby refining the consistency and integrity of the assessment.

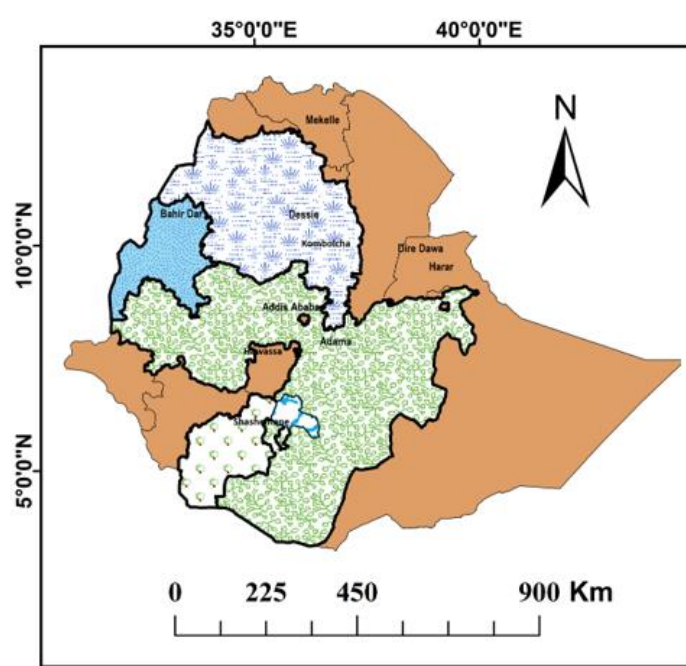


Figure 1 Study Cities of Municipality Scoping Assessment.

Similarly, stakeholder mapping, service mapping, quick evaluation, and interviews with key municipal stakeholders were also conducted. A study of existing documents was initiated to collect secondary data on current policies, plans, regulations, implementation papers, and other reports from authorities such as the Federal Ministry of Health (FMOH), the Ministry of Water and Energy (MoWE), the Ministry of Education (MoE), and water utilities under local governments. The approach focused on obtaining data on city-level plans, national policies, regional and national strategies, as well as the roles and duties indicated in the relevant documents.

2.3 Key Informant Interviews

The institutional and governance aspects of urban WASH systems were evaluated using KIIs that could not be effectively assessed through document review alone. Participants were purposively chosen from city level for interview, based on their professional roles and direct involvement in

planning, financing, regulating, implementing, operating, or monitoring WASH services. The purposive sampling method ensured that respondents had adequate technical and institutional knowledge to deliver consistent data related to the assessment. The respondents for the KIIPs were represented from offices directly related to urban WASH activities, such as municipal administrations, water and sewerage utilities, the education bureau, the health bureau, urban development offices, the environmental protection bureau, the women's affairs bureau, NGOs, selected private organizations, and small and medium enterprises.

Based on the modified WASH Systems Building Blocks Framework, a semi-structured interview guide was developed. This format allowed reliable coverage of the assessment themes, while allowing respondents to elaborate on local institutional challenges and contextual factors. The modified WASH Systems Building Blocks Framework was applied to break down the complex socio-technical WASH system into nine more manageable 'sub-sections' (building blocks), namely institutions, law, funding, planning, infrastructure construction, administration, monitoring, regulation, learning and adaptation, and water resource management. A total of 70 key informants were interviewed across the ten municipalities. Additional data collection and analysis tools were also used to generate data as input to the framework.

Collected data and reviewed document types were national, regional, and city-level policy documents, regulations and proclamations, guidelines and tools, monitoring and evaluation framework, strategic and operational plans; city demography, geography, climate, and socio-economic data; institutional arrangements, organizational structures, and capacities; stakeholder and city services maps; service standards, tariffs, fees, and expenditures; monitoring and reporting mechanisms and tools; KIIs; city investment plans and maps (WASH).

2.4 Scoring, Data Analysis, and Quality Assurance

The modified WASH Systems Building Blocks Framework with a standard three-point scoring scale as 0 (criterion absent or no evidence), 0.5 (partially implemented), and 1 (fully implemented with supporting evidence) was used for assessment. The scoring criteria were identical across all municipalities to confirm reliability in the evaluation of the 54 assessment indicators. Qualitative data collected from interviews have been examined using a thematic content analysis. Interview records were primarily prepared based on the nine WASH Systems Building Blocks and their matching assessment indicators.

The triangulation approach was applied for scoring through various data sources, namely KIIs, policy and planning documents, financial and regulatory records, stakeholder and service mapping, and field observations. Qualitative data were investigated by thematic content examination associated with the nine WASH system building blocks. Scores were not allotted on the basis of a separate decision; rather, each indicator was scored only after comparing evidence obtained from several independent sources such as key informant interviews, stakeholder mapping, service mapping, official reports, strategic planning documents, and direct field observations.

To avoid inconsistencies and reduce subjective bias, prior to aggregation into building block and general city performance scores, indicator scores were subsequently reviewed through technical consensus meetings. To ensure the reliability and uniformity of the assessment across all municipalities, standardized interview guides, uniform scoring criteria, evaluator orientation, evidence triangulation, and follow-up verification of conflicting information were ensured.

Wherever contradictory data were identified, further verification was initiated through additional document review or discussion with relevant stakeholders before assigning the final score.

2.5 Ethics Approval and Consent to Participate

Approval for this study was obtained from the Faculty Research Examination Committee of the Water Technology Institute, Arba Minch University. This study was carried out in accordance with the Declaration of Helsinki.

None of the authors conducted any experiments with humans or animals in this work. Only survey data were collected, mostly from residents, for which the authors obtained verbal consent from all participants rather than written agreements, as obtaining written agreements from all participants was a challenge. The authors have informed the participants of the purposes, methods, and benefits of the research, including potential risks. Furthermore, the researchers respected the dignity, autonomy, culture, customs, and privacy of the participants. Hence, anonymity was used for each participant to avoid potential risks.

2.5.1 Consent to Participate

Informed consent was obtained from all participants prior to data collection after explaining the study objectives and procedures. Participation was entirely voluntary, and participants had the right to withdraw at any time without consequences. No personally identifiable information was collected, and all data were treated confidentially and used solely for research purposes.

2.5.2 Consent to Publish

Not applicable as the manuscript contains no individual person's data, images, or videos.

3. Results and Discussions

3.1 Status of Cities Based on Metrics

3.1.1 First Round Analysis

Almost all ten cities met first-round core indicator thresholds (Table 3). These core indicators are important in assessing a city's capabilities and potential for development and investment.

Table 3 Status of secondary cities based on core criteria.

SN	Cities	Core Indicators (Criteria)					
		Projected population of 100,000 or more (yes/no)	Major transport corridor (yes/no)	Center of higher education (university) (>10,000 students)	Presence of major health center (hospital) (referral hospital)	Presence of an industrial park (yes/no)	Regional capital/ important administrative hub (yes/no)
1	Adama	Yes	Yes	Yes	Yes	Yes	Yes
2	Bahir Dar	Yes	Yes	Yes	Yes	Yes	Yes
3	Bishoftu	Yes	Yes	No	Yes	No	No
4	Dessie	Yes	Yes	Yes	Yes	No	Yes
5	Dire Dawa	Yes	Yes	Yes	Yes	Yes	Yes
6	Hawassa	Yes	Yes	Yes	Yes	Yes	Yes
7	Harar	Yes	Yes	No	Yes	No	Yes
8	Kombolcha	Yes	Yes	Yes	No	Yes	No
9	Mekelle	Yes	Yes	Yes	Yes	Yes	Yes
10	Shashemene	Yes	Yes	No	Yes	No	Yes

3.1.2 Second Round Analysis

The second round of study focused on subject areas related to seven major indicators; infrastructure, health, education, governance, economics, geography, and demography. Figure 2 depicts the second-round analysis by indicator. Dire Dawa scored the highest, followed by Adama, Bahir Dar, and Mekelle, while Shashemene and Harar rated the lowest but still received 70%. Cities like Dire Dawa-Harar, Hawassa-Shashemene, Dessie-Kombolcha, and Bishoftu-Adama are more likely to exchange resources since they are close to key assets such as industrial parks and airports.

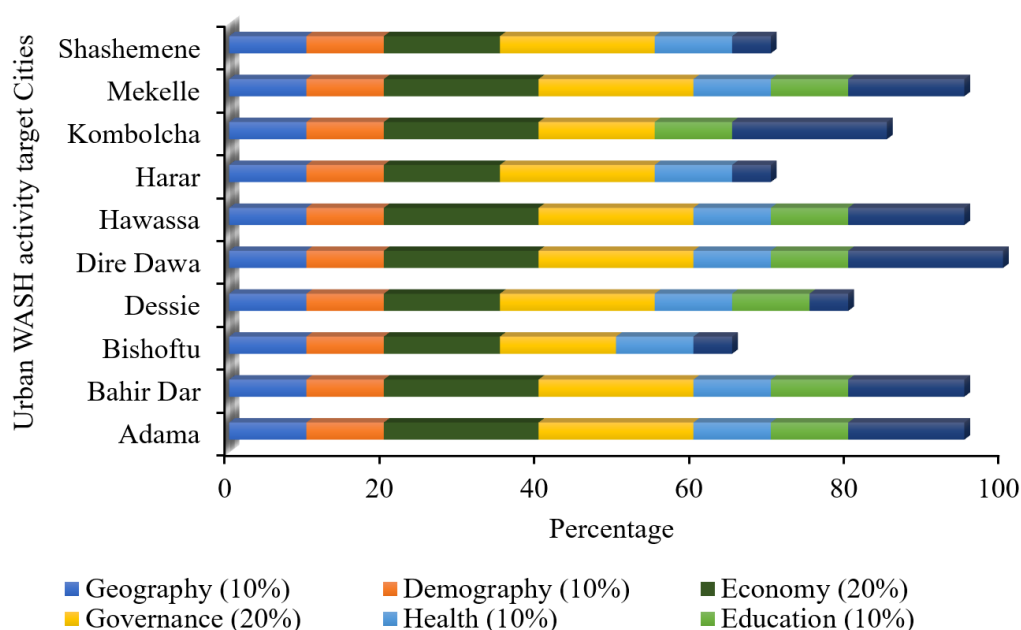


Figure 2 Status of Urban WASH in secondary cities based on key factors.

Internally displaced people are rare, except in Mekelle, where they account for more than 10% of the total population due to the recent civil conflict in Tigray and nearby districts (Figure 2). This indicates prospective pressure on housing availability, education and health services, and employment. Unemployment rates range from 27.5% in Kombolcha and 26.8% in Adama to 16.2% in Harar. Except for Bishoftu and Kombolcha, all cities serve as regional or zonal capitals. All secondary cities except Kombolcha have referral hospitals, a fundamental indication covered in round one. Education was also graded on a single criterion: the presence of a significant public university (more than 10,000 students). This indication was also used to qualify for round one, and only Shashemene fails to satisfy it. Inadequate investment in critical infrastructure, such as the water system, might hinder a secondary city's flourishing potential (Figure 2).

3.1.3 Third Round Analysis

The third and final round of analysis examined the specific WASH context factors enabling environment against the nine building block components with 54 associated criteria based on the WASH Systems Building Block tool (Table 4).

Table 4 WASH context by building block.

Sl. No.	Building blocks	Sub-themes	Evaluation points (Criteria)	Weight	Adama	Bishoftu	Shashemene	Hawassa	Bahir Dar	Kombolcha	Dessie	Mekelle	Dire Dawa	Harar
1.	Institutional Arrangements and Coordination	Mandates and roles	2	18%	2	2	2	2	2	2	2	2	2	2
		Coordination	3		1.5	2.5	1.5	1.5	1.5	0	2	0.5	1.5	1.5
		Institutional capacity	4		2.5	3	3	2	2.5	2	2.5	2	2	2
		Status of service providers	1		0.5	1	1	0.5	0.5	0	0.5	0.5	0.5	0.5
					11.7%	15.3%	13.5%	10.8%	11.7%	7.2%	12.6%	9%	10.8%	10.8%
2	Service Delivery Infrastructure	Design and construction	3	13%	2	2	2	2	2	2	2	2	2	2
		Maintenance	3		1.5	1.5	2	1.5	2	2	1.5	1.5	1.5	1
		Technical standards	1		1	0	0	0	0	0	0	0.5	0	0
				8.37%	6.51%	7.44%	6.51%	7.44%	7.44%	6.51%	7.44%	6.51%	5.58%	
3	Regulation and Accountability	Legal Framework and Enforcement	2	11%	1	1	0.5	1	1	1	1	1	1.5	0.5
		Accountability	4		3	3	3.5	2.5	2	2	2.5	2.5	2.5	2.5
				7.32%	7.32%	7.32%	6.41%	5.49%	5.49%	6.41%	6.41%	7.32%	5.49%	
4	Inclusive Planning	Participation	2	11%	2	1.5	2	2	1.5	2	2	2	1.5	2
		Inclusive planning	3		3	3	3	2.5	2.5	3	3	1.5	3	2.5
		Resilience	1		0	0	0	0	0	0	0	0	1	0
				9.15%	8.24%	9.15%	8.24%	7.32%	7.32%	9.15%	6.41%	10.07%	8.24%	

5	Finance	Budgeting and Financing	3	7%	1.5	1.5	1.5	1.5	1.5	0.5	1.5	1	1.5	1.5	
		Revenue collection	2		1.5	1	1.5	1.5	1.5	1.5	1.5	0	1.5	1	
		Financing mechanisms	1		1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
					4.68%	3.51%	4.09%	4.09%	4.09%	2.93%	4.09%	1.76%	4.09%	3.51%	
6	Monitoring	Data collection	4	9%	2	2	1.5	2	3	2	2	2	2	1.5	
		Data analysis	1		1	1	1	1	1	1	1	1	1	1	
		Monitoring Capacity	1		0	0.5	0.5	0.5	0.5	0	0.5	0.5	0.5	0.5	
					4.5%	5.25%	4.5%	5.25%	6.75%	4.5%	5.25%	5.25%	5.25%	4.5%	
7	Water Resources and Environment	Resource management and efficiency	4	11%	3	2.5	2	2.5	3	2	2.5	1.5	2.5	2	
		Balancing of interests	1		1	1	1	1	1	1	1	1	1	1	
					8.80%	7.70%	6.60%	7.70%	8.80%	6.60%	7.70%	5.50%	7.70%	6.60%	
8	Learning and Adaptation	Learning	2	7%	1	2	2	1	1	1	1	0	1	1	
		Adaptation	2		2	2	2	2	2	2	1.5	2	1		
					5.25%	7.00%	7.00%	5.25%	5.25%	5.25%	5.25%	2.63%	5.25%	3.50%	
9	Demand, Behavior, and Political Will	Attitude, Behavior, and Social Norms	3	13%	1	1	1	2.5	1	0.5	1.5	1.5	2	0	
		Demand and political will	4		4	4	4	3.5	4	4	2.5	1	4	4	
					9.3%	9.3%	9.3%	11.16%	9.3%	8.37%	7.44%	4.65%	11.16%	7.44%	
Total					100%	69.07%	70.13%	68.91%	65.41%	66.15%	55.10%	64.40%	49.03%	68.15%	55.66%

3.2 Institutional Arrangement and Coordination

The study's institutional arrangement and coordination analysis was evaluated based on mandates and roles, coordination, and institutional capacity. The results of institutional arrangement and coordination (Figure 3) identified one of the most vital distinguishing factors among the building blocks between the assessed cities.

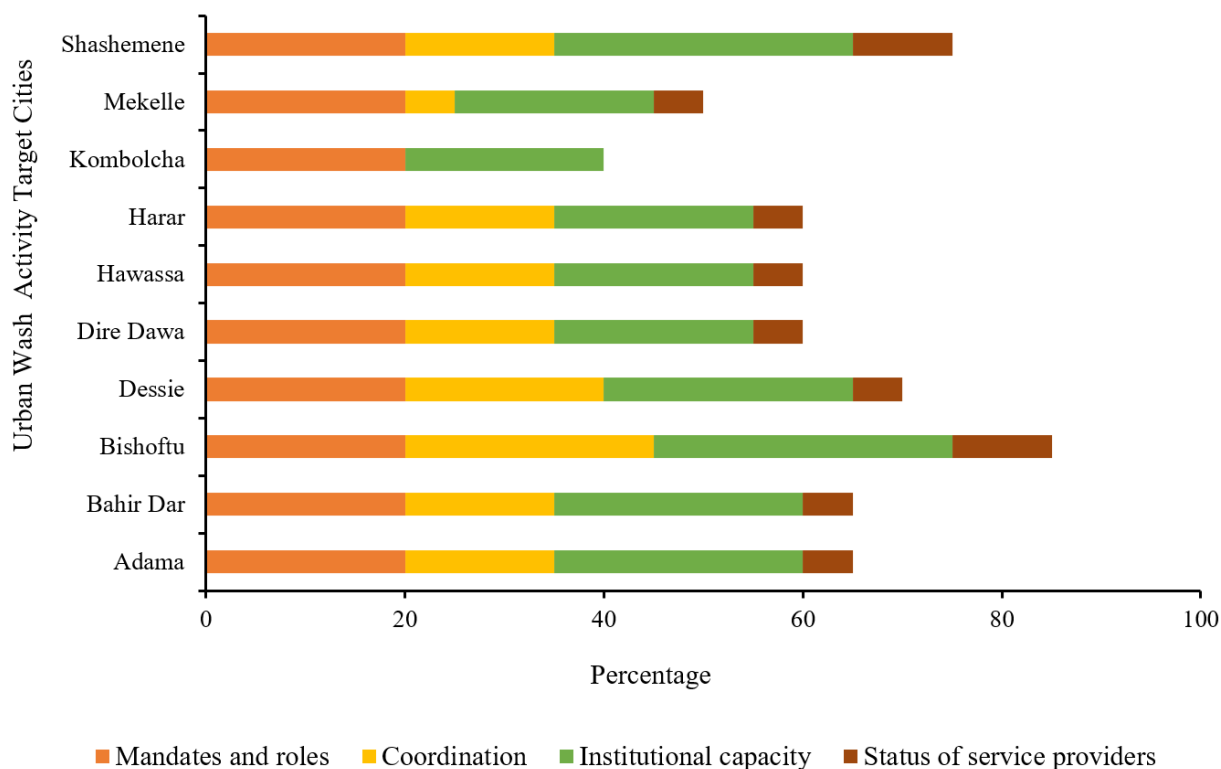


Figure 3 Institutional Arrangement and Coordination Context of Secondary Cities in Ethiopia.

3.2.1 Mandates and Roles

In Ethiopia, various stakeholders, including federal ministries, local administrations, utilities, and non-governmental organizations participate in the institutional arrangement and coordination of WASH service delivery at the city level. The Ministry of Water and Energy (MoWE) establishes national policy, while the Ministry of Health (MoH) focuses on hygiene and sanitation. City-level water supply and sewerage utilities provide water and sewage services across the city. However, there is no sewage system; therefore, utilities only administer the water supply service. Table 5 summarizes the roles and responsibilities of each stakeholder at the city-level WASH service.

Table 5 Ethiopian Institutions and Roles under the WASH Memorandum of Understanding signed in 2005.

Ministry	Role and Responsibilities
Ministry of Water and Energy (MoWE)	Provision of safe and adequate water for human consumption and domestic use for communities and institutions (e.g. schools, clinics). Water quality monitoring; training of water committees, teachers, and other management associations.
Ministry of Health (MoH)	Provision of water and sanitation facilities in health institutions; monitoring water quality for consumption before and after scheme commissioning. Support and supervision of Regional Health Bureaus. Support establishment of 'Health clubs' in health institutions to promote hygiene and sanitation in the health Institutions.
Ministry of Education (MoE)	Water and sanitation provision in schools. Support establishment of WASH clubs in schools. Ensure appropriate WASH curriculum in schools. WASH training for teachers and parent-teacher associations. Mobilize school communities to promote hygiene and sanitation.
Ministry of Finance and Economic Development (MoFED)	Communicate with WASH sector ministries on the funding programs. Provide updates and ensure timely fund disbursement and settlement. Ensure funding transfers to regions are based on action plans approved by the National WASH Steering Committee. Ensure financial reporting from woredas and regions is disaggregated for each WASH subsector.
WASH Development Assistance Group (DAG)	Provide representatives to the National WASH Steering and Technical Committees. Organize and participate in the WASH Multi-stakeholder Fora, Joint Sector Review, and other WASH Fora.
City Administration	Responsible for overseeing urban development, including WASH services. Provides leadership and coordination for WASH interventions within the city. Coordinates with federal and regional governments and utilities to allocate resources and implement policies.
Water and Sewerage Utilities	Operate under city administrations or as autonomous entities. Responsible for providing water supply and sewerage services in urban areas. Manage the planning, operation, and maintenance of water and sanitation infrastructure.

NGOs and International Organizations	Support city-level WASH interventions by providing technical expertise, funding, and capacity-building. Often work in coordination with local governments to complement public efforts.
Public-Private Partnerships (PPPs)	Collaboration with private sector entities to expand service coverage, especially for sanitation. Examples include private operators managing waste collection or treatment facilities.

A detailed analysis in Table 4 demonstrated that all cities scored full points (2) in the mandates and roles evaluation criteria (Figure 3). This indicates that all stakeholders at the city level have defined responsibilities for WASH. Additionally, all water utilities in selected urban WASH activity-targeted cities have a clear mandate for financing and undertaking repair, replacement, expansion, monitoring, planning, and ODF monitoring. All targeted urban WASH activity cities can also recurrently budget for permanent solutions and have mechanisms for employee motivation and reward.

3.3 Coordination

Effective coordination systems encourage synergy, reduce redundancy, and improve resource allocation [8]. The results showed that (Table 4) significant differences were observed in coordination among assessed cities (Figure 3). Bishoftu scored the highest coordination (2.5) out of 3 (Table 4). As a consequence of the lack of cross-sectoral coordination and a clear mandate among WASH stakeholders, Kombolcha city received 0 out of 3 points (Table 4). Correspondingly, Mekelle city has defined mandates, but there is no cross-sectoral cooperation as a result of the region’s previous conflict. Due to these shortcomings, Mekelle scored just 0.5 out of 3 points in the coordination evaluation category (Table 4).

3.4 Institutional Capacity

Building capacity among people, institutions, and organizations involved in WASH services is critical for successful WASH program development, implementation, and administration [23, 42]. The contrast between consistent performance in official mandates and inconsistency in coordination is particularly important. It shows that the key institutional conflicts are not due to the absence of legitimately assigned responsibilities. However, it is rather the capability of different performers to work collectively. Water utilities, municipalities, finance departments, health offices, and other stakeholders could have obviously distinct tasks but still function through fragmented planning, poor information exchange, reporting, and decision-making processes. Comparatively, the high institutional score was observed in Bishoftu (2.5 out of 4) (Table 4), which suggests that better coordination and institutional capacity may contribute meaningfully to its overall performance. On the other hand, the lowest coordination score in Kombolcha and weak coordination in Mekelle shows system limitations that may affects the performance of other building block, indicates, weak coordination, fragmented infrastructure planning, incompetent use of financial resources and weak accountability.

3.5 Status of Service Providers

Except for Kombolcha, all cities have legal registrations for sanitation and water service providers. There is no platform for debate or representation at the service authority, resulting in a minimum score of 0 in Kombolcha and 0.5 in the other cities (Table 4 and Figure 3). There are no private vacuum truck operators or owners in Kombolcha. Thus, inconvenience is experienced due to travel from Dessie.

3.5.1 Service Delivery Infrastructure

The service delivery infrastructure analysis considered three major areas: design and construction, maintenance, and technical standards (Figure 4).

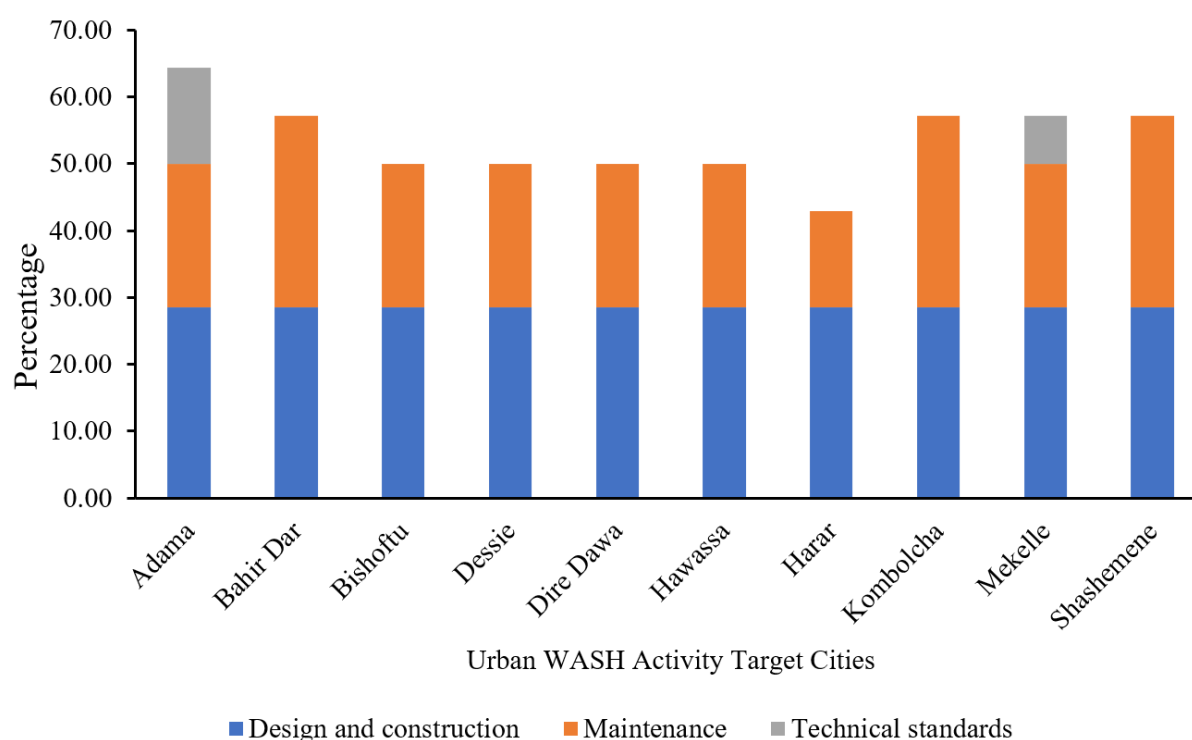


Figure 4 Service Delivery Infrastructure Status of Secondary Cities.

3.6 Design and Construction

The design and construction criteria received a score of 2 out of 3 points in all ten cities, indicating that the fundamental processes related to WASH infrastructure expansion were in place across the municipalities (Table 4 and Figure 4). This is most likely because service authorities have initial design and construction quality standards, which were monitored through transparent processes in all Urban WASH activity-targeted cities. Nevertheless, maintenance performance varied across all cities. This has been due to the currency exchange rate, which has made it extremely difficult for service delivery infrastructure to purchase high-quality materials and spare parts at reasonable prices. Furthermore, there are gaps and difficulties in providing WASH facilities in the current climate and satisfying demand in all urban WASH-targeted cities (Table 4).

3.7 Maintenance

Maintenance services face major hurdles when conducted in all urban WASH activity-targeted cities in Ethiopia. Affordable and high-quality post-construction maintenance methods are available, but they do not entirely comply with specified requirements in all targeted urban WASH activity cities (Table 4). As a result, all cities were awarded maintenance scores ranging from 1.5 to 2 out of 3 points (Figure 4). Insufficient maintenance funding might result in a decline in the quality and reliability of WASH services over time. The financial constraints on WASH facility replacement and preventive maintenance undermined the service authority's budget and objectives in all targeted urban WASH activity cities.

While urban WASH targeted activity city-level service providers have some plans and funds for preventive or proactive maintenance, they are insufficient and frequently not carried out as expected. Infrastructure investment in the absence of satisfactory preventive maintenance and technical quality guarantees can result in early decline, higher operating prices, and service interruptions.

Service providers in all urban WASH activity-targeted cities have an infrastructure inventory and monitoring system. However, frequent updates and inspections are inconsistent (Table 4 and Figure 4). Regular inspections, equipment servicing, and proactive maintenance can help extend the life of WASH infrastructure. Strengthening the financial resources, adhering to norms, and conducting regular monitoring is critical for long-term WASH maintenance [7, 12].

3.8 Technical Standards

The most prominent weakness was in technical standards in all cities. Adama achieved the maximum score of 1; Mekelle achieved 0.5, whereas the remaining cities scored zero (Table 4 and Figure 4). This indicates that infrastructure expansion is taking place; however, systematic application and enforcement of technical standards may be weak. Furthermore, the infrastructure department of all cities' municipal management has authorized and approved WASH facilities that have been built in their respective cities; however, the water utility has no right to regulate or guide households and contractors to build locally appropriate water supply and sanitation facilities (Figure 4).

3.8.1 Regulation and Accountability

The Ethiopian Urban WASH initiative focuses on improving regulation and accountability among city service authorities and providers in order to improve urban water and sanitation services. The regulation and accountability building block assessed the legal framework and its enforcement and accountability mechanisms (Figure 5).

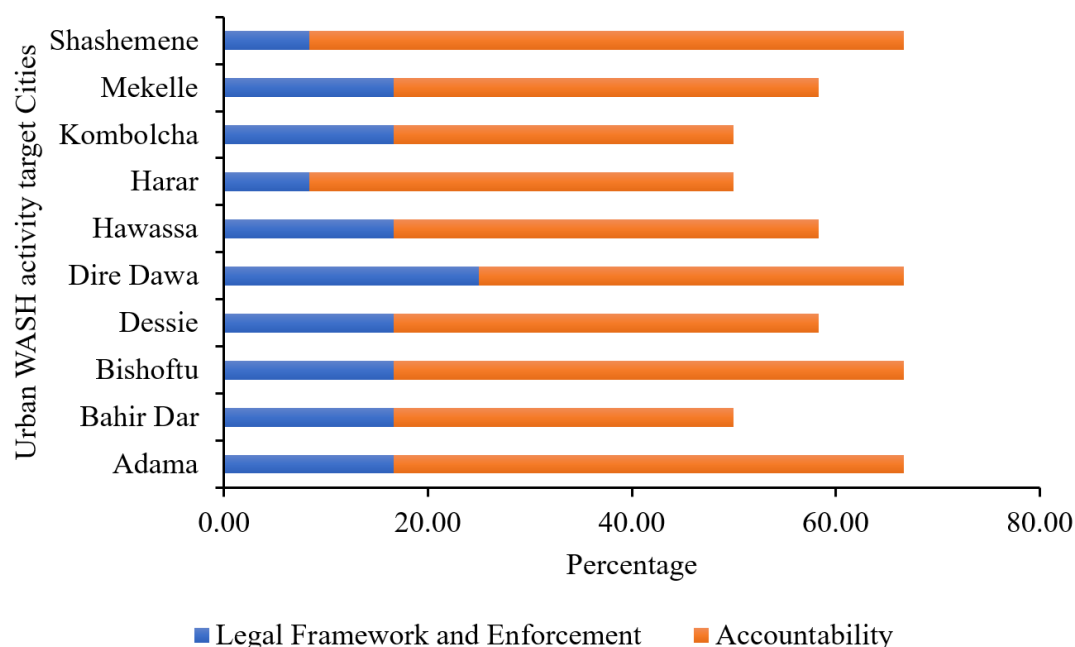


Figure 5 Results of the Regulation and Accountability Building Block.

3.8.2 Legal Framework and Enforcement

Ethiopia's urban WASH service delivery is governed by a legal framework that enforces sector rules, regulates service providers, and preserves service standards. At the city level, rules, service standards, and social norms are in place to guide both service providers and users in urban WASH activity-targeted cities. However, while these safeguards exist, enforcement is limited (Figure 5). Legal frameworks may protect disadvantaged groups' access to WASH services by acknowledging the right to water and sanitation and encouraging a rights-based approach to service delivery. Strengthening ongoing enforcement and resolving accountability gaps are critical for better service delivery [2, 35].

3.9 Accountability

Accountability mechanisms for urban WASH service delivery and authority in Ethiopia have been developed, but continuous execution remains an issue [34]. Almost all urban WASH activity-targeted cities have established well-organized and functional customer service complaint processes for inadequate service delivery, high tariffs, and environmental contamination. While public and private service providers are registered in all urban WASH activity-targeted cities except Kombolcha, they are not regularly monitored and do not report to the appropriate authorities. In all targeted WASH activity cities, the city-level Trade and Industry Office has registered service providers (only vacuum trucks for fecal sludge management), but they fail to submit regular reports and are not inspected by the water utility department.

In addition, WASH organizations have agreed on a framework to encourage mutual accountability in performance, transparency, and systems, although its regular effectiveness is limited. As a result, most cities' water utilities received a 2.5 out of 4 rating for accountability evaluation (Table 4). Improving service delivery requires strengthening monitoring, reporting, and implementing accountability systems. Exceptionally, Shashemene City (Figure 5) received 3.5 out of

4-point rating for accountability evaluation due to the presence of a developed MOU and agreement with service providers to keep an eye on the vacuum truck service providers based on their MOU and agreement, and they are required to provide frequent performance reports to the utility.

The results showed a vital distinction between having rules and enforcing them. Municipal WASH systems need not only suitable legal and regulatory frameworks but also institutions with adequate authority, technical capacity, evidence, and resources to monitor compliance and take remedial action.

3.9.1 Inclusive Planning

Inclusive Planning integrates participatory approaches to identify and prioritize the needs of diverse groups, including women, children, the elderly, and persons with disabilities. This building block addressed participation, inclusive planning, and resilience of cities in WASH service delivery and regulation (Figure 6).

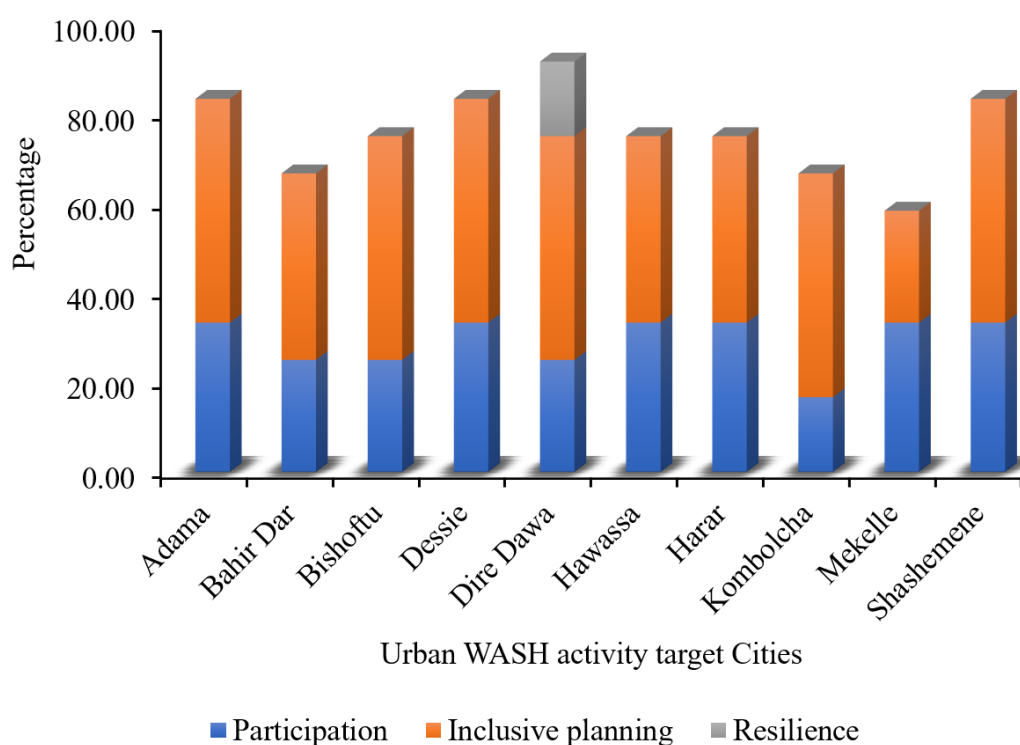


Figure 6 Status of Inclusive Planning in UWASH Secondary Cities.

3.9.2 Participation

The participation strategy stresses user engagement throughout the planning process and includes them in decision-making to ensure that infrastructure is in line with local preferences, affordability, and willingness to pay [28]. In most urban WASH activity-targeted cities (Figure 6), inclusive planning was the best approach, earning a full point (2) out of two for inclusive planning evaluation (Table 4). Users who stated a willingness or ability to pay, including women, individuals with disabilities, and the pro-poor, participated in surveys for WASH planning processes in all urban WASH activity-targeted cities [19].

3.9.3 Inclusive Urban WASH Planning

Inclusive urban WASH planning at the city level stresses comprehensive and equitable solutions for achieving and maintaining universal access to WASH services [32]. In all urban WASH-targeted cities, stakeholders have been involved in WASH service planning at the service authority level. In light of this (Figure 6), most of the cities received full marks (3 points) for inclusive planning criteria due to their best practices for an updated plan to achieve and maintain universal WASH services, as well as a revised plan and budget based on monitoring data and connections with local, national, and diverse user groups (Table 4).

3.9.4 Resilience

Resilience for all urban WASH activities in selected cities underlines the problems caused by a lack of risk reduction and resilience measures among service authorities and suppliers [4, 30]. In contrast, except for Dire Dawa, there is no evidence that WASH disaster risk reduction and resilience methods exist in any other target urban WASH activity cities (Table 4). Without this planning, urban WASH systems are subject to interruptions from climate change, natural disasters, and other shocks (Figure 6). This shows that although municipalities could carry out participatory planning and incorporate WASH into urban expansion procedures, resilience to shocks is rarely institutionalized.

3.9.5 Finance

Finance for Urban WASH services is crucial for guaranteeing long-term and equal access to WASH services. Adequate financing is necessary for infrastructure development, operation, repair, and recurring expenses. The finance building block analyzed in urban WASH activity targets cities based on budgeting and financing, revenue collection status, and available financing mechanisms, as illustrated in Figure 7.

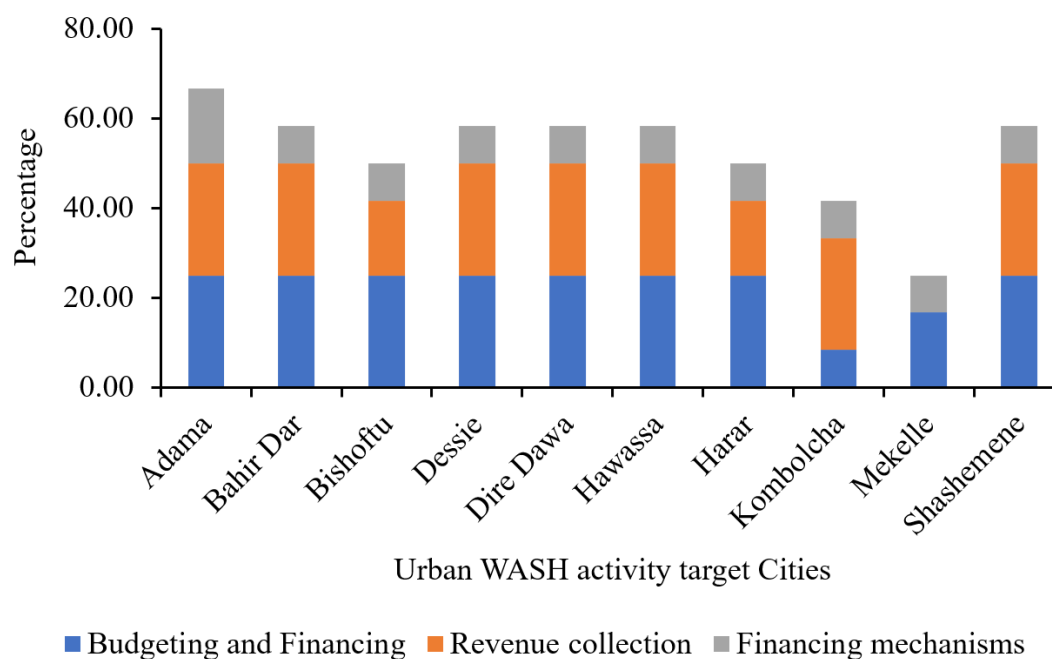


Figure 7 Status of Finance and Budgeting Building Blocks.

3.10 Budgeting and Financing

In all urban WASH activity-targeted cities, stakeholders are aware of and committed to their financial duties, and service authorities contribute funding for direct assistance and capital maintenance. However, important components of the sanitation service chain, such as continual sanitation monitoring, enforcement, behavior change campaigns, and targeted subsidies, are sometimes disregarded. Insufficient maintenance funding may reduce the quality and reliability of WASH services over time. Moreover, revenue generated from sanitation services is insufficient to cover the costs across the entire sanitation chain, undermining service sustainability (Table 6). Budgeting and financing recorded 1.5 in most cities, Kombolcha recorded only 0.5 and Mekelle 1.0 (Table 4). Addressing these challenges requires comprehensive budgeting, improved cost recovery mechanisms, and targeted financial strategies to ensure equitable and effective urban WASH services in all urban WASH-targeted activity cities in Ethiopia [36, 39].

Table 6 Main expenditure categories.

SN	Cities	Capital Expenditure (CapEx)	Operating and Minor Maintenance Expenditure (OpeEx)	Capital Maintenance Expenditure (CapManEx)	Expenditure on Direct Support (ExpDS)	Expenditure on Indirect Support (ExpIDS)	Cost of Capital (CoC)
1	Adama	Not available	249,961,984.81	Not available	52,583,044.99	Not available	Not available
2	Bahir Dar	86,921,426	106,063,080	10,263,632	53,492,912	18,831,181	8,692,143
3	Bishoftu	Not available	Not available	Not available	Not available	Not available	Not available
4	Dessie	5,235,138.96	20,714,239.45	1,491,425.57	27,615,536.31	3,076,685.29	Not available
5	Dire Dawa	881,933.87	43,786,338	25,346,731	40,870,073	17,009,309.86	7,695,097.08
6	Hawassa	168304078	44148392.62	2666749.62	Not available	6,663,503.76	Not available
7	Harar	Not available	52,768,895	Not available	Not available	Not available	Not available
8	Kombolcha	883,068.45	1,297,522.74	Not available	65,000.00	20,000.00	Not available
9	Mekelle	39751523	42261023	Not available	2460055	Not available	Not available
10	Shashemene	77,407,042.00	1,662,381	2,322,211.13	3,870,352.13	1,935,176.06	23,222,112.77

Note: The unit for currency for all cost mentioned in the table. No available mean of the data has not been provided by the municipality but Water bureau was taken into account.

3.10.1 Revenue Collection

All urban WASH activity-targeted cities have been striving to improve revenue collection mechanisms and develop equitable pricing structures to ensure the financial sustainability of WASH services. Tariffs in all targeted cities for Urban WASH activities are intended to cover full operation and maintenance (O&M) expenses, generate a reserve for capital maintenance and growth, and offer cross-subsidies to help disadvantaged households and the larger sanitation service chain [14, 37]. As a consequence, except Mekelle, most targeted cities achieved a revenue collection rate of more than 90%, indicating improved financial procedures and effective enforcement methods, such as nonpayment sanctions (Figure 7). However, financing for urban sanitation is insufficient and only supports basic services. Insufficient funding shows a low priority for sanitation development, as well as a lack of effective techniques or financial plans to achieve a turnaround. These initiatives received a performance rating of 1.5 out of 2 in the revenue collection evaluation (Table 4). The revenue collection rates are inadequate in Mekelle City because the conflict in the region reduced the utility's activity for collecting payments, which is a gap and obstacle to revenue collection [33]. The low financial record in Mekelle is most likely to pressure other aspects of the WASH system because inadequate financing could disturb maintenance, monitoring, staffing, infrastructure rehabilitation, and institutional capacity simultaneously.

3.10.2 Financing Mechanisms

All cities selected for urban WASH activities focus on developing affordable finance methods for service authorities and suppliers to support water and sanitation infrastructure development. Nowadays, all urban WASH activity-targeted cities continue to rely only on central government budget allocations, with FSM funding and other sources of assistance severely restricted [43, 44]. This limits other stakeholders (such as municipal governments) from carrying out their mandates, resulting in a lack of on-site sanitation support, insufficient sanitation monitoring, and limited institutional capacity [13].

In examining finance strategies, all targeted urban WASH activity cities received one out of two points (Table 4 and Figure 7). This demonstrates improvements in providing institutional funding, but it also reveals inadequacies in incorporating household affordability and inclusion into the financial structure. Continued efforts are required to improve funding mechanisms and promote equitable financial access for all stakeholders [5].

3.11 Monitoring

Monitoring WASH service delivery and authority in Ethiopia's urban regions is critical for maintaining accountability, efficiency, and service sustainability [31]. The monitoring building block includes data collection, analysis, and monitoring capacity components (Figure 8).

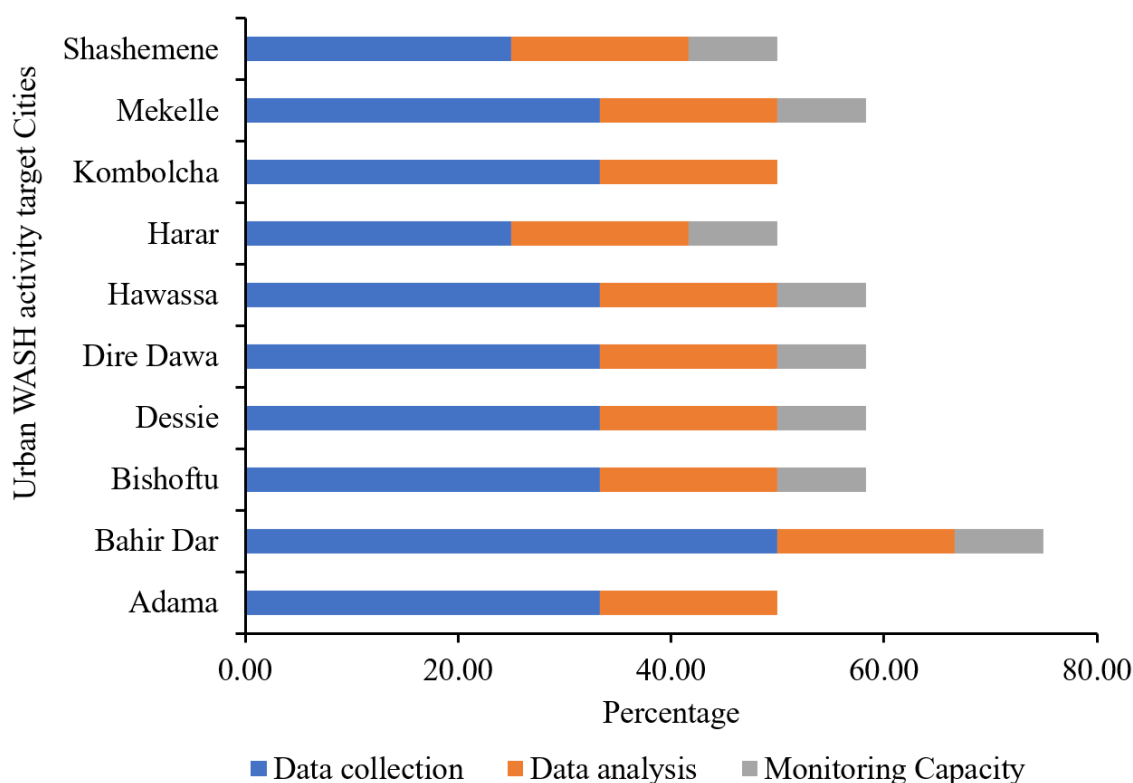


Figure 8 WASH Service Monitoring Building Block.

3.12 Data Collection

WASH data collection for service delivery and authority in Ethiopian urban areas highlights the presence of monitoring frameworks. While mechanisms exist to monitor the functional condition of all urban WASH activity-targeted cities, service levels, sanitary standards, and important behaviors, these systems are not operational, and the data obtained is not fed into national databases or used to drive remedial measures. An operational framework assures the quality of spare parts and infrastructure works; however, WASH stakeholders in all urban WASH-targeted cities lack consistent monitoring indicators and fail to exchange data with the service authority (Figure 8). Due to these limitations and problems, the majority of urban WASH-targeted cities obtained a score of two out of four during the data collection review (Table 4). This pattern indicates that the main problem is not the complete absence of data but rather the institutional capability to systematically collect, analyse, understand, and apply information for management decisions.

3.12.1 Data Analysis

In targeted cities, monitoring data is effectively analyzed, with lessons learned feeding directly into planning and budgeting processes at the service authority level. Best practices for evaluating data are consistently applied, ensuring monitoring insights drive improvements in service delivery and resource allocation. As a result, all cities received full points (1) for data analysis evaluation (Table 4 and Figure 8). The results propose an essential need to reinforce staff capacity, monitoring systems, data quality assurance, information management, and mechanisms connecting monitoring results with municipal decision-making. This systematic approach enhances accountability and

supports evidence-based planning, contributing to the sustainability and effectiveness of urban WASH services.

3.12.2 Monitoring Capacity

WASH monitoring capacity for service delivery and authority in all targeted cities for urban WASH activities indicates limited ability at the service authority level. While certain skills, standards, data management, and resources are available, gaps remain in ensuring complete and adequate monitoring. A restricted ability to monitor resulted in a monitoring capability score of around 0.5 out of 1 (Table 4 and Figure 8). Effective monitoring and evaluation of WASH initiatives are critical. Limited capacity impairs the ability to gather, evaluate, and systematically act on WASH data, limiting service delivery and planning [22].

3.12.3 Water Resources and the Environment

Water resources and environment in WASH service delivery and authority in all targeted cities for urban WASH activity stress the need for long-term water resource management and environmental conservation to provide urban WASH services. This building block covers the resource management and efficiency components, as well as the balancing of interest component (Figure 9).

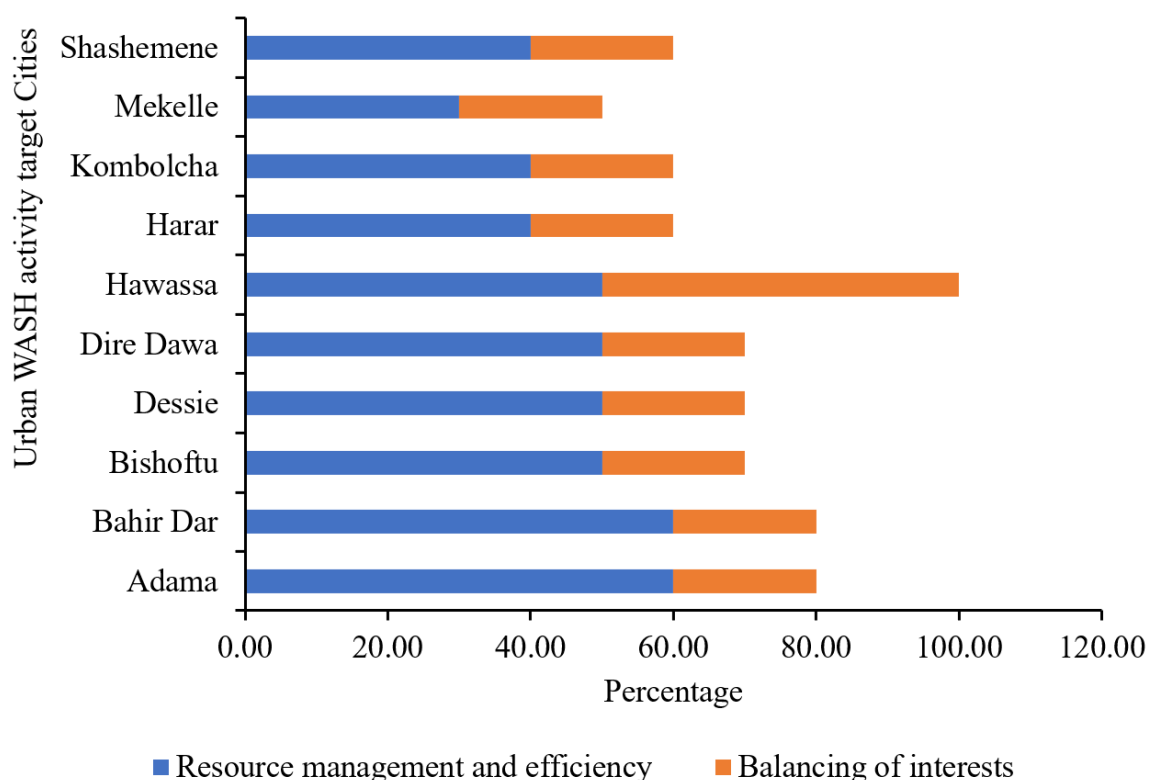


Figure 9 Water Resource and Environment Management Building Block.

3.13 Resource Management and Efficiency

WASH resource management and efficiency for service delivery and authority in all targeted cities for urban WASH activities highlight achievements and limitations in sustainable resource

usage. When expanding water and sanitation infrastructure, service providers and authorities take into account water availability and variability, as well as monitoring water quality, quantity, and yields before and after development in all urban WASH activity-targeted cities [1, 17]. However, monitoring fecal sludge management (FSM), waste, and sewage treatment effluents is restricted to the building period and does not include ongoing evaluations. All ten urban WASH activity cities have dumpsites, not landfills, and the majority are unfenced, enabling people and animals to roam freely across them.

The Mekelle and Kombolcha landfills have become dumps due to inadequate management and financing. There is no treatment for leachate, resulting in harmful flow from dump sites into neighboring rivers. All 10 cities have inefficient wastewater and sludge treatment. Kombolcha is distinguished by its superb infrastructure, which includes two waste stabilization ponds and sludge drying beds, as well as efficient operations. Mekelle's sludge drying beds are not well managed, resulting in low treatment efficiency. In most localities, the sludge discharge point is close to the solid waste dumpsite, causing significant pollution in the surrounding area.

There is little evidence of safe sludge reuse. While service providers have the expertise and capacity to protect water resources, they do not implement these measures. Cities fail to address resource recovery or hygiene problems. Due to the inadequacies and issues mentioned above, the cities' efficacy and resource management received a 2.5 out of four (Table 4 and Figure 9). The results show that water-resource management capacity differs across cities and can indicate changes in water accessibility, institutional capacity, urban growth, resource constraint, and local environmental situations.

3.13.1 Balancing of Interests

The balance of interests for service delivery and authority in urban WASH activity-targeted cities exemplifies a collaborative approach to water resource management and issue resolution. A functioning multi-stakeholder forum allows for frequent involvement from service providers and consumers, facilitating debate and consensus on water resource distribution and addressing service-related issues. This inclusive platform helps to balance opposing interests, assures openness, and promotes fair decision-making, resulting in more effective and sustainable urban WASH service delivery. As a result, the balance of interests received a perfect score of 1 (Table 4 and Figure 9).

3.13.2 Learning and Adaptation

Service authorities and providers use procedures to learn from past experiences, monitor outcomes, and change strategies to enhance WASH systems. Learning and adaptability are building components (Figure 10).

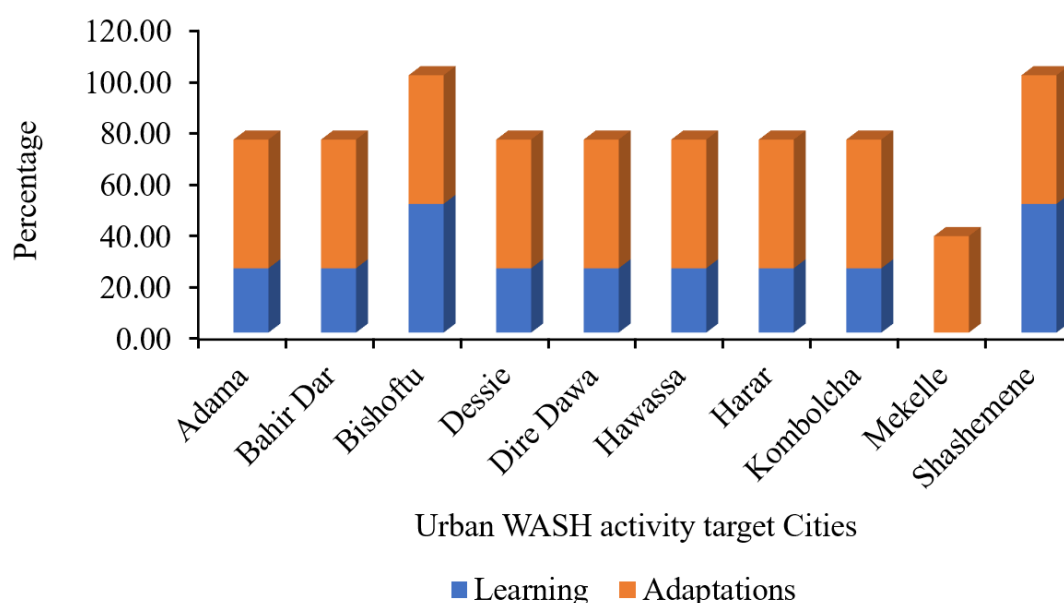


Figure 10 Learning and Adaptation Building Block.

3.13.3 Learning

WASH Learning for service delivery and authority emphasizes the provision of exchange channels that allow stakeholders to share their experiences, issues, and lessons freely. These platforms allow for a two-way knowledge flow between the national and district levels, which promotes cooperation and informed decision-making among water utilities of urban WASH activity-targeted cities through town forums. Except for Mekelle, others obtained just one out of two learning assessment points (Table 4). The three-year battle in Mekelle has stopped either side from learning or sharing knowledge. Mekelle City received a 0-point score on the learning evaluation due to these inadequacies, gaps, and challenges (Figure 10). This variance indicates that municipalities can respond to operational problems without scientifically institutionalizing the lessons produced from those practices. Furthermore, adaptation can happen reactively, though organizational learning remains weak. Sharing knowledge and best practices among practitioners, organizations, and communities may foster ongoing learning and innovation in water, sanitation, and hygiene service delivery.

3.13.4 Adaptation

The evaluation of adaptation is complete because the planning and monitoring components of the city learning activities result in the adaptation of strategies, plans, and actions that obtained one out of two marks (Table 4). The adaptation evaluation is a complete point because all learning activities are connected to planning and monitoring and result in adapting strategies, plans, and actions. Investing in capacity building and technical expertise may help stakeholders offer WASH services more effectively, generate sustainable solutions, and solve supply-side constraints (Figure 10). Bishoftu's highest act in this measurement can partially clarify its comparatively strong overall score. Conversely, Mekelle's poor learning score indicates incomplete institutional capacity to convert practice into sustained system development.

3.14 Demand, Behavior, and Political Will

There is a growing need for enhanced WASH services as communities become more aware of the necessity of water, sanitation, and hygiene. This building block includes demand, behavior, and social norms from service consumers, as well as demand and political will from service providers and authorities (Figure 11).

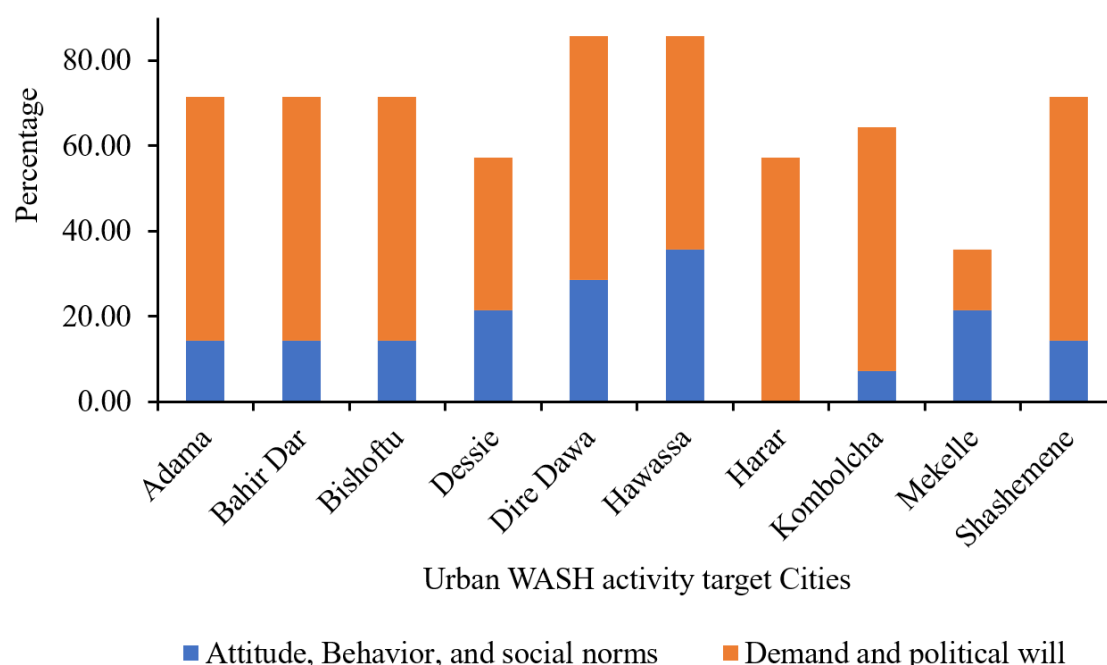


Figure 11 Status of Demand, Behavior, and Political Will in Urban WASH Secondary Cities.

3.14.1 Attitude, Behavior, and Social Norms

WASH attitudes, behaviors, and social norms in all targeted cities for urban WASH activity demonstrate a disconnect between evaluation and action in addressing WASH-related practices and behaviors. While aspects such as behavioral determinants, taboos, and cultural traits are evaluated, cities rarely use the results to guide planning. Behavior modification initiatives can benefit from social learning and peer influence by encouraging community members to share their good experiences with successful WASH practices. Consequently, most cities received a 1 out of 3 rating for attitude, conduct, and social norms evaluation (Table 4 and Figure 11).

Social norms governing hygiene and sanitation exist in all urban WASH activity-targeted cities, but they are deeply rooted and hard to alter. However, continuing behavior modification strategies are poorly incorporated into WASH programs, and service authorities, providers, and consumers frequently fail to follow these guidelines in all cities. Furthermore, there are no enforcement mechanisms or penalties for noncompliance, which limits the efficacy of initiatives to change WASH habits and practices.

3.14.2 Demand and Political Will

WASH demand and political will for service delivery and authority in urban WASH activity targeted cities demonstrate considerable user demand for enhanced water, sanitation, and hygiene

services, with many prepared to pay for such services and related items such as handwashing soap. This need is reinforced by strong political will at all levels, with political leaders actively promoting and assisting advances in the WASH sector. This dedication is reflected in the service authority's plans and budget allocations, prioritizing first-time access to WASH services and preserving service quality in all targeted cities for urban WASH activity. Political leaders also have enough authority to drive and sustain these initiatives, which are entrenched in national and municipal agendas, assuring continuous improvements in service delivery for all urban people. In light of this, all urban WASH activity-targeted cities scored full points (4) for WASH demand and political will evaluation (Table 4 and Figure 11).

3.15 Building Block Analysis Results

Table 4 demonstrates that institutional organization and coordination rates ranged from 7.2% in Kombolcha to 15.3% in Bishoftu City. These findings revealed that the targeted cities for urban WASH activity earned a moderate/good value rating for institutional setups and coordination assessments. However, significant limitations were observed in coordination, institutional competency, and service provider positioning in all targeted urban WASH activity cities. The service delivery infrastructure score ranged from 8.37% (Adama City) to 5.58% (Harar City) out of 13%, resulting in a moderate/good evaluation value for all urban WASH-targeted cities except Harar City (Figure 12). The degree of regulation and accountability in urban WASH activity-targeted cities was assessed to be moderate/good, with evaluation criteria ranging from 5.49% (Bahir Dar, Kombolcha and Harar) to 7.32% (Aadma, Bishoftu and Shashemene) out of 11% (Table 4 and Figure 12). At all city levels, private sector enablement is ranked average in the water sector but consistently low in the sanitation sector.

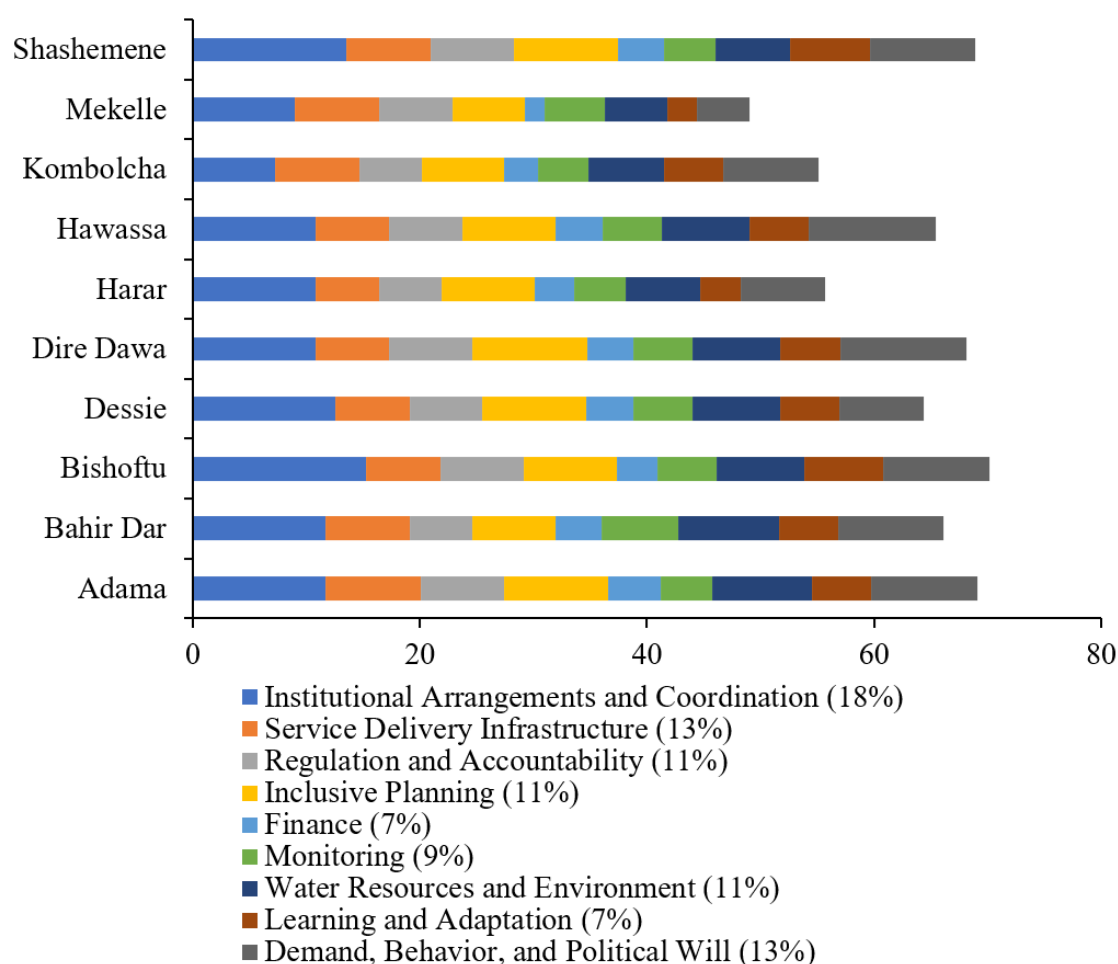


Figure 12 WASH Context Based on Building Block Analysis.

The total assessment results for inclusive planning in the targeted urban WASH activity cities ranged from 10.07% (Dire Dawa) to 6.41% (Mekelle) out of 11%, indicating moderate or good evaluation. The funding building block in selected urban WASH activity cities is regarded inadequate because of a mismatch between demand and expenditure on CapEx, CapManEx, and direct support (Table 4). It varied between 1.76% and 4.68% out of 7%. The monitoring assessment score varied from 4.5% to 6.75% out of 9%, suggesting a moderate rather than poor evaluation (Table 4). In this regard, all urban WASH-targeted cities have created best practices for frequent monitoring processes to collect data on the proper functioning of the water supply system (at the sources and pumping stations) and on infrastructure and spare-part quality.

Overall, water resource management in targeted urban WASH activity cities varied from 5.50% to 8.80% out of 11% (Table 4). The obtained data suggested that overall water resource management in selected urban WASH activity cities is deemed modest. The status of cities in this building block varies greatly. The learning and adaptation values ranged from 2.63% to 7% out of 7%, indicating modest performance. The demand, conduct, and political will scores varied from 4.65% to 11.16% out of 13% (Figure 12). This classed the overall results as modest. Mekelle had the lowest score, while Dire Dawa and Hawassa had the highest, with identical scores. The score variances can be attributed to the fact that WASH-related practices, behaviors, behavioral factors, taboos, and cultural features are not analyzed; hence, findings are not used to inform and modify techniques and tactics for behavior change.

3.15.1 Stakeholders' Analysis

The stakeholders' analysis for city-level WASH activities in selected cities for urban WASH activities focuses on key players participating in both WASH service authority (governance, policy, and regulation) and service delivery [24]. Service authorities and service providers are the key entities responsible for providing water supply, sanitation, and hygiene services and programs at the city level. Table 7 outlines the different stakeholders at the city level, their role in WASH service provision, their areas of influence in the sector, and their specific interest in sector strengthening.

Table 7 Role, Power, and Interest of WASH stakeholders in secondary cities.

Stakeholder	Role in WASH Service Provision	Power: How much influence is related to Systems Strengthening?	Interest: How interested in Urban WASH?
Health Office	Water quality monitoring Regulate WASH infrastructures/facilities	Highly influential in health, sanitation, and hygiene promotion	Capacity building on system development and skill enhancement
Environment, Forestry and Climate Change	Enforcing regulations about sanitation and waste management	Highly influential in environmental protection and promotion	Capacity building on system development and skill enhancement
Municipality/Mayor's office	Provision of services for solid and liquid waste collection and disposal, public latrine construction and management, and managing green areas	Can both facilitate and impede changes in WASH governance and budgeting through its legislative and political power?	Acquiring new technologies in WASH (both water supply and sanitation)
City Trade and Industry	License registration	Highly powerful	High interest in regulating trade licensing, tax issues, and revenue
Education Office	Control and regulation of WASH infrastructure construction in schools based on design standards	Influence safe WASH promotion in schools through its school clubs	Capacity building of school clubs
Women and Children Office	Rights to equal and equitable use of WASH facilities for women and children	Highly influential in equitability of use, sanitation, and hygiene promotion	Capacity building on system development and skill enhancement
Job and skills development/technical and vocational education and training	Training and organization of small and micro-enterprises (SME)	Highly influential in SME development	Capacity building and funding for SME development
Land Administration and Urban Development	Land preparation for WASH infrastructure construction	Highly powerful	Highly interested in land allocation, master planning

Water Supply and Sewerage Service utility	Deliver water supply and provide sewerage services	Highly powerful in facilitating changes in the water supply system	Acquiring new technologies in water supply O&M systems for the utility
Culture and Tourism Office	Regulates licenses for food and drinking establishments together with the health office	Some power/influence	Interested in quality service
Construction Office	Permission, regulation, and control of WASH facilities for buildings	Highly influential in urban infrastructure planning, including drainage systems and sanitation facilities design	Capacity building in urban planning and sanitation technology
Finance Office	Control and management of budgets allocated for WASH by government organizations and NGOs	Plays a key role and influence in budget allocations	Capacity building in finance mobilization techniques
SMEs managing public toilets	Sanitation facility management (public toilet)	Critical in enhancing efficiency and quality of services and facility maintenance	Priority interest is acquiring viable and profitable business loans and skills
Vacuum truck owners/operators	Fecal sludge transport and disposal	Critical in enhancing efficiency and quality of emptying services	Priority interest is acquiring viable and profitable business loans and skills
Fecal sludge disposal site operators	Management of disposal site including control and regulated volume of FS disposed (charge 60 birr/truck)	Critical in enhancing the efficiency and reliability of services	Priority interest is acquiring viable and profitable business loans and skills
Water vendors	Selling potable water	Critical in enhancing efficiency and quality of services and goods	Priority interest is acquiring viable and profitable business loans and skills
Water supply and sanitation contractors	Construction of WASH infrastructure and pipe layout alignment	Critical in enhancing efficiency and quality of services and goods	Priority interest is acquiring viable and profitable business loans and skills

Chemical suppliers	Supply of chemicals for water treatment	Can influence WASH sector by setting market norms and providing reliable supply chain	Business skills development
Spare parts suppliers	Supplying various spare parts for WASH facilities during construction, operation, and maintenance	Can influence the WASH sector by setting market norms and providing a reliable supply chain	Business skills development
Workshop and garage, including SME	Maintenance for cars, various electromechanical components	Enhancing efficiency of services and goods	Priority interest is acquiring viable and profitable business loans and skills
Laboratory equipment suppliers	Selling various water quality laboratory kits and equipment	Critical in enhancing efficiency and quality of services and goods	Priority interest is acquiring viable and profitable business loans and skills
NGOs, donors, UN agencies and development partners'	Develop public and communal latrines as well as public showers on a project basis	Critical providers of funds and technologies	Their priority interest is reaching the poor
Community service delivery approach	Community initiates and develops, with help of development actors, communal sanitation facilities including toilets and showers.	They are critical players in community mobilization at local levels	Rehabilitation and new development of public sanitation facilities in their locality
Town Electric Utility Branch Office	Providing electric power to the town water supply	Influential in terms of electric power supply to the system	none

At the city level, significant players include municipal governments, water utilities, the Educational and Health Bureau, the Environmental Protection Office, Women and Social Affairs, the Labor and Skills Office, and regulatory agencies such as the four primary WASH ministries (MoWE, MoH, MoE, and MoFED). These organizations are responsible for developing policies, allocating resources, planning, and monitoring WASH services to ensure their long-term viability and equity. Correspondingly, the city's water supply and sewage service utilities deliver water and sewerage across the city. The municipality of all urban WASH activity-targeted cities is in charge of fecal sludge management. Service delivery stakeholders include water utilities, commercial operators, non-governmental organizations (NGOs), and community-based groups. Their responsibilities vary from water supply and waste management to executing sanitation and hygiene initiatives.

However, there is no sewage system in all targeted urban WASH activity cities, so it can only oversee the water supply service. Only wastewater collection and treatment systems have been implemented at Hawassa Industrial Park, Ayder Referral Hospital in Mekelle, Adama, Bahir Dar, and Dire Dawa City Universities. Except for Kombolcha, most urban WASH-active cities have operating faecal sludge vacuum vehicles, although the majority of them are malfunctioning. Health Extension Workers (HEWs) are the primary actors who advise households on optimal WASH practices. Private companies offer faecal sludge emptying services in all urban WASH-targeted cities. Several international agencies, non-governmental organizations (NGOs), and regional governments finance the WASH industry.

The stakeholder examination identifies issues such as overlapping mandates, coordination gaps, inadequate technical and financial resources, and insufficient community participation. Recommendations focus on strengthening institutional frameworks, increasing stakeholder participation, building capacity, and encouraging accountability mechanisms to enhance WASH results in urban WASH activity-targeted cities.

3.15.2 Stakeholders' Mapping

The stakeholder mapping for urban WASH activities in cities in Ethiopia identifies and categorizes key players involved in WASH service authority and service delivery. The mapping outlines their roles, levels of influence, and interactions, providing a comprehensive view of the WASH landscape. Table 8 details this further. Ethiopia's WASH sector has achieved significant progress in building the essential institutional arrangements, policies, and strategic frameworks mirrored in the federal administrative structures. The four major WASH ministries (MoWE, MoH, MoE, and MoFED) have regional, zonal, and city-level counterparts. The MoWE is in charge of federal water policy, coordination, and monitoring, whereas the MoH is in charge of monitoring water quality, promoting sanitation and hygiene, and implementing community-led methods. MoFED plays a vital role in the WASH sector by overseeing the bilateral finances and budgets of the other line ministries. The MoE also has relevant WASH duties. The stakeholder mapping highlights critical interdependencies, coordination gaps, and opportunities for collaboration.

Table 8 Formal roles and current practices of WASH stakeholders in Ethiopian secondary cities.

Stakeholders	Assigned/Formal Role	Current Practice	Key Challenge
Health Office	Regulate WASH infrastructures/facilities and monitor water quality	Health and hygiene promotion Water quality regulatory system	Poor follow-up and enforcement
Environment, Forestry and Climate Change	Enforcing regulations about sanitation and waste management	Focus primarily on industrial waste and large institutions	Limited capacity and resources
Municipality	Public services provision, including WASH	Solid and liquid waste collection and disposal Public toilets	Funding limitations Absence of expertise for WASH services
Mayor's office	Public services provision of solid and liquid waste collection and disposal Public latrine construction Management of green areas	Both facilitates and impedes WASH governance and budgeting through its legislative and political power.	High turnover of appointed personnel for the mayor
City Trade and Industry	License registration	Provides registration license only for vacuum trucks	No expertise to evaluate WASH service
Education	Control and regulation of WASH infrastructure construction in schools based on design standards	Create community awareness for WASH and hygiene promotion	No budget; limited skills and staff
Women and children	Rights to equal and equitable WASH facilities for women and children	Supervision of WASH facilities during construction with respect to women's and children's benefits	Lack of financial resources and logistics
Job and skills development/Technical and Vocational Education and Training	Training and organization of SMEs	SME business skills development Skills development for individual WASH facilitation	Lack of training and financial support for micro-enterprises. Lack of sufficient job opportunities in the WASH sector

Land administration and urban development	Land preparation for WASH infrastructure construction	Selection of suitable land for WASH scheme development	Capacity constraints
Water supply and sewerage service enterprise/utility	Deliver water supply and sewerage services	Provide and manage water supply and sanitation system	Weak oversight and regulation of private sector service providers Inadequate local government funding Capacity constraints
Culture and Tourism Office	Regulate licenses for food and drinking establishments together with the health office.	Regulate licenses for food and drinking establishments together with the health office.	Capacity constraints
Construction office	Permission, regulation, and control of all facilities	Permission, regulation, and control of all facilities	Capacity constraints
Finance	Control and management of budgets allocated for WASH by government organizations and NGOs	Management of funds from donors and development partners	Mandate overlaps Capacity gaps
SMEs managing public toilets	Sanitation facility (public toilet) management	Sanitation facility (public toilet) management and additional small businesses (i.e., coffee, fast food)	No support for promoting private sector engagement in urban waste management Lack of training and skills to manage fecal sludge
Vacuum truck owners	FS transport and disposal	FS transport and disposal	Absence of clear policies and strategies for involving private partners Unsure that the business is profitable
Fecal sludge disposal site operators	Disposal site management	None in most places	Capacity constraints No regulation

	Control and regulate the volume of FS disposed of at the site by truck (charge 60 birr/truck)		Lack of accountability mechanism
Water vendors	None	Selling of potable water	Capacity constraints No water quality regulation
Water supply and sanitation contractors	Construction of WASH infrastructure and pipe layout alignment	Construction of different infrastructure	Absence of clear policies and strategies for involving private partners Issues of business profitability Capacity constraints
Chemical suppliers	Supply water treatment chemicals	Supply water treatment chemicals	Supply chain issues (cost, timing, delivery, availability)
Spare parts suppliers	Supply various spare parts for WASH facilities for construction, O&M	Supplying spare parts for WASH facilities for construction, O&M	Supply chain issues (cost, timing, delivery, availability)
Workshop and garage, including SME	Maintenance for car, various electromechanical components	Maintenance for car, various electromechanical components	Lack of skills for maintenance of FS vacuum truck, water pumps, and other equipment
Laboratory equipment suppliers	Selling various water quality laboratory kits and equipment	Equipment sales	Supply chain issues (cost, timing, delivery, availability)
NGOs, donors, UN agencies and development partners	Develop public and communal latrines as well as public showers on a project basis	Develop public and communal latrines as well as public showers on a project basis	Lack of coordination, poor accountability
Community service delivery providers	Community initiates and develops communal sanitation facilities, including toilets and showers	Mobilize the community Manage and maintain facilities	Capacity constraints
Town Electric Utility Branch Office	Providing electric power to town water supply	Providing electric power to town water supply	Capacity constraints Power reliability

3.15.3 Stakeholders' Matrix

The stakeholders' matrix is a valuable tool for understanding service authority dynamics and delivery dynamics for Ethiopian city-level urban WASH initiatives. It organizes stakeholders by responsibilities, influence, interests, and relationships to improve understanding and coordination. The matrix categorizes stakeholders based on their level of influence (high or low) and interest in WASH initiatives, allowing for more tailored engagement methods. It emphasizes the need to work with high-influence and high-interest stakeholders while engaging low-influence actors to build capacity and encourage inclusion in attaining WASH goals.

Service authority stakeholders include governance, regulation, strategic planning, and ensuring that WASH rules and standards are followed. However, coordination issues and capacity constraints at various levels of government frequently undermine their efficacy.

Service delivery stakeholders are frequently in charge of providing water supply, sanitation, and hygiene programs in collaboration with governmental authorities. Water utilities and donors frequently have substantial resources and technical competence, but their goals may not necessarily coincide with local needs. Community-based groups, while very engaged in local WASH results, frequently lack influence and funding. Empowering these groups via collaboration and capacity-building efforts can improve local service delivery.

The matrix also identifies weaknesses in stakeholder cooperation, notably between service authorities and service delivery agents. Addressing these gaps through stakeholder forums, shared responsibility frameworks, and inclusive planning procedures will help to provide sustainable and equitable WASH services in Ethiopia's cities.

3.16 Study Limitations and Future Research

This study provides an all-inclusive comparative analysis of urban WASH systems in Ethiopian secondary cities. However, the study has several limitations that need to be acknowledged when interpreting the results. In general, the study was carried out in the ten secondary cities for USAID urban WASH activity. These municipalities were purposively selected. It is mostly due to of their strategic position to the countrywide Urban WASH Activity. It cannot be assessed nor can be established as a statistically illustrative sample for the entire Ethiopian cities, but definitely reflect the consensus as a whole.

In fact, Ethiopia includes municipalities that vary significantly in geographic location, socioeconomic growth, population size, investment history, institutional capacity, and governance structures. The output of this study could be understood as illustrative of the selected study cities rather than comprehensive for all urban areas in Ethiopia. The finding of this study can deliver valued insights into the strengths and weaknesses of urban WASH systems in secondary cities because the nominated municipalities designated varied range of administrative, geographic, and socioeconomic situations.

Furthermore, the assessment approach relied mainly on document review, key informant interviews, stakeholder mapping and consultation, field surveys, and expert judgment to analyse the nine modified WASH Building Blocks systems. The obtained multiple information sources of evidence were triangulated to standardized scoring criteria.

Besides, much documentary evidence was partial or incomplete and varied in quality among municipalities, and respondents may have varied information, knowledge, or institutional

viewpoints. These issues can introduce bias, reporting subjectivity, or information bias into each indicator score. To moderate these limits, the analysis integrated multiple data sources, applied predefined scoring criteria, and validated results using discussions between the assessment team and local stakeholders. However, some uncertainty remains and could be taken into account when interpreting the outcomes.

In spite of these drawbacks, the study provides one of the first inclusive applications of a systems-based WASH assessment framework among several Ethiopian secondary cities. By compiling contextual assessment with institutional performance analysis, this study offers a significant baseline for investment prioritization, municipal planning, and policy development. The results also reveal the value of systems-thinking methods for recognizing institutional bottlenecks that could not be noticed through traditional infrastructure-based assessments alone.

Based on the study's key findings, the following recommendations were drawn. The future research shall enlarge the assessment to wider range of Ethiopian municipalities consisting of metropolitan cities and emerging towns, to enhance national representativeness. Furthermore, combining systems-based analysis with quantitative provision performance indicators-namely non-revenue water, sanitation coverage, fecal sludge treatment performance, and financial sustainability- would provide a more complete understanding of urban WASH system performance and resilience.

4. Conclusion and Recommendations

This study used the modified WASH System Building Blocks Framework for comparatively assessing the urban WASH enabling environment across ten Ethiopian secondary cities. The assessment results showed that city performance is controlled not by any single building block but by the collaboration of numerous factors such as institutional, financial, technical, and governance components that collectively influence the sustainability of urban WASH facilities.

Bishoftu, among the assessed municipalities, achieved the maximum overall score. This highest performance shows comparatively well-established institutional coordination mechanisms, effective collaboration between various stakeholders, monitoring systems, and strong financial management. In contrast, Mekelle achieved the lowest overall score. The relative lowest overall performance does not necessarily show poor institutional commitment rather indicate the cumulative impacts of prolonged conflict, economic distraction, institutional uncertainty practiced in the northern Ethiopian.

The most vital policy suggestion is thus that Ethiopian secondary cities would not be preserved as having only WASH challenge or demanding a uniform interference package. In its place, municipal WASH programmes would recognize the definite system bottlenecks of separately city and prioritise involvements accordingly. Thus, the study concluded that the practical value of systems-thinking methods for diagnosing governance bottlenecks and controlling policy decisions in quickly urbanising cities, both in Ethiopia and in other low- and middle-income countries facing similar WASH challenges.

Author Contributions

Tamru Tesseme Aragaw conducted field data collection, as well as data analysis and paper writing and editing. Writing the first draft, doing data analysis, and designing the content were

conceptualized by Kidest Tadesse, Yoseph Kebede, and Rahel Kaba. The study, validation, manuscript review, and editing were overseen by Tarun Kumar Lohani. The final manuscript has been reviewed and approved by all authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability Statement

Data will be made available on request.

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