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Water Integrity Research

Strengthening Integrity in Water and Sanitation

Evidence from Two Informal Settlements in Khulna City, Bangladesh

Bangladesh Water Partnership

WIN Water Integrity Network

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Working paper

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STRENGTHENING INTEGRITY IN WATER AND SANITATION

Evidence from Two Informal Settlements in Khulna City, Bangladesh

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Bangladesh Water Partnership

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The Water Integrity Network (WIN) advocates for integrity in the water and sanitation sectors to reduce corruption risks and improve services, for the benefit of all. Access to safe water and sanitation are fundamental human rights. Our goal is to contribute to the realisation of these rights, as well as ensure the sustainable use of water resources in the face of the climate crisis.

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ABSTRACT

Access to safe water, sanitation, and hygiene (WASH) services in low-income and informal settlements in Bangladesh is constrained by governance weaknesses, lack of accountability, fragmented mandates, and uneven institutional responsiveness. This paper examines integrity-related barriers to WASH service delivery in Montu Kaloni and Nurani Mahalla in Khulna, both in the service jurisdiction of the Khulna Water Supply and Sewerage Authority (KWASA). Applying the Transparency, Accountability, Participation, and Anti-Corruption (TAPA) framework developed by the Water Integrity Network (WIN), the study adopts a mixed-methods design combining field observations, focus group discussions, key informant interviews, and structured household surveys (n = 40 per settlement). Integrity issues were assessed using a five-point Likert scale (Very low–Very high), standardized to a 1–10 scale, and subsequently aggregated through the Analytic Hierarchy Process (AHP) to derive weighted integrity deficiency scores and rankings.

AHP prioritization assigns the highest normative weight to transparency (46.6%), followed by accountability (27.7%), participation (16.1%), and anti-corruption (9.6%), reflecting stakeholders' perception of governance importance. Transparency is seen by communities as being critical for integrity in service provision, while anti-corruption actions are given the lowest rating largely because they are seen as intransigent issues that are hard to address. Aggregated deficiency results reveal a contrasting empirical pattern in informal settlements.

Across the study area, accountability-related deficiencies account for 69% of total integrity deficiency, compared to 22% under transparency, 7% under participation, and 2% under anti-corruption. Overall integrity deficiency is 2.32 times higher in Montu Kaloni than in Nurani Mahalla; specifically, Montu Kaloni records 1.99, 2.44 and 1.80 times higher deficiencies under transparency, accountability, and participation respectively, while anti-corruption-related deficiency (2%) is observed only in Montu Kaloni and is absent in Nurani Mahalla. Transparency deficiencies constitute 21% of total integrity gaps in Montu Kaloni and 24% in Nurani Mahalla, while participation deficiencies represent 7% and 9% respectively.

Issue-level AHP and Likert-based ranking clarifies the drivers of integrity deficiency. The highest-ranked issue—indiscriminate use of submersible groundwater systems—reflects weak regulatory enforcement, inadequate service coverage, and ineffective oversight of groundwater abstraction and water quality management. Political mediation required for new connections in disputed settlements ranks second, revealing dependence on informal power structures and the absence of clearly operationalized legal mandates for service provision in contested land areas. Lack of knowledge regarding grievance submission procedures and limited awareness of formal application processes indicate failures in public communication on services and institutional responsibility for ensuring that communities understand their rights and entitlements.

Collectively, these findings demonstrate that while transparency carries the highest theoretical weight, structural accountability failures—stemming from unclear mandates, land tenure constraints, weak enforcement, limited grievance redress, and fragmented institutional coordination—dominate in practice. Participation gaps reflect restricted community engagement, donor-driven planning processes, and limited awareness of civic rights, while anti-corruption concerns remain comparatively limited but embedded within broader governance weaknesses.

By presenting TAPA weightage alongside aggregated integrity deficiency and ranked issue-level evidence, the study demonstrates a clear divergence between normative governance prioritization and empirical integrity breakdown in informal settlements. Strengthening WASH governance therefore requires integrated improvements across all TAPA dimensions, with particular emphasis on institutionalized accountability, improved transparency of service standards and tariffs, inclusive participation mechanisms, and enforceable anti-corruption safeguards to achieve equitable urban service delivery.

Keywords: WASH governance, integrity assessment, TAPA framework, informal settlements, AHP, Khulna, Bangladesh.

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ACRONYMS

ADB	Asian Development Bank
AHP	Analytic Hierarchy Process
BDT	Bangladeshi Taka (currency)
CBO	Community-Based Organization
CR	Consistency Ratio (in AHP)
DSK	Dushtha Shasthya Kendra (NGO)
FGD	Focus Group Discussion
JICA	Japan International Cooperation Agency
JJS	Jagrata Juba Shangha (NGO)
KCC	Khulna City Corporation
KDA	Khulna Development Authority
KII	Key Informant Interview
KWASA	Khulna Water Supply and Sewerage Authority
LIC	Low-Income Community
Mn++	Manganese (chemical contaminant in water)
NGO	Non-Governmental Organization
SDG	Sustainable Development Goal (UN)
TAPA	Transparency, Accountability, Participation, Anti-Corruption (framework)
TIB	Transparency International Bangladesh
WASH	Water, Sanitation, and Hygiene
WIN	Water Integrity Network
WUA	Water User Association

1 INTRODUCTION

1.1 Water and Sanitation in Khulna's Low-Income Communities

Khulna City, one of Bangladesh's major urban centres, faces significant challenges in ensuring adequate water and sanitation services, particularly for its low-income communities (LICs). In this study, LICs refer to densely populated low-income urban neighbourhoods characterized by insecure tenure, limited infrastructure, and partial or informal service access; while many LICs overlap with informal settlements, not all LICs are entirely unrecognized in planning frameworks. Khulna hosts more than 180 identified low-income settlements, accommodating an estimated 30–35% of the city's population, making service provision in these areas a major urban governance concern (Hasan Ali et al., 2025; Naz et al., 2025). Despite efforts by the Khulna Water Supply and Sewerage Authority (KWASA) to improve these services, significant gaps remain.

Khulna is the third-largest city in Bangladesh after Dhaka and Chattogram. Located in the southwest coastal belt it faces distinct hydro-climatic challenges including saline intrusion, tidal flooding, groundwater depletion, and seasonal scarcity, which compound WASH vulnerabilities in LICs. As of 2023, only 65% of all households had access to safe drinking water, and 55% to improved sanitation facilities, leaving many poor households without services (Brousmiche et al., 2023). Here, "without services" refers to lack of reliable, formal, household-level connections. Many households rely instead on shared standposts, shallow or deep tube wells, or private/self-supplied sources, often with variable water quality and reliability.

40% of households in Khulna's LICs rely on shared water points that are often prone to contamination due to inadequate maintenance and management (Naz et al., 2025). These shared water points may be provided by KWASA through public standposts, installed by NGOs, or developed through community self-supply arrangements, depending on land tenure status and infrastructure feasibility. These shared and often unsafe water sources, coupled with inadequate sanitation, perpetuate the marginalization of LICs and place the health and safety of LIC residents at risk (Abanyie et al., 2025). LIC populations are typically more economically vulnerable, spatially congested, and socially marginalized than planned residential areas, with higher mobility and weaker institutional recognition, which complicates sustained community organization and formal engagement mechanisms. Service gaps reinforce cycles of poverty and vulnerability within LICs (Alam & Sheoti, 2024).

The challenges for LICs to access essential services stem from a systemic failure to integrate them into the city's urban planning and formal WASH service delivery programs and systems. Bangladesh does not have a dedicated national legal framework explicitly guaranteeing formal tenure or service rights for informal settlements, although policy instruments emphasize pro-poor service expansion; this creates ambiguity in implementation at the utility level. Work by the Bangladesh Water Integrity Network (BAWIN), the Water Integrity Network (WIN), and Transparency International also highlights integrity failures and corruption as contributing to inadequate services. Such integrity failures and corruption take place within a context of lack of transparency, weak accountability, and inadequate participation by communities. In several LICs, community-based organizations (CBOs) exist—often

supported by NGOs such as NGO Forum and WAVE—but their influence on formal utility decision-making remains limited.

A study of integrity and corruption in urban water in Bangladesh highlights that many public utilities in Bangladesh, including KWASA, struggle with transparency in their operations Hasan Ali et al., 2025). This lack of transparency not only results in inefficiencies in resource allocation but also creates opportunities for including the misappropriation of funds meant for infrastructure development. It is important to distinguish between informal or unauthorized connections arising from survival strategies and corruption involving abuse of official authority. Corruption occurs where discretionary power is exploited for private gain, such as through bribery or preferential allocation. The study also shows that in many cases, residents of LICs are not included in decision-making processes or provided with opportunities to voice their concerns regarding water and sanitation services. This means that there is little incentive to improve, address concerns, or verify that services meet the specific needs of communities. The study calls for the implementation of anti-corruption mechanisms and the promotion of Transparency, Accountability, Participation and Anti-Corruption (TAPA) in water management.

Increasingly both local government and civil society are aware of integrity and governance issues and practices. KWASA undertook an internal integrity assessment in partnership with Water Integrity Network (WIN) and NGO Forum and is working to address the integrity risks areas that were identified. That assessment highlighted gaps in transparency (limited public disclosure of service standards and tariffs), accountability (weak grievance redress and enforcement against illegal extraction), and participation (limited inclusion of LIC voices in planning processes), which directly inform the analytical focus of this study. CSOs such as WAVE have conducted studies and held public hearings to hold KWASA to account. Members of the Bangladesh Water Integrity Network (BAWIN) actively engage with related issues.

1.2 Research Aims

This study aims to

- Explore the experiences of LICs in accessing water and sanitation services. It seeks to understand community perceptions of Transparency, Accountability and Participation.
- Consider how community empowerment and integrity tools—such as the Transparency, Accountability, Participation, and Anti-corruption (TAPA) framework developed by the Water Integrity Network (WIN)—can be applied to improve WASH governance in LICs.
- Establish a basis for identifying strategies to strengthen governance in the delivery of WASH services in Khulna's LICs, ensuring that these communities have access to reliable water and sanitation systems that meet their needs. A key point that emerges is the important role of LICs in holding institutions such as KWASA accountable and the need to empower them to do so.

1.3 Case Study Profiles

In order to develop an understanding of these dynamics at the local level, developments in two LICs were examined: Montu Kaloni (Ward No. 21), and Nurani Mahalla, Moilapota, Sonadanga (Ward No. 17) in Khulna as indicated in Figure 1. The areas were selected because they face challenges accessing water and sanitation, they are relatively small and of a similar size, and the researcher could gain access to households who would be willing to speak openly about issues being experienced. These areas were identified with the support of Nabalok, a CSO working with groups of informal settlement residents.

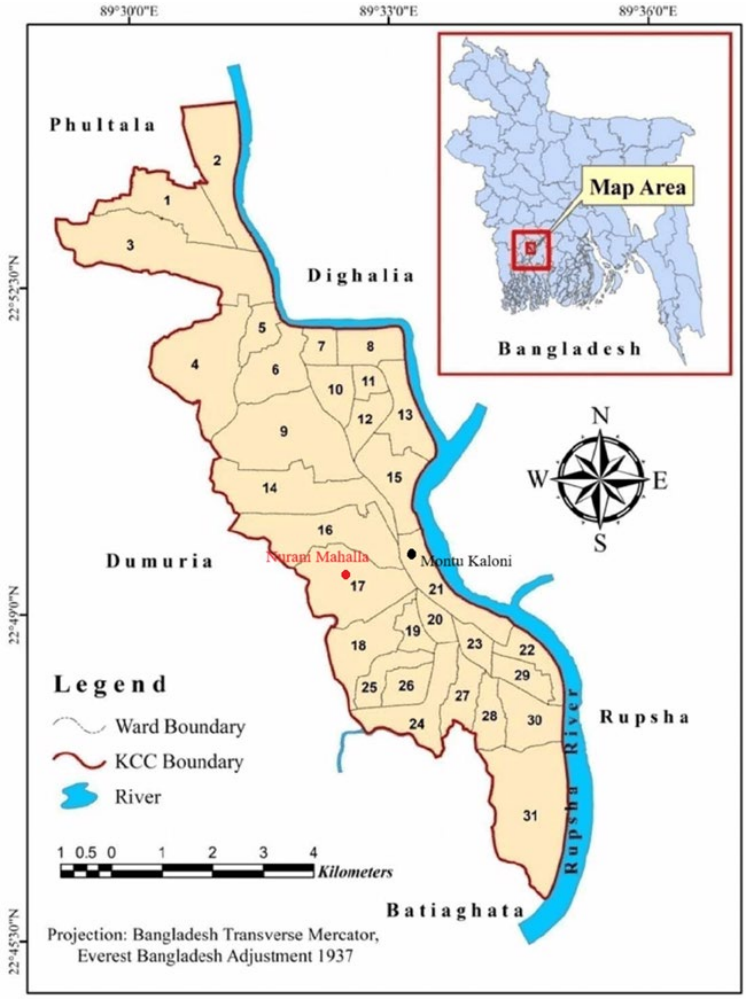

Figure 1: Study area map

While the two areas are not statistically representative, this study sheds light on the types of integrity risks that arise in LICs and the most likely means of mitigating them through a TAP approach. It is reasonable to expect that similar challenges are faced by other LICs in KWASA's service area. It is therefore hoped that this study can be used as a guide to identifying integrity challenges in other LICs and formulating appropriate responses.

Montu Kaloni informal settlement is close to the city centre and the KWASA office. About 450 families live there - nearly 2000 people. Although this area falls within the service jurisdiction of KWASA, it is not connected to the water supply system and does not receive formal service. The settlement is on land owned by Khulna Railway. Generally, utility services like water supply are provided to areas where there is clear ownership or legal permission from the landowner. In this case, without proper agreements or permission from the railway authorities, KWASA claims it is unable to intervene or develop the infrastructure needed to provide water.

Water challenges are also exacerbated by the environmental conditions in Khulna, such as groundwater depletion and seasonal water scarcity. Community members must rely on the Railway Authority for land-related permissions before any formal water infrastructure can be installed. Despite the limited formal service relationship between KWASA and the settlement, Montu Kaloni remains a critical case study because it illustrates how jurisdictional overlap, land tenure insecurity, and institutional fragmentation generate integrity risks even within the official service boundary of a public utility. The absence of direct service provision does not imply the absence of governance; rather, it exposes the structural accountability gaps and coordination failures that the TAP framework seeks to analyse and address.

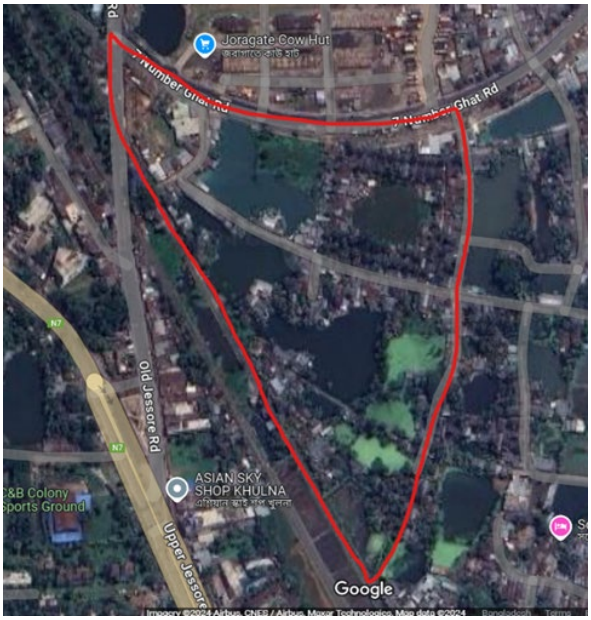

Figure 2: Field survey area of informal settlements in Montu Kaloni (October 2024)

Nurani Mahalla informal settlement is also located near the city centre of Khulna and also falls in the service jurisdiction of KWASA. Unlike Montu Kaloni, however, the land ownership in Nurani Mahalla is more regularized, allowing partial engagement with formal service provision. Despite its proximity to the city centre, like many urban informal settlements the area experiences problems with reliable water supply and sanitation services. Some households are connected to the municipal water network or access shared standposts, while others rely on alternative sources such as tube wells or private vendors due to limited coverage, irregular supply, or infrastructure constraints.

The community has a population of approximately 1,500 people, comprising around 350 families. The community is actively seeking improvements in these services to address their daily needs and improve overall living conditions.

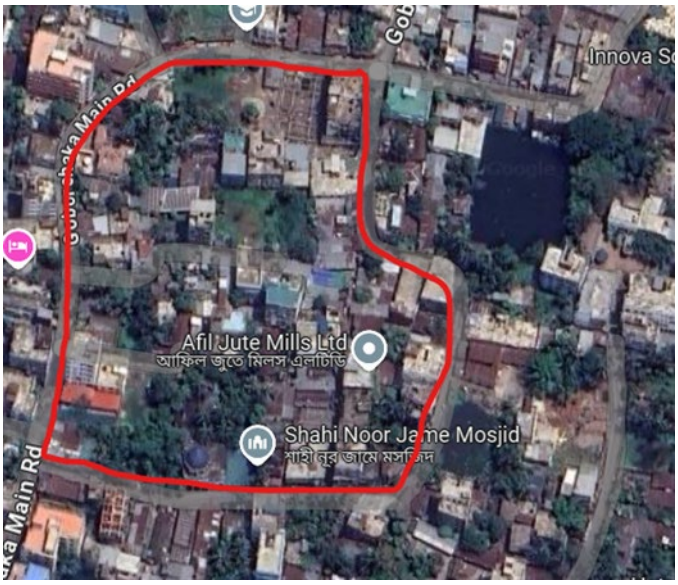

Figure 3: Field survey area of informal settlements in Nurani Mahalla (October 2024)

2 METHODOLOGY

2.1 Methods and Research Design

This study employs a mixed-methods approach, integrating qualitative and quantitative techniques to assess governance and integrity gaps in water and sanitation services. It applies the Water Integrity Network's conceptual framework for strengthening governance and mitigating against integrity risks by strengthening Transparency, Accountability, Participation and Anti-Corruption (TAPA) (WIN, 2021).

Table 1 sets out the research design, which prioritised and assessed TAPA by using the Analytic Hierarchy Process (AHP) (Saaty, 1984).

Table 1: Conceptual framework of the study

Description	Data Source	Analysis Method
Phase 1: Field Study		
Problem Identification Assessing water and sanitation access challenges (availability and type of source and quality/ adequacy)	Field survey of available water and sanitation services Two focus group discussions: one for each case study (with participants from a community-based organization and a youth group) Key Informant Interviews (KII) with service providers and government officials	Qualitative content analysis
TAPA Framework Application Evaluating integrity gaps in WASH services using TAPA	FGD and KII	Likert-scale scoring as a basis to develop AHP weighting
Phase 2: AHP-Based Prioritization and Integrity Deficiency Scoring		
Determining the relative importance of TAPA dimensions through pairwise comparisons	Stakeholder judgments (NGOs, KWASA, community representatives)	Eigenvector-based weighting, consistency ratio (CR) validation
Quantifying integrity gaps using Likert-scale surveys (1-5) and standardized scoring (1-10)	Structured questionnaires (see Appendix 1), (n=40 households per settlement, one person per household)	Weighted scoring (AHP × Likert responses)
Phase 3: Findings and Recommendations		
Analysing findings, including comparisons between the two informal settlements	Field data, institutional reports	Descriptive statistics
Considering policy implications and making recommendations based on TAPA gaps	Synthesis of findings	Results and findings from based on the integrity assessment using TAPA framework

Methods included a field survey, focus group discussions (FGD), key informant interviews (KIIs), a structured survey and use of secondary data:

- During the field survey, the researchers visited water sources, took photographs, and conducted basic information gathering about water availability and quality/ adequacy, and to identify service providers.
- FGDs were organized with 20 community members, including Community-Based Organization (CBO) representatives and youth members from each settlement. These provided qualitative insights into contextual challenges.

- KIIs with selected KWASA officials and NGO representatives were used to capture institutional perspectives and to triangulate understanding of institutional barriers.
- Structured surveys employed a validated 5-point Likert scale to measure perceptions of WASH service quality, accessibility, and integrity.
- Secondary data was also used, including official reports from KWASA (2023), and implementing NGOs such as Nabolok, along with water quality monitoring records and national policy documents (LGED, 2021). Although the raw secondary data are not directly presented in this paper due to confidentiality considerations, the findings from these sources were incorporated into the analysis to support the assessment of water and sanitation service delivery and governance conditions.

2.2 Steps to Weigh, Measure and Score TAPA

Table 2: Steps to Weigh, Measure and Score TAPA

Three steps to weigh, measure and quantify TAPA
Likert-scale scoring as a basis to develop AHP weighting
Eigenvector-based weighting, consistency ratio (CR) validation
Weighted scoring (AHP × Likert responses)

The study evaluates governance deficiencies in WASH service delivery using the TAPA framework, which looks at Transparency, Accountability, Participation, and Anti-Corruption. The scoring and weighting process was carried out in three main steps (Table 2):

Step 1: Collect and scale responses

Participants' survey answers about each TAPA dimension were first collected and measured on a scale to indicate their perceptions. These responses were converted into a Likert scale as a basis for further weighting.

Step 2: Determine the importance of each dimension

The relative importance of Transparency, Accountability, Participation, and Anti-Corruption was then calculated. This was done using Analytic Hierarchy Process (AHP) methods, where eigenvector-based weights were derived and validated using a consistency ratio (CR) to ensure the ranking was reliable.

Step 3: Combine weights and scores

Finally, each survey response was multiplied by the corresponding AHP-derived weight to generate a weighted score for each dimension. This weighted scoring approach (AHP × Likert responses) produces a standardized score ranging from 1 to 10, allowing direct comparison across the TAPA dimensions.

Prioritizing/Weighting each TAPA component

The Analytic Hierarchy Process (AHP) is then used to determine the relative importance of each TAPA dimension. Stakeholders, including community representatives and institutional actors, participated in pairwise comparisons using Saaty's 1–9 scale, ensuring a structured prioritization of integrity gaps. Eigenvector analysis derives the final weights, while the Consistency Ratio (CR < 0.10) validates the reliability of judgments (Allakulov et al., 2023; Saaty, 1984; WIN, 2021).

From TAPA measurement to Integrity Deficiency scores

Survey responses are transformed into integrity deficiency scores by combining Likert-scale values with AHP-derived weights. This approach quantifies governance gaps, allowing for a comparative analysis between Montu Kaloni (non-KWASA coverage) and Nurani Mahalla (partial KWASA coverage).

3 WATER AND SANITATION CHALLENGES IN MONTU KALONI AND NURANI MAHALLA (PHASE 1)

FGDs were convened by the local CSO, Nabolok, to understand local water and sanitation conditions, the challenges residents face in accessing services, and their interactions with KWASA. Two FGDs were conducted, one in each of the studied informal settlements, with 20 participants per group. Each FGD comprised approximately 10 members from a Community-Based Organization (CBO) and 10 members from a youth group, both of which had been formed by Nabolok during previous projects. Nabolok facilitated participation and organized the discussions, ensuring representation from different community segments. During the FGDs, participants were encouraged to share their experiences and perspectives on water and sanitation access. While Mrs. Miti, a community leader, and Mrs. Shipra, representing the respective CBOs, helped articulate key points for the group, the discussions included contributions from all participants, generating multiple viewpoints on local WASH challenges.

Figure 4: FGD with the youth group in Montu Kaloni

Figure 5: FGD with the CBO group in the Montu Kaloni

Figure 6: CBO and youth group in Nurani Mahalla

Figure 7: FGD with CBO and youth group in Nurani Mahalla

3.1 The State of Water and Sanitation Services in Montu Kaloni

Before 2020, the only reliable source of drinking water for the residents of Montu Kaloni was a deep tube well located 30-40 minutes away by foot. Women had to collect water daily, making multiple trips, often waiting in queues for 1 to 1.5 hours. Some used local transport like vans, which cost 50 BDT per trip, but most households could not afford this and had to walk. For bathing, washing and cooking, the community relied on shallow tube wells, known locally as “Lobon Panir Kall” (sources of salty water), or water from ponds.

Since 2020, with support from various NGOs and the local commissioner, 9 submersible pumps, 2 Tara pumps, and 15-20 shallow tube wells were installed. The submersible pumps were set up by the local commissioner, Nabolok, Caritas, and Jagrata Juba Shongha (JJS) NGOs while the Tara pumps were provided by JJS and the shallow tube wells by Nabolok (which started installing them as early as 2007). The local commissioner’s role was primarily facilitative, involving coordination and support at the community level, as they do not hold a formal mandate for water and sanitation service provision. Approval from the Bangladesh Railway authorities was required for installations on railway-owned land, and such approvals were sought as part of the process. The water supply condition has improved significantly since then. People now have easier access to water, and no one has to walk long distances.

Submersible pumps and Tara pumps are now the primary sources of drinking water in Montu Kaloni. People use shallow tube wells for bathing, washing, and cleaning purposes.

Each household now pays 20-30 BDT per month for water from the submersible pumps, with the cost determined by the electricity consumed by the pump’s motor, as indicated by an electric meter.

Figure 8: Tara pump with gender-sensitive facility

Figure 9: Shallow tube well (Lobon Panir Kall)

Figure 10: Submersible pumps for drinking water supply

The Tara pumps, designed with gender-sensitive features, further ensure women's comfort during water collection.

Additionally, rainwater harvesting systems have been introduced by Caritas for some households, although these systems are only used during the rainy season. Households contributed 2500-3000 BDT for setting up the rainwater harvesting systems, and Caritas regularly inspects the water filters to ensure they remain in good condition. Interestingly, one household reported using rainwater specifically for cooking rice, as they believe it enhances the quality of the rice.

Figure 11: Rainwater harvesting plant

Figure 12: Deep tube well outside Montu Kaloni

Figure 13: A nonfunctional old water supply tank

3.2 Challenges in Accessing Water and Sanitation in Montu Kaloni Informal Settlement

3.2.1 Poor Water Quality

A major issue in Montu Kaloni is the poor quality of water available from the Tara and submersible pumps. These water sources are often linked to widespread health problems within the community, especially for women and children. Skin diseases and diarrhoea are common among residents, with hair loss being a particular concern for girls and women. The water, in some instances, has a foul odour, making it unfit for consumption and daily use.

This issue is largely attributed to the depth from which the water is being drawn. Shallow water extraction increases the risk of contamination from various pollutants, a situation that is increasingly common across informal settlements in Khulna. As the city grows, unchecked pollution and the lack of proper water treatment exacerbate these risks. Without alternative sources of clean water, residents are forced to rely on these substandard water sources, perpetuating the cycle of waterborne diseases and health risks.

3.2.2 Insufficient Water for Domestic Animals

While there is just enough drinking water for human consumption, the situation is dire for domestic animals like cows, goats, and ducks. These animals are vital to the livelihoods of many families in Montu Kaloni, providing milk, meat, and other products. However, the water available for these animals comes from shallow tube wells, which is often salty and of poor quality. The animals frequently fall ill after consuming the contaminated water, leading to additional economic burdens on households that rely on them for sustenance and income.

3.2.3 Non-Functional Deep Tube Wells

Over-extraction of groundwater, combined with inadequate recharge systems, has significantly lowered the water table in Khulna. The phenomenon is not unique to Montu Kaloni but is common across Khulna City, where growing urbanization has placed immense pressure on available water resources. During dry seasons, groundwater availability becomes even more constrained.

The depletion of groundwater in Khulna has caused many deep tube wells in Montu Kaloni to become non-functional. With fewer functioning deep tube wells, residents are increasingly reliant on shallow water sources, which are more likely to be polluted.

3.2.4 Unhygienic Latrine Practices

Sanitation is another critical challenge in Montu Kaloni. There are pit latrines installed by NGOs but these are poorly managed and improperly sited. Leachate from these latrines pollutes nearby water bodies, such as ponds and marshy lands. This creates significant health risks, as the contaminated water is accessible to the hens, ducks and other animals, which roam freely in the area and swim in these polluted waters, increasing the spread of diseases within the community.

Moreover, the discharge from latrines into ponds and marshes introduces toxic elements and pathogens into the food chain. Fish cultivated in these water bodies are consumed by the local population, escalating the risk of illness. In some cases, human sludge is discharged into areas where vegetables are grown, contaminating the soil. Additionally, polluted water from these areas is often used to prepare food for domestic animals, increasing the likelihood of illness among livestock.

Figure 14: Outlet of human sludge is directly connected to local marshy lands

Figure 15: Outlet of human sludge is directly connected to the vegetable garden

Figure 16: Local poultry like hens and ducks are roaming in contaminated water

Figure 17: Preparation of food for domestic animals using polluted water

3.2.5 Water Shortages During Dry Seasons

Seasonal water shortages are a recurrent problem in Montu Kaloni, especially during the dry season when the groundwater table drops significantly. This results in many tube wells becoming unusable, making it difficult for residents to access water for drinking, cooking, and maintaining basic hygiene. The shortage of water during these periods compromises the community's ability to maintain cleanliness and sanitation, leading to a rise in health issues.

3.3 The State of Water and Sanitation Services in Nurani Mahalla Informal Settlement

Before 2022, residents relied solely on community tube wells for drinking water. However, during the dry season, when groundwater levels dropped, these tube wells would stop functioning, forcing people to travel to nearby residential areas for water.

Figure 18: Community tube well in Nurani Mahalla

Since 2022, KWASA connections have been established, with water supplied through meters. The KWASA system in Nurani Mahalla consists primarily of shared, piped connections rather than individual household connections; water is metered at the source or connection point, but supply is not delivered through individual household meters. Instead, multiple households rely on shared access points managed informally. Users typically pay a fixed or negotiated amount rather than a volumetric tariff directly linked to actual consumption.

There are also community tube wells, submersible pumps, and deep tube wells, including four deep tube wells installed with assistance from Dushtha Shasthya Kendra (DSK) NGO. Each of these systems involves different payment arrangements: water from community or NGO-supported tube wells is generally low-cost or free, while water from privately owned submersible pumps requires regular payments, which are higher and less predictable. In addition, submersible pumps outside the Nurani Mahalla provide water supply to the community.

People use the KWASA water supply for bathing, cleaning, and washing purposes but not for drinking due to concerns over its quality (such as the presence of dust particles). KWASA water is available twice daily, between 8:00–10:30 AM and 4:00–6:30 PM. However, controlling the supply from the privately operated submersible pumps can be challenging, as the individual who manages the pump regulates water distribution according to their own preferences.

Figure 19: Water supply pipeline from the submersible pump outside Nurani Mahalla

Figure 20: KWASA water supply line in a household of Nurani Mahalla

Figure 21: KWASA water supply meter in Nurani Mahalla

3.4 Challenges in Accessing Water and Sanitation in Nurani Mahalla Informal Settlement

3.4.1 Health Risks from Submersible Pump Water

A major challenge faced by residents is the health risks associated with using water from submersible pumps. Many people, particularly women and girls, have reported skin irritation, rashes, and hair loss after prolonged exposure to water drawn from these pumps. The water's unsafe condition is also indicated by a strong foul odour, making it unsuitable for drinking. These health issues are widespread across the settlement, causing significant concern among residents about potential long-term effects. Currently, there are no viable alternatives, forcing households to continue using this water despite the associated health risks. In addition, some submersible pumps are non-functional due to inadequate maintenance (Figure 22).

Figure 22: Water from this submersible connected pipeline is undrinkable due to odour problem in Nurani Mahalla

3.4.2 KWASA Water Quality Issues

The poor quality of KWASA water presents a significant challenge. Residents do not trust KWASA's water for drinking purposes, citing poor taste and occasional contamination. This forces the community to use KWASA water only for non-drinking purposes such as bathing, washing clothes, and cleaning. Residents reported that they have limited access to information on water quality testing results and are not informed about when or how such tests are conducted, which contributes to uncertainty and mistrust. Residents have shared these concerns through community meetings, informal discussions with local leaders, and interactions during project consultations, but there is limited participation in decision-making processes or opportunities for the community to engage with KWASA on this issue.

3.4.3 Lack of a Local KWASA Representative

One of the most pressing challenges is the absence of a designated KWASA representative in Nurani Mahalla. Without a local liaison, residents have no clear avenue to report issues such as service disruptions, complaints about water quality, or billing discrepancies. The community's participation in service monitoring and feedback is also limited due to the lack of communication channels with KWASA. From an anti-corruption perspective, the lack of a direct line to KWASA through, for example, a local representative, reduces accountability and can make it more difficult to address issues of informal or corrupt practices. Residents are, instead, forced to rely on unofficial middlemen to access services or have their issues resolved. Some residents indicated that they have depended on local intermediaries or influential individuals to convey complaints or negotiate service-related matters, highlighting this as an existing issue rather than a hypothetical risk. Appointing a local representative would enhance both accountability and transparency, ensuring that the community has a reliable way to voice concerns and receive timely responses.

3.4.4 Non-Functional Tube Wells

Many of the community's tube wells, which once provided a crucial source of water, have become non-functional due to the depletion of the groundwater table. As a result, residents who once relied on tube wells for their water needs are now forced to depend on the submersible pumps, which often deliver water of poor quality.

Figure 23: Nonfunctional deep tube well in Nurani Mahalla

3.4.5 High Cost of Drinking Water

On average, families in Nurani Mahalla spend an additional 200–300 BDT per month on drinking water due to their reliance on submersible pumps that are located outside the community and are not managed by community members. These submersible pumps are owned and operated by third-party providers, and households are required to pay the charged amount directly to these external operators, rather than to a community-managed or public water service. This additional expense places a disproportionate financial strain on low-income households.

3.4.6 Limited KWASA Coverage

Currently, around 20% of Nurani Mahalla is not connected to KWASA's water supply network, leaving these households entirely dependent on submersible pumps or private water sources. The unequal distribution of water services disproportionately affects the most vulnerable residents. There is little information available about plans to expand KWASA's network or about how residents can access these services.

4 STATUS OF INTEGRITY ISSUES IN THE WASH SECTOR IN INFORMAL SETTLEMENTS IN KHULNA: ANALYSIS AND FINDINGS (PHASE 2)

4.1 Understanding TAPA

The TAPA Framework—standing for Transparency, Accountability, Participation, and Anti-Corruption—proposed by the Water Integrity Network (WIN), provides a conceptual foundation for assessing integrity gaps and prioritizing reform interventions.

These four core criteria are defined below:

- Transparency (T): Transparency refers to the accessibility, clarity, and timeliness of information related to WASH services, rights, responsibilities, infrastructure status, service quality, pricing, and grievance mechanisms. In the context of integrity, it implies that both service providers and public authorities make critical information available to all stakeholders, especially marginalized communities.
- Accountability (A): Accountability refers to the existence and effectiveness of institutional mechanisms that ensure service providers, decision-makers, and communities are held responsible for their actions and decisions in the delivery and governance of WASH services. This includes systems for monitoring, reporting, oversight, and redressal.
- Participation (P): Participation captures the extent to which community members are meaningfully involved in the planning, design, implementation, and monitoring of WASH services. This includes their presence in decision-making forums, consultations, feedback mechanisms, and citizen-led monitoring processes.
- Anti-Corruption (A2): Anti-Corruption refers to measures taken to prevent, detect, and address corrupt practices in the governance and delivery of WASH services. This includes corruption in procurement, political favouritism, illicit payments, capture of subsidies, and manipulation of service eligibility criteria.

4.2 Ranking TAPA: Analytic Hierarchy Process (AHP)

To assess the relative significance of the four core water integrity dimensions—TAPA—the study employed the Analytic Hierarchy Process (AHP) developed by Saaty (1984). This technique allows for a structured, transparent assessment of subjective judgments made by stakeholders and experts on the relative importance of each integrity dimension. It is particularly suited for multi-criteria decision-making problems, such as evaluating governance attributes in complex, informal urban contexts.

The extensive qualitative work and computations to apply the AHP are detailed in Appendix 2.

The derived priority weighting and ranking presented in Table 3 offer crucial insight into the relative importance of the four TAPA dimensions within the complex governance environment of informal settlements in Khulna. These findings not only reflect community perceptions but also reveal the practical and institutional opportunities and constraints for strengthening water integrity. The prioritization was derived using the Analytic Hierarchy Process (AHP), a structured multi-criteria

decision-making approach that converts qualitative judgments into quantitative weights through systematic pairwise comparisons among the TAPA dimensions. This method is important because it allows the relative importance of each integrity dimension to be ranked, rather than relying solely on descriptive qualitative inputs, which do not capture trade-offs or priority under limited institutional capacity. A higher AHP score indicates that a TAPA dimension is perceived as relatively more critical and more actionable compared to others, while a lower score reflects comparatively lower priority. Although perceptions of importance and opportunities for action are conceptually distinct, AHP enables their integration by capturing how stakeholders simultaneously assess the severity of integrity problems and the feasibility of institutional response based on lived experience and governance realities.

Table 3: TAPA principles, weighted and ranked as per AHP for WASH in Khulna informal settlements

Criterion	Priority Weight	Rank
Transparency	0.466	1st
Accountability	0.277	2nd
Participation	0.161	3rd
Anti-Corruption	0.096	4th

The ratings captured in Table 3 indicate the perceived influence and feasibility of action regarding each TAPA component, as described below:

4.2.1 Transparency (46.6%) – The Cornerstone of Service Equity and Community Empowerment

Transparency was consistently rated highest. This reflects the aggregation of multiple individual pairwise comparisons collected through the AHP process. Each respondent contributed a single set of comparative judgments across the TAPA dimensions, and these individual judgments were mathematically aggregated to produce one final priority weighting. The consistency of transparency's high score across respondents explains its dominance in the final ranking.

This prioritization emerged from repeated community concerns over the lack of accessible and timely information. Residents often do not know whether they are eligible for municipal WASH services or whether the services they can access are safe. They are unaware of existing grievance mechanisms, water tariffs, or infrastructure plans. Hence, improving transparency was seen as the most immediate enabler of citizen action and accountability.

The dominant weight assigned to transparency signifies its foundational role in improving WASH service delivery in contexts marked by institutional ambiguity and informational asymmetries. In settlements where residents often lack legal land tenure, face shifting jurisdictional authority (e.g., between KWASA and Khulna Railway), and have limited contact with formal service providers, access to accurate and timely information is key.

4.2.2 Accountability (27.7%) – Mechanisms for Responsive and Responsible Governance

Accountability followed as the second-highest ranking. Community stakeholders and NGO staff emphasized the absence of mechanisms to track complaints, assign responsibility, or sanction poor service. Although accountability is structurally more complex than transparency, it was still seen as operationally critical for sustainable improvements.

This reflects the need for enforceable feedback and redress mechanisms to accompany transparency. Community stakeholders expressed clear expectations for avenues through which they can hold providers — governmental or non-governmental — responsible for delivery failures, mismanagement, or negligence.

However, in informal contexts where governance is often fragmented and formal complaint systems are inaccessible or ineffective, accountability must be reconceptualized. Here, fragmented governance refers to the dispersion of authority and responsibility across multiple institutions—such as WASA, municipal authorities, land-owning agencies, NGOs, and political intermediaries—without clear mandates, coordination mechanisms, or enforceable accountability pathways. Locally driven initiatives, such as community scorecards, citizen audits, and participatory monitoring, represent feasible entry points. These mechanisms create feedback loops that can pressure duty bearers to respond while enhancing social legitimacy.

This approach is particularly relevant in informal settlements where residents lack legal recognition and formal engagement channels, making conventional accountability tools ineffective. Communities perceive that documenting service failures and collectively sharing the results with WASA, local authorities, NGOs, or the media can create reputational or political pressure on duty bearers, even in the absence of formal legal mechanisms. The feasibility of these initiatives is often linked to external support, such as NGOs or civil society facilitation, as local groups may lack capacity or resources to implement them independently. Additionally, safeguards such as inclusive participation, transparency in monitoring, and independent facilitation are necessary to reduce the risk of interference by local political actors and ensure the credibility of community-driven accountability efforts.

4.2.3 Participation (16.1%) – A Valued Yet Constrained Dimension

Participation was ranked lower, despite being acknowledged as important. It was judged to be less influential, primarily due to systemic barriers—including informal land tenure, weak legal recognition, and limited space for meaningful engagement. Stakeholders noted that community input is often tokenistic or restricted to NGO-led forums.

While participation is recognized as a fundamental tenet of democratic governance, its relatively lower weight underscores the practical challenges faced by informal settlement residents in translating participation into influence. Structural exclusions—particularly insecure tenure, lack of official recognition, and weak integration into planning frameworks—limit the extent to which communities can contribute to or influence decision-making processes.

Nevertheless, community-based organizations (CBOs), youth groups, and women's collectives have shown potential in advocating for local needs and mobilizing for collective action. As such, participation remains a crucial medium- to long-term goal that requires both capacity development and institutional recognition. Its current weight reflects the need for simultaneous investments in enabling environments and inclusive governance structures.

4.2.4 Anti-Corruption (9.6%) – Normatively Important but Practically Elusive

Anti-Corruption was rated the lowest, despite its acknowledged significance. The rationale was its perceived intractability—corruption often manifests in informal settlements in subtle or embedded forms (e.g., political favouritism, informal payments to secure connections), where corruption is hidden, normalized, or integrated into everyday practices, making it difficult to detect or confront directly. Residents reported a sense of powerlessness and risk in confronting such issues. As a result, anti-corruption efforts were seen as indirect and long-term goals, less actionable than the other dimensions.

While corruption—whether in the form of informal payments, favouritism, or opaque procurement—is widely acknowledged as a threat to equitable service delivery, stakeholders regard it as deeply entrenched and difficult to address at the community level without institutional reforms. Some groups reported that they have tried to raise related issues but encountered limited success, and residents often expressed fear or felt pressured, which discouraged them from confronting corrupt practices directly.

This view highlights a pragmatic understanding that anti-corruption efforts must be embedded within broader systemic changes that address upstream governance processes. However, community actions that promote transparency and accountability—such as tracking fund flows, monitoring project implementation, or publicly reporting service delays—can serve as indirect deterrents to corruption and build a culture of integrity over time.

The dynamics between different groups and their actions that undermine TAPA and lead to integrity failures are illustrated in Figure 24.

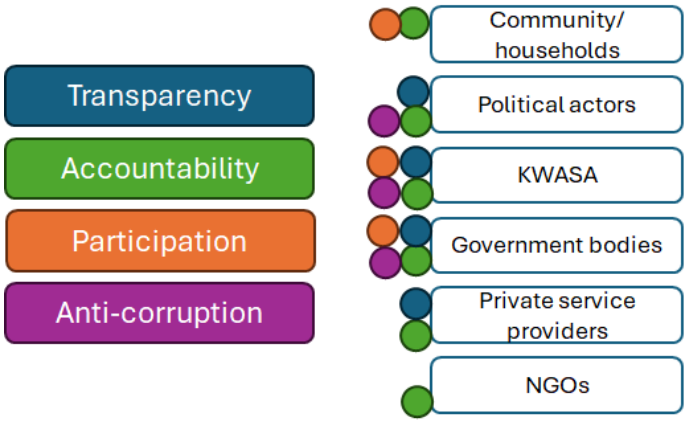

Figure 24: Integrity issues in WASH as per the TAPA framework and responsible stakeholders in informal settlements of Khulna (source author)

Figure 24 illustrates the distribution and interlinkages of integrity issues in WASH service delivery in the informal settlements of Khulna using the TAPA (Transparency, Accountability, Participation, Anti-Corruption) framework, while also identifying the responsible stakeholders associated with each issue. The circles in the figure, shown in the same colour as the corresponding TAPA dimension, represent direct correlations between specific integrity deficiencies and the actors responsible for addressing them.

Accountability-related issues emerge as the most dominant and recurrent integrity concern. These include delays in establishing WASA connections, lack of legal action against unauthorized submersible pumps, insufficient investment in addressing water issues, lack of sustainable water solutions for low-income communities with no land ownership, and weak coordination with other organizations. The accountability-coloured circles primarily point toward KWASA, local authorities and land-owning agencies, highlighting institutional failures in enforcement, service coverage and inter-agency collaboration. The figure demonstrates that accountability gaps are systemic rather than isolated, affecting service reliability, infrastructure protection, and long-term sustainability.

Transparency-related issues reflect information asymmetries between service providers and users. These include lack of trust in water quality, lack of confidence in the accuracy of water bills, limited promotion of WASA activities, low awareness of available services (connections, complaint mechanisms, public meetings), and insufficient knowledge of water, sanitation, and hygiene practices. The key linkages are to WASA and service intermediaries, indicating inadequate public disclosure, weak communication strategies, and limited community outreach. The harmful effects of widespread unauthorized use of submersible pumps are also connected to transparency gaps, as communities remain uninformed about groundwater risks and regulatory requirements.

Participation-related integrity issues reflect the lack of public input in project planning and implementation—particularly in foreign-funded projects—and the failure to reach consensus in problem-solving processes. The circles highlight the limited role of communities in decision-making and oversight, pointing toward KWASA, donor agencies, NGOs, and local government bodies as key stakeholders responsible for facilitating inclusive governance mechanisms. The figure shows that weak participation exacerbates accountability failures, as community feedback and monitoring are largely absent from formal service delivery processes.

Anti-corruption-related issues primarily involve bribery in obtaining KWASA connections and mistrust in billing practices. The circles connect both to service providers and intermediaries, illustrating how informal payments and discretionary power undermine fairness, transparency, and trust in WASH services. The overlap of anti-corruption circles with accountability and transparency dimensions demonstrates the interdependent nature of integrity failures.

4.3 Integrity Issues and Integrity Deficiency Ranking

A 'Likert scale' format was used to design the survey questions, and the indicator-specific standardized score (1-10) is calculated from participants' responses (Joshi et al., 2015). In this study, the 'Likert scale' is categorized into five classes: Very low (1), Low (2), Medium (3), High (4), and Very high (5). Questionnaires were prepared to obtain the score of integrity issues in the WASH sector based on the TAPA framework.

Appendix 3 provides an explanation of the indicators, parameters, respondents and scoring of each integrity issue. These are summarized below:

Table 4: AHP and 'Likert scale' based Ranking of Integrity deficiency

Serial no.	Integrity Issues	Score	Rank
1.	Indiscriminate use of the submersible water supply system. This refers to uncontrolled or unplanned use of pumps and groundwater, which can cause over-extraction, water quality issues, unequal access, and threaten the system's sustainability.	12.96	1st
2.	KWASA has to convince local political actors (e.g. Member, City Mayor) to ensure new supply connections in the disputed informal settlement areas (e.g. informal settlements in Khulna Railway area)	10.05	2nd

3.	People in Nurani Mahalla don't know 'where and to whom' complaints have to be submitted regarding issues of KWASA supply	9.05	3rd
4.	Residents are unaware of the application procedures for KWASA supply connections.	7.91	4th
5.	Conflict between KWASA and the Railway Authority for providing KWASA supply line.	7.71	5th
6.	Have to pay a high charge to 'third party' to ensure safe water (Nurani Mahalla).	6.69	6th
7.	Have to pay a high charge to 'third party' to ensure safe water (Montu Kaloni).	6.27	7th
8.	No maintenance of existing water sources	2.77	8th
9.	No management of sludge	2.77	8th

4.4 Integrity Deficiency in Montu Kaloni and Nurani Mahalla

In this study, "integrity issues" refer to specific, observable problems or weaknesses in WASH governance (such as lack of information disclosure, weak enforcement, or limited participation), whereas "integrity deficiency" represents the cumulative magnitude and severity of these issues when assessed systematically using the Transparency, Accountability, Participation, and Anti-corruption (TAPA) framework. Integrity deficiency therefore reflects how far the existing WASH governance system deviates from integrity principles, based on the aggregation of multiple integrity issues rather than isolated incidents.

This section presents a comparative analysis of integrity deficiencies in the WASH sector across the two informal settlements using the Transparency, Accountability, Participation, and Anti-corruption (TAPA) framework. Building on the issue-level integrity assessment presented earlier and detailed in Appendix 3, this section aggregates individual integrity issues into criterion-level scores to identify which governance dimensions contribute most to overall integrity gaps and to enable a clearer comparison between the two settlements.

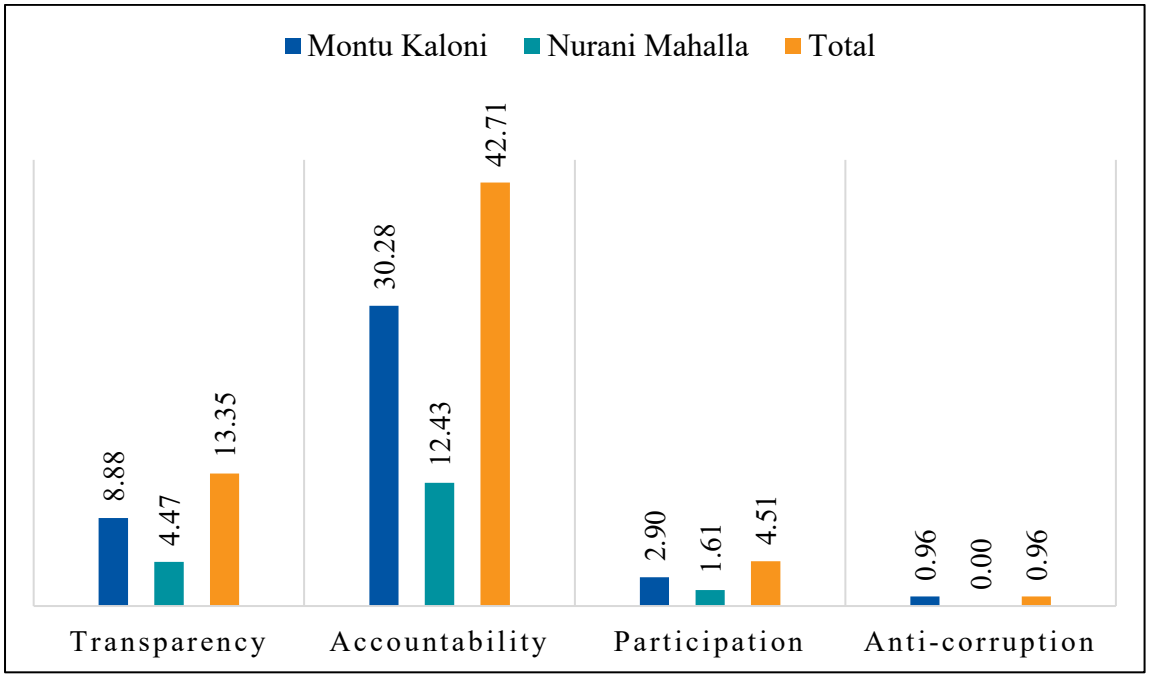

Figure 25: Integrity deficiency in Montu Kaloni and Nurani Mahalla

Figure 25 shows that integrity deficiency is 2.32 times higher in Montu Kaloni than in Nurani Mahalla. In the study area, the maximum deficiency of WASH integrity is covered by accountability issues (69%), and the least portion is under anti-corruption (2%) (Figure 26). In comparison with Nurani Mahalla, Montu Kaloni has respectively 1.99, 2.44, and 1.80 times higher integrity deficiency, regarding transparency, accountability, and participation. Anti-corruption is rated 0% missing in Nurani Mahalla but 2% in Montu Kaloni (Figure 26). Integrity issues under transparency also contribute significantly to the integrity deficiency. Transparency issues cover 22% of the study area's WASH-related integrity deficiency (21% and 24% respectively in Montu Kaloni and Nurani Mahalla). Participation related WASH integrity issues are also present in this area (7% of the integrity deficiency in the study area, 9% in Nurani Mahalla and 7% in Montu Kaloni).

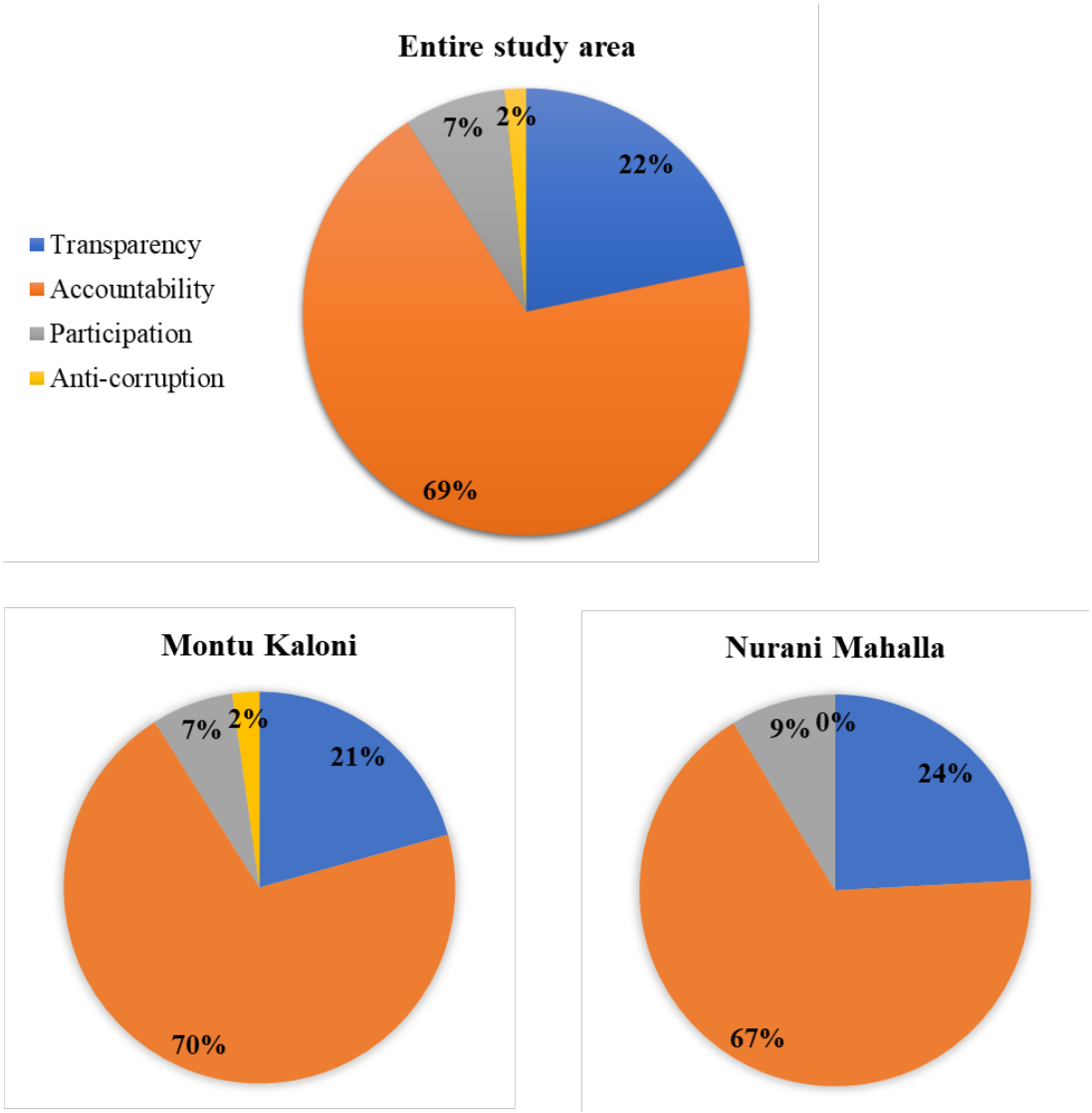

Figure 26: TAPA tool-based integrity assessment after weighting

Although transparency received the highest weight in the integrity assessment framework, the situation in the study area shows a different reality. In practice, most of the problems are linked to accountability rather than transparency (Appendix – 3). There is no clear legal or policy framework that defines how WASH services should be provided in informal settlements. As a result, responsibilities are unclear, enforcement is weak, and there are no strong mechanisms to hold institutions accountable for service delivery. This lack of clear rules and defined responsibility creates major barriers for residents in accessing safe and reliable WASH services.

At the same time, KWASA, along with other stakeholders (Khulna Railway Authority, Khulna City Corporation), cannot take effective measures to ensure water supply in informal settlements. The issue is not the absence of national WASH policies, but rather the lack of a clear, coherent, and enforceable interpretation of existing legal and policy frameworks that explicitly addresses the context of informal settlements, especially those located on public or contested land. In addition, many organizations take advantage of the policy gap and do not properly respond to or cooperate with KWASA regarding protecting water supply networks during the construction of roads,

maintenance of underground gas lines, internet cables, and other facilities. Although sector-specific policies exist for road construction and utility maintenance, weak inter-agency coordination, unclear accountability lines, and lack of enforcement mechanisms allow these agencies to bypass responsibility for protecting WASH infrastructure, thereby creating an operational accountability gap rather than a purely legal one.

Poor sludge management exists in Montu Kaloni as most of the latrines contaminate nearby water bodies causing serious threat to health and environment. KWASA is currently constructing sewerage lines across Khulna city including the informal settlements. This is expected to be fully functional in 2026.

Participation related integrity issues arise as residents have limited or no access to decision-making processes around WASH development. KWASA suggests that participation is often impossible or that there is limited scope as the development projects are designed by foreign donors (e.g. ADB, JICA). However, accountability gaps are not limited to KWASA. NGOs and development partners involved in project design and implementation also bear responsibility for ensuring meaningful community engagement, clear grievance redress mechanisms, and identifiable contact points when services fail or infrastructure breaks down, as well as for planning long-term operation, maintenance, and sustainability. However, residents are often unaware of the importance of participation and their rights as WASH service users, and many do not know how or where to participate in decision-making processes.

This lack of awareness is closely linked to low literacy levels, limited access to information, and the absence of community-friendly engagement platforms. As a result, residents frequently feel disempowered and fear negative consequences or social backlash if they raise concerns or demand accountability, which further discourages them from voicing their rights and engaging with service providers.

5 RECOMMENDATIONS

The water and sanitation integrity challenges in Khulna's informal settlements stem from governance gaps, institutional inefficiencies, and socio-political marginalization. By implementing the following recommendations, authorities can reduce integrity risks and improve service delivery to LICs:

5.1 Transparency: Ensuring Open and Accessible Information

Transparency is the most critical factor in improving WASH integrity. Key interventions include:

Public Disclosure of WASH Policies and Services

KWASA should

- Publish clear guidelines on water connection eligibility, tariffs, and application procedures in local languages (Bangla) and disseminate them through:
  - » Community meetings, posters, and leaflets.
  - » Mobile announcements and social media (where applicable).
  - » Local NGOs and Community-Based Organizations (CBOs).

- Establish an online/offline WASH information hub where residents can access:
  - Water quality test results.
  - Service schedules (e.g., KWASA supply timings).
  - Grievance redress mechanisms.

Transparent Water Pricing and Billing:

This recommendation is directed primarily at KWASA, in coordination with Khulna City Corporation and relevant regulatory authorities, to regulate and oversee community-level or privately operated submersible pumps that function as interim or supplementary water sources in areas with limited or no KWASA coverage. It does not imply that submersible pumps are a formal alternative to KWASA supply but recognizes their current use in informal settlements due to service gaps. KWASA and local authorities should ensure that approved tariffs or user charges for such interim water sources are clearly displayed at collection points to improve transparency, protect low-income users from arbitrary pricing, and reduce opportunities for rent-seeking by third-party operators.

Regular Water Quality Reporting:

KWASA and NGOs should conduct and share monthly water quality tests (e.g., for manganese, salinity, bacterial contamination) via:

- Public noticeboards.
- SMS alerts (for literate residents).
- Community health workers.

5.2 Accountability: Strengthening Oversight and Redress Mechanisms

Accountability ensures that service providers are answerable to the community.

Formalize Grievance Redress Systems:

KWASA should

- Appoint a local representative to:
  - Receive complaints (e.g., water contamination, supply disruptions).
  - Track resolution timelines (e.g., 48-hour response for urgent issues).
- Introduce a toll-free WASH helpline for reporting issues anonymously.

Strengthen Monitoring and Enforcement:

- KWASA should penalize illegal submersible pump usage by:
  - Conducting surprise inspections.
  - Imposing fines on unauthorized operators.
- NGOs should ensure post-installation maintenance of water sources (e.g., tube wells, rainwater harvesting systems).

Legal and Policy Reforms:

KWASA, KCC, and Khulna Railway Authority should clarify roles and responsibilities to avoid conflicts and accountability gaps.

KWASA should develop a WASH policy for informal settlements to ensure legal recognition of their rights to water and sanitation.

5.3 Participation: Empowering Communities in Decision-Making

Participation ensures that marginalized groups have a voice in WASH governance.

Community-Led Water Committees:

Communities should

- Form Water Committees with equal gender representation to:
  - » Monitor water supply and quality.
  - » Liaise with KWASA and NGOs on infrastructure needs.
- Ensure community leaders are trained on WASH rights and advocacy.

Inclusive Planning and Feedback Mechanisms:

KWASA should

- Hold quarterly public consultations to:
  - » Discuss service improvements.
  - » Incorporate community feedback into project designs.
- Use participatory budgeting to prioritize WASH investments (e.g., new pipelines, sludge management).

Awareness and Capacity Building:

KWASA and NGOs should:

- Conduct literacy programs on WASH rights and hygiene practices.
- Engage youth and women's groups in awareness campaigns (e.g., dangers of contaminated water).

5.4 Anti-Corruption: Preventing Exploitation and Leakages

Anti-corruption is essential for equitable service delivery.

Crack Down on Informal Payments:

Illegal intermediaries exploit information gaps and weak oversight by charging unauthorized fees to facilitate water connections, increasing the financial burden on low-income households and undermining equity in service delivery. Proactive investigation, clear reporting channels, and strict penalties against such practices would deter corruption, protect consumers, and reinforce KWASA's accountability and credibility as a public service provider.

Digitizing WASH service application and approval processes can minimize direct interactions between applicants and officials, thereby reducing opportunities for discretionary decision-making, informal payments, and favouritism. Digital systems also improve transparency by clearly outlining application requirements, processing steps, and timelines, allowing applicants to track the status of their requests. To avoid excluding low-income households with limited internet access or digital literacy, digitization should be complemented by assisted application support and parallel offline options.

Transparent Procurement and Contracting:

KWASA, NGOs and other service providers should

- Publish procurement information and contractor performance reports (e.g., project completion rates, fund utilization).
- Encourage whistleblowing through anonymous complaint boxes in community centres or other appropriate and safe routes.

Social Audits and Public Oversight:

KWASA should

- Conduct annual social audits of WASH projects with community participation.
- Use community scorecards to rate KWASA and NGO performance.

6 CONCLUSION

The study highlights critical water and sanitation challenges in the informal settlements of Montu Kaloni and Nurani Mahalla in Khulna, Bangladesh, emphasizing governance and integrity gaps that hinder equitable service delivery. The application of the TAPA (Transparency, Accountability, Participation, and Anti-Corruption) framework, coupled with the Analytic Hierarchy Process (AHP), reveals that transparency (46.6%) and accountability (27.7%) are the most pressing integrity dimensions, while participation (16.1%) and anti-corruption (9.6%) remain constrained by structural and institutional barriers.

Key findings indicate that accountability-related deficiencies dominate (69% of total integrity gaps), primarily due to the absence of a legal policy framework for informal settlements, weak enforcement of regulations, and poor institutional coordination among KWASA, local authorities, and NGOs. This refers to the lack of formal legal recognition of informal settlements within existing WASH laws and utility service rules, which prevents KWASA from extending services or enforcing standards, and the limited application of existing groundwater, water quality, and sanitation regulations in these areas due to unclear jurisdiction, weak monitoring, and absence of enforceable mandates. Transparency gaps (22% of deficiencies) stem from inadequate public disclosure of WASH service information, pricing, and grievance mechanisms, leaving communities uninformed about their rights and service eligibility. Indiscriminate use of submersible pumps (highest integrity deficiency score: 12.96) exacerbates health risks, with contaminated water linked to skin diseases, hair loss, and gastrointestinal illnesses.

The study also identifies political interference in service provision, highlighting how informal political influence shapes who receives water services, when services are delivered, and which areas are prioritized, often undermining transparency and institutional accountability, conflicts between KWASA and the Railway Authority, and the financial burden of securing safe water through third-party vendors as major integrity challenges. While Montu Kaloni faces 2.32 times higher integrity deficiencies than Nurani Mahalla, both settlements suffer from poor sludge management, non-functional deep tube wells, and seasonal water shortages, further aggravated by climate variability and groundwater depletion.

To address these gaps, the study recommends:

1) By engaging communities in the management of water services—planning, monitoring, oversight and maintenance— KWASA can strengthen service delivery and bridge the service gaps in LICs (Rahman et al, 2023). This specifically applies to LICs, as community involvement in governance helps bridge service gaps by enabling local monitoring of service quality, identifying access barriers faced by low-income households, reducing information asymmetries between providers and users, and creating collective pressure for utilities to respond to unmet service needs. Service providers can ensure that their interventions are aligned with the needs and priorities of the communities they serve, making them more effective. Being engaged in the process also fosters a community sense of ownership, which can improve the sustainability of water and sanitation systems. (Chowdhury et al., 2023) Finally, through collective action and advocacy, communities can demand better services and hold service providers accountable for their performance. This may lead to more sustainable and effective outcomes.
2) Strengthening transparency, accountability, and participation would foster a more responsive and equitable WASH system, enabling better service delivery to Khulna's LICs. When service providers openly share information, are answerable for their actions, and actively involve communities in decision-making, service gaps reduce and trust between communities and institutions such as KWASA improves. Together, these governance principles ensure that WASH services are delivered based on need rather than political influence or informal arrangements.
3) Transparency can be strengthened through community awareness campaigns, public disclosure of WASH service standards, and accessible grievance mechanisms. This can include regular community awareness campaigns that inform residents about their rights, service eligibility, water quality standards, tariffs, and application procedures. Public disclosure of WASH service standards and water quality information enables communities to understand what level of service they should expect. Establishing clear and accessible grievance mechanisms allows residents to report problems without fear or dependence on informal intermediaries, reducing misinformation and opportunities for exploitation.
4) Enhancing accountability by establishing local KWASA representatives, enforcing regulations on submersible pump use, and integrating informal settlements into municipal WASH planning will strengthen accountability. Such a representative can receive complaints, monitor service delivery, and coordinate responses. Enforcing regulations on indiscriminate submersible pump use is necessary to protect groundwater resources and public health. Integrating informal settlements into municipal WASH planning—regardless of land tenure status—

ensures that service providers are formally responsible for meeting the water and sanitation needs of LIC residents.

5) Participatory governance should be promoted by actively involving community-based organizations and youth groups in WASH planning, monitoring, and evaluation processes. Their engagement ensures that services reflect local priorities and challenges while strengthening community ownership and oversight. Participation also empowers marginalized residents to voice concerns, demand better services, and contribute to accountability through collective action. Active participation of women must be ensured as well.
6) Investing in sustainable infrastructure, such as expanded rainwater harvesting systems and proper sludge management, reduces dependency on groundwater and protects public health and the environment. Proper sludge management prevents contamination of water bodies and surrounding land, while alternative water sources enhance resilience to seasonal water scarcity. These investments support long-term service sustainability and protect public health in densely populated informal settlements.

These measures require multi-stakeholder collaboration among KWASA, local government, NGOs, and communities to ensure equitable, resilient, and integrity-driven WASH services. Future research should explore the socio-political dynamics influencing WASH governance and evaluate the long-term impacts of integrity interventions in informal urban contexts.

By prioritizing transparency and accountability, Khulna can mitigate WASH-related health risks, reduce service inequities, and advance Sustainable Development Goal (SDG) 6—ensuring clean water and sanitation for all.

REFERENCES

Abanyie, S. K., Amuah, E. E. Y., Douti, N. B., Antwi, M. N., Fei-Baffoe, B., & Amadu, C. C. (2025). Exploring the spatial Nexus of wash and child health in Khulna using geospatial techniques. City and Environment Interactions, 28, 100256. https://doi.org/10.1016/j.envc.2022.100546

Alam, M. Z., & Sheoti, I. H. (2024). Ethnicity and access to water, sanitation, and hygiene in Bangladesh: a study using MICS data and policy reviews. BMC Public Health 2024 24:1, 24(1), 2726-. https://doi.org/10.1186/s12889-024-20250-0

Allakulov, U., Cocciolo, S., Das, B., Habib, M. A., Rambjer, L., & Tompsett, A. (2023). Transparency, governance, and water and sanitation: Experimental evidence from schools in rural Bangladesh. Journal of Development Economics, 163(484), 103082. https://doi.org/10.1016/j.jdeveco.2023.103082

Brousmiche, D., Lanier, C., Occelli, F., Pochet, L., Degezelle, S., Genin, M., Deram, A., & Cuny, D. (2023). Spatial scale and spatial effects: Shedding light on how a change of scale can affect the characterization of environmental health inequalities. Environmental Science & Policy, 144, 20–30. https://doi.org/10.1016/j.envsci.2023.03.005

Hasan Ali, M., Banerjee, B., Hasan Sindeed, M., Rashid Rumi, R., & Abu Sufian, M. (2025). A Study on WASH integrity implementation status, governance mechanism, challenges and opportunity of the existing policy and practices at Khulna and Rajshahi City Corporation, WAVE Foundation.

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert Scale: Explored and Explained. British Journal of Applied Science & Technology, 7(4), 396–403.

LGED. (2021). National Strategy for Water Supply and Sanitation, Revised and Updated Edition (2021), Ministry of Local Government, Rural Development & Co-operatives, Government of People's Republic of Bangladesh.

Naz, S., Hossain, M. Z., & Rahaman, K. R. (2025). Assessing the effectiveness of a rights based approach for pro-poor WASH services: A study in urban poor settlements in Khulna, Bangladesh. World Development Perspectives, 37, 100663. https://doi.org/10.1016/j.wdp.2025.100663

Saaty, T. L. (1984). The Analytic Hierarchy Process: Decision Making in Complex Environments. Quantitative Assessment in Arms Control, 285–308. https://doi.org/10.1007/978-1-4613-2805-6_12

WIN. (2021). ANNUAL REPORT. https://waterintegrity.net/mw9

APPENDIX 1: QUESTIONNAIRE

SECTION 1: TRANSPARENCY (T)

- Availability of information about KWASA water connection procedures
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Clarity of water tariff (pricing) information
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Frequency of water quality reports shared with community
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High

SECTION 2: ACCOUNTABILITY (A)

- KWASA's responsiveness to water supply complaints
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Enforcement of rules against illegal water connections
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Effectiveness of local leaders in holding KWASA accountable
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High

SECTION 3: PARTICIPATION (P)

- Opportunities for community input in WASH projects
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Inclusion of women in water-related decision making
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High

SECTION 4: ANTI-CORRUPTION (A2)

- Fairness in distribution of water connections
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Prevalence of bribery to obtain water services
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High

SECTION 5: WASH SERVICE QUALITY

- Safety of drinking water from current sources
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Adequacy of water supply during dry seasons
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High
- Proper disposal of human waste in your area
  (1) Very Low (2) Low (3) Medium (4) High (5) Very High

SECTION 6: OPEN-ENDED QUESTIONS

- What is the most serious water problem your household faces?
- What single improvement would help most in your water situation?

APPENDIX 2: AHP METHOD COMPUTATIONS/ APPLICATION

Construction of Pairwise Comparison Matrix:

Justification of Judgments (this text is summarized in the body of the paper):

Each entry in the matrix is grounded in the perceived influence and feasibility of action regarding the four integrity criteria, as follows:

- Transparency (T) was consistently rated highest (with relative scores of 2, 3, and 4 against other criteria). This prioritization emerged from repeated community concerns over the lack of accessible and timely information. In informal settlements, residents often do not know whether they are eligible for municipal WASH services, and are unaware of existing grievance mechanisms, water tariffs, or infrastructure plans. Hence, improving transparency was seen as the most immediate enabler of citizen action and accountability.
- Accountability (A) followed as the second-highest criterion, with relative scores of 1/2, 2, and 3. Community stakeholders and NGO staff emphasized the absence of mechanisms to track complaints, assign responsibility, or sanction poor service. Although accountability is structurally more complex than transparency, it was still seen as operationally critical for sustainable improvements.
- Participation (P) was ranked lower, despite being acknowledged as important. With values such as 1/3 and 1/2 against T and A, participation was judged to be less influential, primarily due to systemic barriers—including informal land tenure, weak legal recognition, and limited space for meaningful engagement. Stakeholders noted that community input is often tokenistic or restricted to NGO-led forums.
- Anti-Corruption (A2) was rated the lowest (receiving 1/4, 1/3, and 1/2 against other criteria), despite its acknowledged significance. The rationale was its perceived intractability—corruption often manifests in informal settlements in subtle or embedded forms (e.g., political favouritism, informal payments to secure connections). Residents reported a sense of powerlessness and risk in confronting such issues. As a result, anti-corruption efforts were seen as indirect and long-term goals, less actionable than the other dimensions.

Construction of Pairwise Comparison Matrix:

To assess the relative significance of the four core water integrity dimensions—Transparency (T), Accountability (A), Participation (P), and Anti-Corruption (A2)—the study employed the Analytic Hierarchy Process (AHP) developed by Saaty (1980). AHP provides a structured technique for organizing and analysing complex decisions based on pairwise comparisons and eigenvalue-based priority ranking. The method is particularly suited for multi-criteria decision-making problems, such as evaluating governance attributes in complex, informal urban contexts.

(AHP provides a structured technique for organizing and analysing complex decisions based on pairwise comparisons and eigenvalue-based priority ranking.)

A 4 × 4 pairwise comparison matrix $A=[a_{ij}]$ was constructed to quantify the relative importance of each criterion in the context of WASH integrity in informal settlements of Khulna. Each element a_{ij} in the matrix represents the judged importance of criterion i relative to criterion j, based on Saaty's 1–9 scale, where:

- 1 implies equal importance,
- 3 indicates moderate importance,
- 5 reflects strong importance,
- 7 denotes very strong importance, and
- 9 implies extreme importance.

Reciprocals (e.g., 1/2, 1/3) are used when i is less important than j.

The matrix was populated using stakeholder consultation data, including focus group discussions (FGDs) conducted with CBO members and youth groups in Montu Kaloni and Nurani Mahalla. Insights were triangulated with the perceptions of local communities and service officials. The judgments are as follows:

Table 5: AHP matrix for assessment of weightage of TAPA tool in WASH integrity

Criteria	Transparency (T)	Accountability (A)	Participation (P)	Anti-Corruption (A2)
Transparency (T)	1	2	3	4
Accountability (A)	1/2	1	2	3
Participation (P)	1/3	1/2	1	2
Anti-Corruption (A2)	1/4	1/3	1/2	1

Computation of Priority Vector:

Step 1: Column-wise Normalization

Each element a_{ij} is divided by the sum of its column:

Table 6: Computation of priority vector

Criteria	T (Σ=2.083)	A (Σ=3.833)	P (Σ=6.5)	A2 (Σ=10)
T	0.48	0.522	0.462	0.40
A	0.24	0.261	0.308	0.30
P	0.16	0.130	0.154	0.20
A2	0.12	0.087	0.077	0.10

Step 2: Priority Vector (Eigenvector)

The row-wise average gives the weights (W):

- w_1 (T) = (0.48 + 0.522 + 0.462 + 0.40) / 4 = 0.466
- w_2 (A) = (0.24 + 0.261 + 0.308 + 0.30) / 4 = 0.277

- w_3 (P) = (0.16 + 0.130 + 0.154 + 0.20) / 4 = 0.161
- w_4 (A2) = (0.12 + 0.087 + 0.077 + 0.10) / 4 = 0.096

Assessment of Consistency:

To ensure the validity of judgments, the Consistency Index (CI) and Consistency Ratio (CR) were assessed.

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{4.053 - 4}{3} = 0.0177$$

$$RI_{(n=4)} = 0.90 \quad \Rightarrow \quad CR = \frac{CI}{RI} = \frac{0.0177}{0.90} \approx 0.0197$$

Since CR < 0.10, the matrix is consistent.

Scoring of Integrity Issues:

A 'Likert scale' format is used to design the survey questions, and the indicator-specific standardized score (1-10) is calculated from participants' responses (Joshi et al., 2015). In this study, the 'Likert scale' is categorized into five classes: Very low (1), Low (2), Medium (3), High (4), and Very high (5). Questionnaires are prepared to identify the score of integrity issues in the WASH sector based on the TAPA tool. Increase in the score of integrity deficiency refers to the decrease in WASH status.

$$X'_{ij} = X_{ij} \times \text{'Likert scale' value} \qquad (i[1,m], j[1,n]) \qquad (1)$$

Where, X_ij^' = 'Likert scale' generated score of ith indicator under jth integrity issue having 'likert scale' value n; X_ij = Number of respondent under ith indicator; m = number of indicator; n = 'likert scale' value (1-5)

$$\text{Standardized score, } S_{ij} = \frac{N_{ij}}{N} \times 10 \qquad (2)$$

$$N_{ij} = \sum_{j=1}^{j=n} X'_{ij} \qquad (3)$$

Where, Sij = Standardized score (1-10) of ith indicator for jth integrity issue and Nij = Summation of 'likert scale' based score of ith indicator under jth integrity issue having 'likert scale' value n

$$N = \text{Highest rank of response}(5) \times \text{Total respondent}\ (40) \qquad (4)$$

$$\text{Integrity deficiency, } I_{ij} = S_{ij} \times W_{(T,A,P,A2)} \qquad (5)$$

Where, Iij = Integrity deficiency (0-10) of ith indicator for jth integrity issue and W_((T,A,P,A2))= AHP based weightage value of TAPA tool

APPENDIX 3: EXISTING INTEGRITY ISSUES AND INTEGRITY DEFICIENCY SCORING

Issue 1:

KWASA has to convince 'local political groups (Member, City Mayor)' to ensure new supply connections in the disputed informal settlement areas (e.g.- informal settlements in Khulna Railway area).

Table 7: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 1

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni	Transparency	Member, City Mayor	Legal documents	Legal 'Policy framework'	Very high (5)	40	4.66
	Accountability	Member, City Mayor	Aware of public rights	Effective measure	Medium (3)	40	1.66
				Response	Very high (5)	40	2.77
	Anti-corruption	Member, City Mayor	Access	Political relation	Very high (5)	40	0.96
							∑=10.05

Issue 2:

Conflict between KWASA and the Railway Authority for providing KWASA supply line.

Table 8: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 2

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni	Accountability	KWASA	Legal documents	Legal 'Policy framework'	High (4) Medium (3)	27 13	2.04
	Participation	KWASA	Legal rights	Legal 'Policy framework'	High (4)	40	1.29
	Accountability	KCC, KDA	Legal documents	Legal 'Policy framework'	Very high (5)	40	2.77
	Participation	KCC, KDA	Legal rights	Legal 'Policy framework'	Very high (5)	40	1.61
							∑=7.71

Issue 3:

Informal people are unaware of the application procedure for the KWASA supply connection.

Table 9: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 3

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni	Accountability	KWASA	Advertisement of KWASA service facilities	Public meeting, announcement, poster, leaflets, miking	Very high (5)	40	2.77
	Accountability	Community people	Aware of KWASA facilities	Literacy	Very high (5)	40	2.77
				Awareness	Very high (5) High (4) Medium (3)	19 13 8	2.37
							$\sum$ =7.91

Issue 4:

Indiscriminate use of the submersible water supply system.

Table 10: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 4

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni, Nurani Mahalla	Accountability	KWASA	Rules and regulations	Application	Very high (5)	40 (M), 40 (N)	2.77 (M), 2.77 (N)
Montu Kaloni	Accountability	KWASA	Service area	Households under KWASA supply connection	Very high (5)	40	2.77
Nurani Mahalla	Accountability	KWASA	Service area	Households under KWASA supply connection	High (4) Medium (3)	16 24	1.88
Nurani Mahalla	Accountability	KWASA	Water Quality	Consumer satisfaction	Very high (5)	40	2.77

				Repair and Maintenance	Very high (5)	40	2.77
							∑ =12.96

Issue 5:

Have to pay a high charge to 'third party' to ensure safe water.

Table 11: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 5

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni, Nurani Mahalla	Transparency	Third party service provider	Rules and regulations	Consumer friendly price set	Very high (5) High (4)	21 (M), 32 (N) 19 (M), 8 (N)	4.22(M), 4.47(N)
Montu Kaloni, Nurani Mahalla	Accountability	Third party service provider	Cost	Unit price	High (4) Medium (3)	28 (M), 40 (N) 12 (M)	2.05(M), 2.22(N)
							∑ =6.27(M)=6.69(N)

Issue 6:

People in Nurani Mahalla don't know 'where and to whom' complaints have to be submitted regarding issues of KWASA supply.

Table 12: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 6

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Nurani Mahalla	Accountability	KWASA	Advertisement of KWASA service facilities	Public meeting, announcement, poster, leaflets, miking	Very high (5)	40	2.77
	Accountability	Community people	Aware of KWASA facilities	Literacy	Very high (5)	40	2.77
				Awareness	High (4) Medium (3)	17 23	1.90

	Participation	Community people	Interested to attend dialogue session in KWASA	Attendance	Very high (5)	40	1.61
							∑ =9.05

Issue 7:

No maintenance of existing water sources

Table 13: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 7

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni	Accountability	NGOs	Monitoring of provided water sources	Water quality test	Very high (5)	40	2.77
							∑ =2.77

Issue 8:

No management of sludge

Table 14: TAPA tool-based score of integrity deficiency - specific indicators of integrity issue 8

Location	Respective TAPA tool	Responsible Stakeholder	Indicator	Parameter	'Likert scale (1-5)' based Integrity deficiency	Respondent	Score of Integrity deficiency
Montu Kaloni	Accountability	NGOs	Sludge management	Direct connection of latrine to water sources	Very high (5)	40	2.77
							∑ =2.77