JOURNAL OF POLITICAL STABILITY ARCHIVE

Online ISSN: 3006-5879 **Print ISSN:** 3006-5860

DOI: https://doi.org/10.63468/jpsa.4.2.41

Vol. 4 No. 2 (2026)

https://journalpsa.com.pk/index.php/JPSA/about

Recognized by: Higher Education Commission (HEC), Government of Pakistan

Governance and Management of Indus Water Supply in Karachi: Identifying Bottlenecks and Solutions

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ABSTRACT

This study examines governance and management challenges in the Indus water supply system in Karachi, a megacity facing severe water scarcity despite major institutional reforms. Drawing on qualitative analysis of policy documents, media reports, and performance data (2023–2026), the research identifies structural, political-economic, and technical bottlenecks that hinder effective service delivery. Key issues include institutional fragmentation, weak inter-agency coordination, aging infrastructure, and high levels of non-revenue water. The persistence of illegal hydrant networks and tanker mafias, supported by political and bureaucratic interests, exacerbates inequitable distribution and undermines reform efforts under the Karachi Water and Sewerage Corporation (KWSC) Act 2023. The findings reveal a significant gap between policy intentions and implementation outcomes, highlighting governance failures rather than physical scarcity as the core problem. The study proposes integrated reforms focusing on institutional clarity, transparency, anti-theft enforcement, infrastructure investment, and community-based and technological innovations to improve water governance and ensure equitable access.

Keywords: Water governance, Karachi, Indus water supply, KWSC Act 2023, water scarcity, tanker mafia, institutional fragmentation, non-revenue water

INTRODUCTION

Background and Context

The largest city in Pakistan and the only economic center is Karachi, which houses a population of more than 20 million people in an area of about 3,780 square kilometers and generates nearly half of the national tax revenue and a quarter of GDP (Hassan, 2019). However, this megalopolis has suffered an endemic water crisis, which is essentially a principal cause of poor health, economic performance, and social injustice. The city is virtually a recipient of the Indus River system, fed by the Keenjhar Lake (Kalri Lake) and Hub Dam, and the installed capacity is about 650 million gallons per day (MGD) versus an estimated demand of 1,100-1,200 MGD (AIIB, 2025). This almost 50% supply-demand imbalance makes Karachi one of the most water-stressed megacities in the world, on par with Cape Town in its Day Zero crisis and worse than Mumbai or Dhaka.

Most importantly, half of the households in Karachi are not connected to the piped water system, meaning that around 10 million people living there do not have access to piped water, which is costly and unreliable instead of tanker water (Express Tribune, 2026a). These households pay 5-10 times higher than related households, and tanker water is often of questionable quality. The other 52 percent with ties are intermittently supplied, usually just a few hours per week in underserved districts, and various hours per day in more privileged districts. Such duality of piped and tanker supply contributes to deep inequality: the rich households invest in storage tanks, booster pumps, and household treatment, whereas the poor households waste their time on water transportation and encounter waterborne diseases.

Institutional fragmentation, political interference, and underinvestment have long been the hallmarks of water governance in Karachi. The Karachi Water and Sewerage Board (KWSB) had a history of forty years of limited independence, poor cost recovery, crumbling infrastructure, and increased encroachments by informal water vendors (Hassan, 2019). The chairpersons of boards would shift with political regimes, compromising institutional continuity. The technical capacity was also dropping due to the loss of experienced staff who were retiring without a replacement. The amount of revenue collected was less than the costs of operation, which made the provincial government reliant on subsidies. Non-revenue water, which is a sum of physical losses through leakage and commercial losses through theft and unbilled consumption, was estimated at 35-40 in 2022, and this is one of the highest in South Asia (AIIB, 2025).

Reform Moment: KWSC Act 2023.

As a reaction to the ongoing governance failures, in March 2023, the Sindh government replaced the KWSB with the Karachi Water and Sewerage Corporation Act (KWSC Act 2023), making it a corporate body with greater autonomy, professional board governance, financial autonomy, and specialized dispute resolution procedures (KWSC Act, 2023). The Act is the biggest institutional change in the history of Karachi in its water sector, which is consistent with the international good practice of utility corporatization.

Some of the major provisions of the KWSC Act 2023 are: KWSC is an established body corporate with perpetual succession; KWSC board of directors with the Mayor as Chairman, independent members of professional expertise and relevant government officials; Water and Sewerage Fund to ensure financial autonomy; powers to impose tariffs, borrow funds, and to retain revenues; powers to enforce regulations against water theft and illegal connections; and a

The Act was hailed by policymakers and development partners as a watershed moment. Asian Infrastructure Investment Bank then gave a go-ahead of USD 240 million to Karachi Water and Sewerage Services Improvement Project (KWSSIP-2) as a way of assisting KWSC to institutionalize and rehabilitate its infrastructure (AIIB, 2025). The Sindh government spent more resources on the rehabilitation of the Hub Canal and other priority investments. Mayor Murtaza Wahab, who was the Chairman of KWSC, promised to make the corporation into a model institution (The News, 2025).

The Implementation Paradox

In spite of this grandiose reform agenda, the Indus water supply in Karachi is still marred by bottlenecks in governance. Current trends indicate that there is a sharp paradox of policies proclaimed at the top levels not turning into better service delivery because of the deep-rooted barriers that exist across institutional, political-economic, and technical levels.

In January 2026, Mayor Wahab publicly acknowledged that water theft by illegal hydrants is a tanker mafia who rob the city of water and intends to shut down all seven active hydrants whose contracts have expired (Express Tribune, 2026a). He revealed that 41 percent of the government water supply is being illegally tapped through these networks, resulting in a loss of millions of revenues every month and denying citizens their rightful portion. He admitted that the hydrant mafia has a hidden support of powerful political units and a colluding bureaucracy (Express Tribune, 2026a). This confession of the highest elected official of the city confirmed what civil society had been claiming.

However, in the following weeks, the Sindh High Court was flustered that residents of Orangi Town, who are in a working-class neighborhood with a population of about 2.5 million, do not have piped water, despite decades of living in a city. Tankers provided by illegal hydrants continue to operate freely across Karachi (Express Tribune, 2026b). In a hearing in February 2026, Justice Muhammad Junaid Ghaffar challenged the counsel of KWSC: Why are you not providing water to the people? Mayor Sahib has guaranteed to provide water using pipelines. Water is being purchased. Tankers are wandering around the city. Where can they get water? (Minute Mirror, 2026b). The court pointed out the contradiction when KWSC mentioned the scarcity of upstream water; tanker operators were receiving water in plenty, yet pipelines were dry. Justice Ghaffar noted that water is intentionally redirected in pipelines to tankers to the advantage of the hydrant mafia, at the expense of citizens (Express Tribune, 2026b).

The governance dilemma is epitomized by this contradiction of officially admitting to stealing things and promising to change, but being found guilty of the same acts in court. Senior levels of expression of political will are met with resistance by the vested interests within the system. The political economy is made up of the hydra-headed mafia, tanker operators, corrupt officials, and their political patrons, who make money out of scarcity and do not want to be transparent and equitable.

The Size of the Crisis

The failures of governance are measured by empirical data. The December 2025 complaint resolution data, published by KWSC and disclosed by mayoral oversight initiatives, shows some dramatic differences: whereas 75% of 27,912 complaints were investigated within 24 hours throughout the city, District West had only 37% (2,170 complaints, 807 resolved) (Express Tribune, 2026c). District Central took 10,927 complaints and closed 8,038 (74%). These numbers bring up core questions of operational capacity and responsibility: Does District West have lower complaints since their supply is more or since the systems to complain are not available? The fact that the rate of resolution is low implies the latter, which means that citizens in certain regions are unable to adequately demand service.

Governance failures are aggravated by infrastructure shortages. The K-IV augmentation project, which is to add 260 MGD, was approved many decades ago and is still not completed because of land acquisition issues, funding sources, and inter-agency tensions (AIIB, 2025). The Hub Canal needs rehabilitation; it was budgeted in 2025-26 with a budget of Rs3.1 billion, and its implementation is slow (Minute Mirror, 2025). The distribution networks, most of which were constructed 40-60 years ago, are prone to breakdowns and leakages of 35% (AIIB, 2025). Power failures interfere with pumping, and the supply is further diminished.

Social costs are disastrous. People living in Orangi Town, North Karachi, and other underserved regions spend hours every day collecting water, which can be spent in other productive ways like education, employment, or care. Women and girls are the main victims of this water collection as they continue to perpetuate gender inequality. Contaminated supply leads to waterborne diseases that result in morbidity and mortality, especially in children, which are preventable. The worst quality of water is sold at the greatest price to the poorest households, which is a retrogressive result of governance failure.

Emerging Responses

Nevertheless, there have been several reform efforts and new solutions to these problems. The KWSC Act 2023 in itself offers an enabling framework. The PPP Unit has introduced the first seawater desalination project (5 MGD) in Pakistan on the basis of a public-private partnership with transaction advisors and international companies showing interest (PPP Unit, 2025). Smart water meter research, which offers the first daily-scale consumption data, has shown that per capita consumption is much less than water utility estimates, and that Friday consumption peaks and temperature limits (Journal of Hydrology: Regional Studies, 2025). A local startup, Asani.io, has created IoT-powered automation solutions deployed in more than 1,000

households, which can start a motor when water is turned on, to save waiting time and unfairness (CB Insights, 2024).

Community-based programs show other ways. Water-Aid also worked with PepsiCo Foundation on the Urban Water Initiative (2022-2025), which involved installing filtration systems in disadvantaged settlements and setting up water user committees to ensure sustainability (APP, 2025a). The installation of submersible water pumps to serve 200 people per day in North Karachi by Anosh Foundation proved the power of community-managed systems (APP, 2025b). Although these bottom-up innovations are small-scale in comparison to the need, they provide scaling models.

Research Questions and Objectives

The current paper is based on three related research questions:

1. What are the major governance and management issues that impact Karachi's Indus water supply?
2. What are the effects of institutional inefficiencies, corruption, and water distribution?
3. Which reforms and solutions will enhance governance and management of the Indus water supply?

The research objective is to: discuss structural and operational bottlenecks in the Karachi water governance; investigate political economy drivers that facilitate water theft and unfair distribution; assess recent reforms like the KWSC Act 2023; record technological and community-based innovations; and propose empirically grounded solutions based on empirical evidence in 2023-2026.

Importance of the Research

The study makes its contribution to the body of research on urban water governance in South Asian megacities by offering empirical evidence on governance bottlenecks in a recently reformed institutional environment of Karachi. The research is up-to-date, as it reflects the progress in the first three years of KWSC functioning (2023-2026), such as mayoral theft admissions, court involvement, PPP, and technology innovations. Its results provide effective guidelines to policymakers, development partners, and civil society organizations in their water sector reform efforts in Pakistan and elsewhere that have similar political climates, with fragmented governance, strong vested interests, and pressing service delivery demands.

The paper also helps in wider theoretical discussions on institutional reform in situations of political economy capture. The Karachi case demonstrates how legal-institutional reform, even ambitious corporatization, can be sabotaged without strategies complementing it to deal with vested interests, establish accountability, and empower citizens. The discussion of the new technological and community-driven solutions presents a reflection of bottom-up solutions that can be used to supplement the top-down reform.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Urban Water Governance: Theoretical Perspectives

The concept of water governance refers to the political, social, economic, and administrative frameworks that shape the way water is used and managed, as opposed to water management, which deals with operational decisions on water allocation and distribution (Rogers and Hall, 2003). According to the Organisation for Economic Co-operation and Development (OECD), transparency, accountability, participation, efficiency, and effectiveness are some of the key governance principles that are needed to ensure sustainable water resource management (Vorathumdusdee, 2024). These principles offer a normative guideline for evaluating the performance of institutions in urban water supply.

Failures in governance in water supply in urban areas are often in the form of a principal-agency problem where utility managers (agents) are acting against the interests of citizens and government principals (World Bank, 2004). In a recent analysis of the Sustainable Groundwater Management Act in California, it has been shown that governance platforms are inherently based on principal-agent tensions as local responses to local political economic circumstances, where it was discovered that local plans can be more responsive to local political economic conditions instead of addressing the groundwater problems that the state is prioritizing (NSF, 2025). This clash between central policy objectives and local practice is very familiar to the situation in Karachi, where the formal KWSC mandate in the 2023 Act faces local interests of the existing order that are hard to break. The analysis of political economy shows that vested interests, such as informal water vendors and politically related elites, expropriate water revenues and oppose any reforms that would enhance equity but jeopardize their rents (Davis, 2004). The hydraulic bureaucracy has a grip on power and dominates water infrastructure in cities of most developing countries, where informal vendors provide services that the system fails to deliver, at exploitative rates (Anand, 2017). This two-tier system reinforces inequality: affluent households can afford to stock up and use reliable water at storage and private connections, whereas poor households pay more per liter of lower-quality water at tanker-delivered water-sellers-vendors-piazza, where 48% of households are still not connected (Express Tribune, 2026a).

The Sanitation and Water for All partnership underlines that democratic governance must exist between planning and budgeting and service delivery, and it has four elements: government leadership and ownership; developing and using national systems; using information systems and being accountable; and building sustainable financing strategies (Sanitation and Water for All, 2025). Their Mutual Accountability Mechanism shows how governments can unilaterally establish commitments with partner assistance, establishing transparency and a sense of responsibility to improve. This framework can be useful as it provides benchmarks to evaluate the governance architecture of KWSC.

Water Governance in Megacities of Developing Countries

Megacities of South Asia have similar issues when it comes to governing water and have contextual peculiarities. A detailed edited book about peri-urban water security in South Asia explores the (in)security of water in Dhaka and Khulna (Bangladesh), Bengaluru, Gurugram, Hyderabad, Kolkata, and Pune (India), and Kathmandu Valley (Nepal) in the context of urbanization (Narain and Roth, 2022). The study illustrates how the processes of urbanization fundamentally change the water flows between urban and rural places and establish new institutions and technologies that mediate relations between peri-urban populations and water. These results emphasize the idea that water governance cannot be seen as an infrastructure-only concept but needs to include the social and political processes that determine access.

The water utility of Dhaka serves just a quarter of the population directly, with the rest relying on groundwater abstraction and informal traders (Akbar et al., 2007). Dhaka Water Supply and Sewerage Authority has sought institutional reforms such as corporatization and performance contracting, but is plagued by the inability to stop groundwater depletion and network expansion constraints. The study of Dhaka slum residents shows that the poor are disproportionately affected by water pricing practices as informal vendors charge 5-10 times the official prices (Ray and Shaw, 2019)

The inequities caused by the intermittent supply system, which is an inheritance of the colonial infrastructure system, continue to place a strain on households who are compelled to invest in the storage tanks, pumps, and household-level treatment (Anand, 2017). Anand's ethnographic study presents the formula of hydraulic citizenship, which is access to water as a result of political identification and negotiation with the state structures, instead of the technical infrastructure. This theoretical prism sheds light on the situation in Karachi, whereby Orangi Town residents are still not linked after decades of living in an urban area, implying that they are marginalized politically, which enhances technical infrastructure shortages.

The groundwater research of megacities in South Asia has shown that urbanization has had an extreme effect on the quantity and quality of groundwater. Urbanization in Delhi and Dhaka has led to a decrease in the groundwater level due to excessive overexploitation, whereas in Karachi and Mumbai coastal regions, coastal water pollution has been enhanced by the closeness to the seawater, in addition to the growing population (Haque et al., 2013). Toxins such as chlorides and nitrates turn out to be the primary anthropogenic toxins that are linked with urbanization, and this illustrates the manner in which reliance on groundwater forms latent weaknesses.

Lahore is experiencing the same issues with groundwater depletion and restrictions on network development, where urbanization is rapidly improving without investing in infrastructure (Qureshi, 2020). Lahore Water and Sanitation Agency has also tried public-private partnerships and community-based strategies, but there are areas of coverage gaps. These examples indicate that the technical

solutions are not sufficient to solve the failures in governance; institutional reforms with a focus on accountability, transparency, and political economy are crucial.

A recent paper that uses the Coupled Infrastructure Systems (CIS) framework for the urban water systems in the Phoenix metropolitan area shows how the incorporation of political-economic feedback in dynamic models of infrastructure systems has been lagging in operational feedback issues (Wiechman et al., 2024). The study reveals that institutional friction - aggregate decision and transaction costs of action- can substantially impact system performance. The sensitivity of a city supply to external shocks may be enhanced by the fact that the slowing effect of institutional friction on both investment and rate-setting decisions can place a premium on the importance of considering political-economic and operational feedback jointly. This framework can be used to analyze the delays in investment and the lack of infrastructure in KWSC.

Water Governance Institutional Framework in Pakistan

The 18th Constitutional Amendment (2010) decentralized the water supply to the provinces, and the Sindh government became the major provider of urban water services (Ahmed, 2015). Before devolution, the supply of water was a federal responsibility, which posed coordination problems between federal and provincial authorities. Devolution meant that provinces had constitutional powers to make laws about water, although some provinces had much greater capacity to do so.

The ordinances of local government also allocate local roles to city districts and metropolitan corporations, establishing complicated multi-tiered systems. The Sindh Local Government Act 2013 created metropolitan corporations in charge of water supply and sanitation, which were later derailed by amendments and political shifts (Cheema et al., 2017). The interaction between provincial government, metropolitan corporation, and water utility continues to be disputed, and overlapping mandates facilitate blame-shifting and a lack of accountability.

The Karachi Water and Sewerage Board (KWSB) into Karachi Water and Sewerage Corporation (KWSC) under the KWSC Act 2023 is an effort to establish an autonomous, professionally run utility with corporate governance structures (KWSC Act, 2023). This reform is in line with international trends of utility corporatization to enhance efficiency and accountability. Nevertheless, the governance platform literature warns that the principal-agent rationales of incompatible preferences and asymmetric information may have an impact on the structure and execution of such reforms (NSF, 2025), implying that it is not possible to ensure an increase in performance through legal transformation without addressing the structural incentives.

Water Governance Transparency and Accountability

Transparency in water governance has become an important concept in modern-day scholarship. According to the Sustainability Directory, it is defined as the institutional determination of ensuring that all the data, decision-making, and performance measures concerning water resource management are available, comprehensible, and actionable to all stakeholders (Sustainability Directory, 2025).

This openness works on multiple levels: the availability of data (the periodic publication of hydrological and usage indicators), the readability of decisions (the transparent description of the reasons why changes are made to the policy), and accountability (the presence of ways through which citizens can dispute decisions).

The theoretical basis is based on information theory and complexity science, in which system resilience is negatively proportional to informational entropy in the control structures of the system (Sustainability Directory, 2025). In the event of withheld data, the system would automatically switch to worst-case scenario planning, which causes hoarding, escalation of conflicts, and inefficient use of resources. This structure sheds light on the Karachi scenario, where there is little information to the public on the district-level complaint resolution (Express Tribune, 2026c) and hydrant contracts (Express Tribune, 2026a), allowing malpractice to persist.

The OECD Principles on Water Governance underline the idea that transparency should be supplemented with the involvement of stakeholders in decision-making and collective responsibility (Vorathumdusdee, 2024). The User Guide of Assessing Water Governance by the UNDP offers useful models of assessing the performance of governance on various dimensions (UNDP, 2013). Such international structures provide guidelines through which the governance of Karachi can be evaluated.

Urban Political Ecology of Water Infrastructure

New urban political ecological studies look at water infrastructure as a nexus of new and complicated social-nature relationships. An in-depth search of 157 English-language articles (1987-2024) has revealed various analytical paths: a political economy analysis based on Marxist views, micro-political analysis based on post-structuralist views, and everyday practice analysis based on post-humanist views (Wang and Xu, 2025). All these approaches lead to the realization of the fact that water infrastructure, through which complex processes of power and informal forms of governance are manifested, determines unequal service delivery.

This literature critically looks at how the capitalist systems create and perpetuate the unequal provision of ecological services and unequal urban living conditions (Wang and Xu, 2025). The emphasis on informal governance practice is especially applicable to Karachi, where hydrant mafia activities and expired contracts (Express Tribune, 2026a) are extra-legal yet established practices. The urban political ecology offers the theoretical means of examining the creation and maintenance of such arrangements despite formal prohibitions.

Analytical Framework

This paper uses a synthesized analytical framework that looks at governance using four dimensions that are synthesized based on the literature:

Accountability: Systems of ensuring that officials are accountable for performance, such as electoral accountability, administrative accountability, and judicial accountability (UNDP, 2004). One of the considerations is the principal-agent dynamics and institutional friction (Wiechman et al., 2024; NSF, 2025).

Transparency: The access of citizens to information regarding decisions, performance, and outcomes, including data accessibility, decision transparency, and easy access to complaint channels (Sustainability Directory, 2025).

Participation: Stakeholders are involved in the decision-making process, which includes formal consultation and informal mobilization of communities (Sanitation and Water for All, 2025; Vorathumdusdee, 2024).

Effectiveness: Institutional capability to execute the policy objectives, such as technical capacity, financial sustainability, and the state of infrastructure (Rogers and Hall, 2003).

In this framework, the three levels of governance bottlenecks are examined: Structural level: Law, institutions, coordination, resource allocation - looking at how the KWSC Act 2023 architecture is doing in relation to design goals.

Political-economic level: Vested interests of major actors, incentive schemes, rent-seeking possibilities, and obstructions to reform, based on political economy (Davis, 2004) and urban political ecology (Wang and Xu, 2025), to comprehend hydrant mafia persistence.

Technical-Operational: Infrastructure state, data systems, human capacity, and technological tools - how institutional friction (Wiechman et al., 2024) influences investment and maintenance decision-making.

This multi-level model allows thorough diagnosis of governance bottlenecks and locating leverage points to reform based on theoretical understanding of principal-agent theory, political economy analysis, and urban political ecology, but is sensitive to the Karachi institutional situation.

RESEARCH METHODOLOGY

This research paper uses a qualitative case study methodology to investigate the bottlenecks in governance and management of the Indus water supply system in Karachi. The case study approach suits exploring modern phenomena in a real-life situation in which a distinction between the phenomenon and the context cannot be easily observed (Yin, 2018). The study uses only secondary sources of qualitative data, such as legal and policy documents (especially the KWSC Act 2023), KWSC performance reports, news media articles on the topic published in major Pakistani outlets (ARY News, Express Tribune, The News) from 2023 to 2026, the grey literature of the Sindh PPP Unit and development organizations, and technical research on smart The analysis of data uses thematic analysis in the steps outlined by Braun and Clarke (2006), which is familiarization, coding, theme development, and interpretation. Multi-source triangulation increases validity, and gap analysis is a comparison between policy frameworks and implementation outcomes. Disadvantages are relying on publicly available data and the fast-changing policy environment.

Indus Water Supply in Karachi Governance and Management Framework

Water Governance in Karachi: History

The water governance structure in Karachi has passed through various periods

in history, each with its own institutional heritage that defines modern arrangements. The establishment was initiated during the British colonial rule when the first modern water supply project was implemented in the city in 1883, which used the Indus River at Kotri and carried the water through the 120 miles of pipeline (Hassan, 2019). Such infrastructure predetermined the sustained Karachi reliance on remote water resources- a geographical fact that still determines the governance issues.

Infrastructure development in the post-independence period continued in a series of plans: the Greater Karachi Water Supply Scheme (1950s-1960s) augmented the supply capacity and extended the networks to expanding residential areas. The K-II project (1970s) added 100 MGD, followed by K-III (1990s), adding another 100 MGD. Every expansion was governed by the changing institutional forms, between municipal department and semi-autonomous board status under Karachi Water and Sewerage Board (KWSB), which was instituted in the 1980s. The KWSB period (1980s-2023) was marked by institutional instability and poor performance. The continuity of institutions and long-term planning were weak because the term of the board chairpersons changed every time the political administration changed (average of less than two years) (Hassan, 2019). Political appointments were based on loyalty rather than technical skills, undermining professional ability. The revenue collection was less than the expenses of operation, hence it relied on provincial government subsidies that came in at an irregular rate and with political conditionalities. The infrastructure fell into disrepair with backlogs of maintenance; by 2022, the Asian Infrastructure Investment Bank had estimated physical losses at 35% (AIIB, 2025).

More importantly, the period of KWSB saw the institutionalisation of the informal water markets. Since piped supply was becoming less and less reliable, tanker operators came into the scene to fill the gap, stealing water through rogue hydrants that were connected to transmission lines. These operators established political networks that helped to protect them against prosecution, forming the hydrant mafia that Mayor Wahab would later admit to looting the water of the city (Express Tribune, 2026a). By 2023, it is estimated that 48 percent of households were relying on tanker water, which they paid 5-10 times official prices (Express Tribune, 2026a).

Legal and Institutional Architecture under the KWSC Act 2023

The Karachi Water and Sewerage Corporation Act 2023 (Sindh Act No. XVIII of 2023) is the largest institutional change that has taken place in the history of the sector. The Act, which was passed in March 2023, changes KWSB into a body corporate, with greater autonomy and professional governance frameworks and dispute resolution mechanisms. The reform is in line with the global trends of utility corporatization, which is supposed to enhance efficiency and accountability (World Bank, 2019).

The legal status and corporate governance are as follows:

The Corporation is defined in section 3 of the KWSC Act as a body corporate with perpetual succession, common seal, and with the power to purchase, retain, and dispose of property, and shall, by the name, be sued and sued. 3) This corporate status allows legal personality independent of government, allowing independent

contracting, borrowing, and retaining revenue, which is a limitation of the previous board structure, where funds were subject to treasury rules by the government.

The governing body is a board of directors, established by the Act, and it consists of:

- As Chairman, the Mayor of Karachi.
- A Sindh government-appointed Vice Chairman.
- Managing Director (CEO) of KWSC.
- Secretaries of the Sindh government's Local Government, Finance, and Planning & Development departments (or their nominees)
- Sindh government appointed four independent directors who are professionally qualified in engineering, finance, management, and law, at the recommendation of the Chairman (KWSC Act, 2023, s. 5)

This form of board is a bid to strike a balance between politics (mayoral chairman) and professional autonomy (independent directors). There is, however, a potential conflict of interest in the mayoral chairmanship: the same person is chairing the corporation and the metropolitan corporation, which may cause a mix of oversight and operations (The News, 2025).

Financial Autonomy

One of the innovations that is critical is the creation of a Water and Sewerage Fund in Section 10 of the Act. The Fund is a collection of all revenues, such as water charges, government grants, loans, and donations, and it is managed by the board. Most importantly, the funds are not to lapse at the end of the financial year and can be stored to make investments in the future (KWSC Act, 2023, s. 10(3)). This is in response to the earlier practice in which unspent funds would revert to the government, thereby generating a perverse incentive to spend towards the year-end, instead of accumulating reasonably.

The Corporation has the power to decide, charge, and collect rates, charges, fees, rent, tariffs, and other charges and dues related to water and sewerage services (KWSC Act, 2023, s. 20). Board ratification, but not provincial government ratification, is needed to set tariffs, allowing greater flexibility in pricing. Nevertheless, politically sensitive tariff changes are still limited due to the political considerations of mayors and boards.

Regulatory and Enforcement Powers

The Act provides KWSC with overall regulatory power. Section 18 would allow the Corporation to act in order to prevent water theft, illegal connections, and misuse of water. Specific offenses include:

- Destruction or interference with water works (punishment: up to three years in prison and/or fine up to Rs 500,000)
- Theft of water (penalty: up to two years imprisonment and/or fine)
- Hindering Corporation employees (penalty: fine up to Rs 50,000)
- Unauthorized connection (fine and at the expense of the consumer) (KWSC Act, 2023, s. 26)

These provisions have some legal teeth that were not there in the past frameworks. But implementation needs an operational capacity and political goodwill, both of which are limited historically. The January 2026 KWSC-Rangers operation destroying a 48-inch illicit conduit shows that it can be enforced should political backing be in place (Pakistan Observer, 2026a).

Dispute Resolution Mechanisms

Section 29 sets up a Water and Sewerage Tribunal to resolve disputes between KWSC and consumers, complaints against KWSC decisions, and offences involving the Act. The Tribunal consists of a chairperson who is a judicial expert and two members who are technical experts. The decisions of the tribunals can be appealed to the High Court.

More importantly, as of February 2026, the Tribunal is yet to be operationalized. There are no appointments, no rules of procedure drawn up, and no cases adjudged. This gap in implementation implies that dispute resolution will still be in regular courts, which are already overburdened and do not have specialized expertise. This institutional deficiency is partially manifested in the direct role of the Sindh High Court, including in cases of water, such as the Orangi Town petition (Express Tribune, 2026b).

Critical Stakeholders and Roles

Although KWSC has an increased mandate, the stakeholder environment is still disjointed, with various players having overlapping authority.

Karachi Water and Sewerage Corporation

KWSC is charged with the main responsibility of water production, transmission, distribution, billing, and customer service in most parts of Karachi. The Corporation has an approximate of 8,000 employees as well as:

- 2 large treatment plants (Dhabeji and Hub)
- 14 pumping stations
- More than 8,000 km of pipes.
- A great number of service reservoirs and balancing tanks (AIIB, 2025)

The area served by KWSC does not include cantonment boards, DHA jurisdictions, but includes the rest of the about 80 percent of the Karachi population. Under the new Act, the Corporation has a Managing Director/CEO, Salahuddin Ahmed, who has implemented visible reforms such as improving the complaint centers and anti-encroachment operations (Pakistan Observer, 2024; The News, 2025).

Karachi Metropolitan Corporation

Karachi Metropolitan Corporation (KMC) still holds major water-related functions, although KWSC was established. At one time, KMC was the mother organization of KWSB, and the shift to KWSC has not completely demarcated institutional lines. KMC continues to:

- Invest in water infrastructure development (Rs700 million in the 2025-26 budget)
- Maintain some water plants that are not transferred.

- Liaise with KWSC via mayoral leadership (since the mayor is chair of both bodies)
- Lead Karachi in inter-governmental water forums.

This has a two-structure that gives coordination problems. Failures to coordinate the KMC-KWSC-Sindh government are partly reflected in the delays of the K-IV project (AIIB, 2025). Demarcation of responsibilities is still not clear.

Sindh Government

The Sindh government has general policy, regulatory, and financing powers. Key roles include:

- Sindh Assembly Legislative powers.
- Appointment of independent KWSC board directors
- Major infrastructure projects.
- Funding by provincial budgetary allocation.
- Liaison with development partners (e.g., AIIB, World Bank).

The Planning and Development Department manages the donor-funded projects such as KWSSIP-2. The provincial subsidies and fiscal transfers are handled by the Finance Department. The Local Government Department continues to have policy control over the municipal services, such as water.

Continuity is, however, influenced by political transitions. Provincial government (most recently, post-2024 elections) changes can change priorities and derail reforms. The provincial and city relationship- the two working together today through the Pakistan People's Party- has proved to be problematic in the past when the parties did not agree.

Cantonment Boards and Defence Housing Authority

There are separate water supply systems run by cantonment boards and the Defence Housing Authority (DHA) in their regions, such as Clifton, Karachi Cantonment, Korangi Creek, and other regions. These entities:

- Control autonomous water sources (groundwater, separate Indus allocations)
- Have distribution channels that are not dependent on KWSC.
- Determine their own tariffs and standards of services.
- Tend to serve better than the KWSC areas.

This parallel system generates inequalities: the residents of cantonment areas will receive a stable supply, but the areas located near the KWSC areas will experience shortages. It also disaggregates the allocation of resources, with cantonment boards not adding to the revenue base of KWSC to invest in the system in a system-wide way. There are minimal coordination mechanisms, and each entity works independently.

Private Sector

The involvement of the private sector is taking place in various ways:

Public-Private Partnerships: The Sindh PPP Unit has launched the first seawater desalination project in Pakistan (5 MGD) in PPP mode, in which transaction advisors EY Ford Rhodes and Techno Consult have been hired, and international companies have shown interest (PPP Unit, 2025). The project may lead to a precedent in private

investment in water infrastructure.

Consultancy and Contracting: design and supervision of infrastructure projects is offered by international consulting firms (e.g., Mott MacDonald, NESPAK). Pipeline rehabilitation and facility upgrades are enforced by construction contractors. Technology Providers: Local startups such as Asani.io create automated systems utilizing IoT to manage water usage in households, and more than 1,000 of them have been installed (CB Insights, 2024). These innovations are not part of formal procurement, but are indicative of scale potential.

Development Partners

The financing and technical support of international development is heavily financed by international development partners:

Asian Infrastructure Investment Bank: USD 240 million was approved towards KWSSIP-2 to reduce non-revenue water, infrastructure rehabilitation, and strengthening institutions (AIIB, 2025). This is the first large single investment in the water sector in Karachi.

World Bank: This has been preceded by the Karachi Water and Sanitation Project and policy dialogue.

Asian Development Bank: Technical support to plan the urban sector and reform governance.

These partners introduce conditionality and international expertise that are able to facilitate the implementation of reforms. Nonetheless, project efficacy relies on the ownership by the government and the capacity to implement.

NGOs and Communal Organizations.

Civil society players adopt community-based interventions that fill the gaps in formal service provision:

WaterAid: Joined the Urban Water Initiative with PepsiCo Foundation (2022-2025) to install filtration systems in underserved settlements, form water user committees, and use WASH in schools and healthcare centers (APP, 2025a).

Anosh Foundation: Installed 200 submersible water pumps to serve 200 people at a time in North Karachi, as an example of community-managed systems to marginalized communities, such as the Christian community (APP, 2025b).

Orangi Pilot Project: Historic role in low-cost sanitation and community organization gives models of participatory approaches, although there has been limited water-specific engagement.

Although the small scale of these interventions compared to the need, they show alternative service delivery models and foster social capital to take collective action.

Water Supply infrastructure and flow.

The physical infrastructure, which facilitates (and limits) water supply, is essential in understanding governance.

Source Water

The water of Karachi is supplied by two main sources:

Indus River through Keenjhar Lake (Kalri Lake): Keenjhar Lake is receiving

Indus water via the Indus Main Canal about 150 kilometers near Karachi. Water can flow through pipelines to the Dhabeji pumping station and then to Karachi, but it will originate at Keenjhar. This source provides some 550 MGD, which is practically all the water of the city.

Hub Dam: This is a reservoir on the Hub River, which serves some 100 MGD to the west of Karachi. Nonetheless, the level of the Hub Dam varies drastically with the rainfall, and long droughts decrease availability.

The reliance of the city on remote sources makes it vulnerable to disruption of transmission, be it by failure of infrastructure, energy deficit, or interference. It also concentrates power with the entities that control the transmission corridor.

Transmission Infrastructure

The water flows out of sources through an intricate transmission system:

K-III System: Finished in the 1990s, this system has a capacity of 100 MGD comprising pipelines, pumping stations, and the Dhabeji treatment plant. It is still the mainstay of Karachi's supply.

K-IV Project: Is set to add 260 MGD, but K-IV has been delayed for several decades. Initially planned in the 1990s, it was funded, contracts were awarded, and construction was launched, but land acquisition problems, contractor performance problems, and lack of funds have hampered progress (AIIB, 2025). The unfinished nature of the project marks the one biggest bottleneck in infrastructure

Hub Canal: Transfers water from the Hub Dam to Karachi. The canal needs to be rehabilitated; the government has invested Rs3.1 billion in the 2025-26 budget (Minute Mirror, 2025), but the work is sluggish.

Distribution Networks

The pipelines in Karachi are about 8,000 kilometers that deliver water to consumers. Key characteristics include:

Age: The age of much of the network is 40-60 years, with materials (asbestos cement, mild steel) having a longer life than the design brief. Regular bursts and leakages are unavoidable.

Status: According to the Asian Infrastructure Investment Bank, physical losses are estimated to be 35% (AIIB, 2025). The system leaks in all areas, and the water that reaches consumers is less in amount than the amount of water that reaches the water supply; there are health risks where leaks cause the water to be contaminated.

Intermittent Supply: In most places, water is delivered within several hours per day, and some (such as Orangi Town) do not get piped water at all (Express Tribune, 2026b). The intermittent supply requires households to invest in storage tanks (mostly overhead and underground), booster pumps, and alternative sources. It also impairs the quality of water by contaminating it in low-pressure seasons.

Coverage Gaps: The presence of piped connections in the household is about 52 per cent, and 48 per cent of the households rely on tankers, groundwater, and other sources (Express Tribune, 2026a). The density of connection differs massively across districts, with more well-off districts served better.

Service Delivery Model

The existing model of service delivery is a combination of formal and informal delivery:

Formal Piped Supply: KWSC supplies and distributes water over the piped network to the connected houses. Supply is sporadic, and quality fluctuates. Billing is determined by connection size and not metered consumption (except in the case of commercial and industrial users). The efficiency of collection is approximated to be 60-70%.

Informal Tanker Supply: To supply unconnected households and as a backup to connected households, water is supplied by private tanker operators using hydrants that tap transmission lines. These operators charge between Rs 1,500 and Rs 2,500 per tanker (about 5,000 liters), versus the piped tariff of KWSC of around Rs 100 per 5,000 liters. The quality of tanker water is not regulated, and it is frequently polluted.

Groundwater: There are numerous homeowners, industries, and commercial facilities using their own wells to tap groundwater. This has caused the critical depletion of aquifers in certain regions and the intrusion of seawaters in coastal regions (Haque et al., 2013). There is a decrease in the quality of groundwater because of over-pumping and contamination.

This free-market system brings about perverse incentives; the hydrant mafia benefits from scarcity, and KWSC loses income on the stolen and sold water. Reform initiatives against theft are a threat to a vested interest, which is why there is a political backlash despite the official denunciation.

Recent Performance Indicators

The initial two years of KWSC under the new Act have yielded mixed results: Complaint Resolution: KWSC received 27,912 complaints in the period between December 2024 and January 2026, with 75% of the complaints being solved within 24 hours citywide (Express Tribune, 2026c). Nonetheless, there are dramatic disparities in the number of districts that resolved 74 (8,038 out of 10,927) and 37 (807 of 2,170) in District Central and District West, respectively. These numbers indicate that not all areas have the same operational capacity, and most complaint mechanisms might be unavailable.

Anti-Theft Operations: The joint operation between January 2026 and Rangers crushing a 48-inch illegal conduit showed the ability to enforce (Pakistan Observer, 2026a). KWSC CEO Salahuddin Ahmed said: They are not going to escape, no matter how influential/powerful the thief of water is. Nonetheless, these operations are extraordinary, as opposed to ordinary.

Revenue Collection: KWSC claimed record growth in monthly revenue at one of the international conferences in Brazil (Pakistan Observer, 2024). Better billing and collection systems seem to be bearing fruit, but no particular numbers were provided.

Infrastructure Investment: The Hub Canal rehabilitation allocation (Rs3.1 billion) and the K-IV project renewed attention are an indicator of investment priority, but the rate of implementation is worrying.

The indicators imply improvement in certain dimensions and the ongoing struggles. The legal framework provided by the KWSC Act 2023 offers enabling factors, yet the transformation of legal provisions into better service delivery takes a long-term political will, institutional capacity, and citizen involvement.

RESULTS: BOTTLENECKS OF GOVERNANCE AND MANAGEMENT.

Introduction to Findings

In this section, empirical evidence regarding governance and management bottlenecks in Karachi in relation to the Indus water supply is presented and arranged in the framework of the analysis made in Section 2. The results are based on triangulated secondary data sources such as court proceedings, official statements, investigative reporting, and institutional performance data in the years 2023-2026. It can be analyzed that governance bottlenecks exist on many levels, such as structural, political-economic, and technical-operational levels, with intricate interconnections that ensure service delivery failures despite the reforms.

Institutional and Structural Fragmentation.

Parallel Utility Systems

Although the 2023 Act has changed KWSC to have a more robust mandate, institutional fragmentation remains a central governance bottleneck. In the areas served by them, the cantonment boards and Defence Housing Authority have their own water supply networks, forming oases of privilege in the midst of overall shortage. These parallel utilities operate independent water sources, run independent distribution networks, and have their own tariff structures that do not add to the revenue base or system-wide investment in infrastructure of KWSC.

This disintegration disrupts comprehensive planning and the distribution of resources. The imbalance in parallel systems is demonstrated when KWSC experiences supply gaps, and the cantonment regions are sufficiently covered. Lack of coordination mechanisms between KWSC and such entities does not allow the best use of available water resources in the metropolitan area.

Inter-Governmental Coordination Failures

The K-IV augmentation project is an example of coordination failures at the different levels of government. Initially planned several decades ago to contribute 260 million gallons per day (MGD) to the Karachi supply, the project has not yet been fully developed because of the continuous inter-agency warfare (Dawn, 2026). In 2026, a new deadline of December 2026 was announced by Federal Minister for Planning Ahsan Iqbal, who visited the project site in February and reported that the cost of the project had increased from 120 billion to 170 billion because of the delays and inflation (Dawn, 2026).

Within the project framework, WAPDA is tasked with bulk water transmission, as well as canal lining, with the Sindh government taking care of internal networks in Karachi (Dawn, 2026). This shared responsibility has brought about the issue of coordination, where both entities accuse each other of delays. The failure of coordination has been exacerbated by land acquisition issues, problems in contractor performance, and insufficiency of funding.

The latest development on the work on the K-IV project was stopped on University Road because the World Bank objected to environmental pollution and poor safety precautions (Daily Qudrat English, 2026). The international lender also raised concerns over the design and route of the project, and authorities suspended construction activities. When the pipeline work was suspended, only approximately 10 percent of the planned work had been done (Daily Qudrat English, 2026). As a sign of great concern, the Senate Standing Committee on Cabinet Secretariat has resolved to hold quarterly review meetings to check the progress of K-IV (Daily Times, 2026).

KMC-KWSC Boundary Ambiguities

The Karachi Metropolitan Corporation (KMC) and KWSC relationship is not properly demarcated, even with the KWSC Act 2023. KMC still spends on water infrastructure (Rs700 million in 2025-26 budget) and still has some facilities not transferred. This two-tiered system introduces difficulties in coordination and allows blaming one another in the event of service failures. The separation of duties which is necessary in accountability is not done.

Political Economy of Water Theft

Scientific investigation. Scale and magnitude of theft.

The most widespread form of governance bottleneck in the Karachi water system is water theft via illegal hydrants. In January 2026, Mayor Murtaza Wahab publicly acknowledged that illegal hydrants are prolific in stealing water, saying that there is a tanker mafia robbing the city of water (Express Tribune, 2026a). Analysts have estimated that as much as 30 percent of the Karachi water is stolen using illegal hydrants, which have been supported by the covert support of powerful political figures and a collusive bureaucracy (Express Tribune, 2026a).

The seven operational hydrants earn the company about Rs300 million of monthly income, but the contract expires in 2025, and the company does not renew it (Express Tribune, 2026a). This contradiction of hydrants being run on the black market yet bringing in huge incomes is an example of how informal systems have become institutionalized in state frameworks. The fact that the hydrants would be closed down gradually, announced by the mayor, is an acknowledgment of an issue that has always been denied or downplayed.

Enforcement Measures and Their Importance

The magnitude of networks of theft has been shocking, as demonstrated by joint operations of the KWSC and the Pakistan Rangers. In January 2026, a combined operation in Shah Faisal Town, Jamia Goth, destroyed a 48-inch illicit conduit, which was stealing 10 million gallons of water each day (Pakistan Observer, 2026a). The pipeline, which was under the territory of Water Corporation, served illegal tankers that ran in the middle of the night, depriving citizens of their legitimate part and costing millions monthly (Pakistan Observer, 2026a).

Areas that were badly hit by this loot were Shah Faisal Colony, Rafah-e-Aam, Shamsi Society, Green Town, Korangi, PFB Faisal and Staff Colony (Pakistan Observer, 2026a). KWSC CEO Engineer Syed Salahuddin Ahmed announced, "The water thief, however influential and powerful they may be, will not be spared. Water

is the right of the citizens, and the water thieves will not be able to rob the citizens of their share of water (Pakistan Observer, 2026a).

A more extensive raid has made impressive figures: during the last month, 204 illegal hydrants were destroyed in 93 raids, and 165 detainees have been taken into custody (Samaa TV, 2026). During a single large-scale operation, law enforcement found that 200 million gallons of water were stolen every day using six pipelines with the help of an 18-foot deep and 200-foot-long tunnel close to the Labor Square in Landhi (Samaa TV, 2026). This stolen water was worth as much as Rs4 million every day, and the illegal hydrant was even working under the cover of a reverse osmosis plant (Samaa TV, 2026).

Theft Networks Political Embeddedness

These enforcement measures notwithstanding, the fact remains that water theft persists, which is indicative of strong political embeddedness. The unofficial support of powerful political factors and a noncommittal bureaucracy (Express Tribune, 2026a) helps the theft networks to continue their activities even after their denunciation by the authorities. Political links of the hydrant mafia imply that enforcement measures, even though symbolically significant, are not commonplace.

This political economy has been challenged head-on by the Sindh High Court. In a February 2026 hearing of an appeal by an Orangi Town resident on the petition, Justice Adnanul-Karim Memon raised the question of why tanker operators were able to get water in large quantities when pipelines were dry (Express Tribune, 2026b). The court referred to tankers that supply water in Karachi when the KWSC counsel mentioned scarce upstream water as evidence that there is water, but it is intentionally evaded in pipelines (Express Tribune, 2026b). The court noted that people had a right to water at their houses in a legal system and threatened to provide strict instructions in case the supply of pipelines was not provided (Dunya News, 2026).

Tanker Mafia and Dependency of Citizens.

The dependency due to the control of distribution to unconnected households by the tanker mafia is hard to reform. Former Karachi Mayor Mustafa Kamal has indicated that about 90 percent of Karachi's water is being purchased, highlighting the misuse of water resources and the strong preference given to services of private tankers (Minute Mirror, 2026b). Tanker dependency impacts about 10 million residents of the city with 48% of households having no connection to the piped network (Express Tribune, 2026a), paying 5-10 times the official rates to receive water of low quality.

This dependency was revealed by the recent water crisis that happened after the repair of an 84-inch pipeline that had burst near Gulshan-e-Iqbal in February 2026 (Lokmat Times, 2026). Repair, which lowered the inflows at Dhabeji pumping station by an average of 200 MGD, led to a disruption of supply to several neighbourhoods such as Korangi, Landhi, Liaquatabad and Nazimabad (Lokmat Times, 2026). People did not trust official guarantees, indicating that such guarantees in the past had little or nothing to do with timely relief (Lokmat Times, 2026).

Pakistan Sunni Tehreek called the condition a clear illustration of administrative failure, claiming that people sit and wait as water leaks and tanker drivers make their fortunes (Lokmat Times, 2026).

Lack of Transparency and Accountability.

Complaint Resolution Disparities

The data of complaint resolution at KWSC, though having certain improvements, presents dramatic imbalances, which indicate the lack of transparency and accountability. The complaints are said to have been solved within 24 hours in 75 per cent of 27,912 complaints citywide (Express Tribune, 2026c). But the differences at the district level are impressive:

- District Central: 10,927 complaints were obtained, 8,038 of them were solved (74%).
- District West: 2,170 complaints made, 807 of which were solved (37%)

These numbers lead to the basic questions: Does District West have lower complaints due to a good supply of them, or due to the inaccessibility of complaint mechanisms? The fact that the resolution rate is low (37%), indicates the latter-citizens in District West who are able to file complaints seldom get satisfactory responses. Such disparities can go unpunished without disaggregated public data that would allow citizens to blame KWSC to their performance at the district level.

Gaps in judicial Oversight and Accountability

The interventions of Sindh High Court in cases related to water supply are repetitive, which indicates the lack of accountability. An example of how the citizens have to turn to litigation to obtain the most basic services can be seen in the Orangi Town petition that resulted in the hearings in February 2026 (Express Tribune, 2026b). The fact that the court notes that Mayor Sahib had agreed to deliver water by pipelines (Minute Mirror, 2026b) shows how disconnected political rhetoric and reality of service delivery are to each other.

The instruction of the court to cease relying on tankers and deliver water via pipelines (Dunya News, 2026) is one of the underlying problems to the political economy of water theft. However, the mere existence of the need to have a judicial intervention means that even the normal accountability mechanisms, such as the electoral accountability, administrative accountability, and the citizen feedback mechanisms are not working to guarantee the delivery of services.

Transparency Deficits in Hydrant Operations

The fact that seven operational hydrants work using out-of-date contracts (Express Tribune, 2026a) underscores the lack of transparency in the simplest regulatory activities. As long as the hydrant contracts were posted publicly and periodically audited, the case of the contract expiration could have been raised in the past. This contributes to the fact that the lack of transparency in the hydrant operations makes it easier to continue with practices that are technically illegal and that are normalized through the lack of transparency.

In the process, the plans to introduce an alternate-day water schedule in different neighbourhoods in the transition have plans to phase-out hydrants announced by Mayor Wahab (Express Tribune, 2026a) in the transition. Even though such a scheduling can contribute to the prevention of shortages, its effectiveness depends on the open communication and its regular enforcement, which is hard to realize in the water management of Karachi in the past.

Financial/Commercial Inefficiencies.

Non-Revenue Water

The non-revenue water is the sum of the physical losses due to leakage and the commercial losses due to theft and unbilled consumption and is approximated to be 35-40% (Asian Infrastructure Investment Bank, 2025). It is one of the highest rates in South Asia and is extremely financially costly. The project of the Asian Infrastructure Investment Bank, which has a USD 240 million financing, is the KWSSIP-2 project, founded on the principle of non-revenue water reduction as one of its priorities (Asian Infrastructure Investment Bank, 2025).

The extent of theft as reported by enforcement efforts, in millions of gallons each day, in millions of rupees, is a demonstration of the commercial values of losses. The theft of 200 million gallons per day which was detected in Landhi (Samaa TV, 2026), worth Rs4 million per day, is losses of over 1.4 billion annually on just one network.

Economic sustainability and revenue collection

However, KWSC CEO Salahuddin Ahmed reported at an international conference in Brazil that its monthly revenues were hitting record numbers (Pakistan Observer, 2024), meaning that it could be possible to enhance its revenue collection. Better billing and bill collection systems seem to be paying off, but no exact figures were given. Additionally, tariff systems have not been able to sufficiently meet expenses. The tariffs are kept at a politically low level and the costs are raised and become dependent on provincial government subsidies. The investment needs will be calculated in billions as opposed to the Rs700 million KMC allocation of water development (Minute Mirror, 2025). Non-revenue water control is required to increase revenues and reduce costs to ensure financial sustainability.

Technical and Infrastructure deficits

Ageing Infrastructure

The physical conditions of Karachi water infrastructure are poor and this is a major technical bottleneck. In an appearance at the February 2026 court hearing, KWSC counsel mentioned old lines and electricity load-shedding as barriers to reliable supply (Express Tribune, 2026b). Most of the 8,000km long distribution network was constructed 40-60 years ago and the materials are older than the design life (Asian Infrastructure Investment Bank, 2025).

The vulnerability of the infrastructure is evident in the crisis that occurred in February 2026 because of repairing an 84-inch pipeline in Gulshan-e-Iqbal (Lokmat Times, 2026). A single break in a large transmission line cut reduced inflows by approximately 200 MGD, leading to the disruption of supply to a number of

neighbourhoods over a number of days. Though authorities claimed that they had changed them before the time period, the people were skeptical due to the past experiences (Lokmat Times, 2026).

Transmission System Constraints

The unfinished K-IV project is the one big infrastructure bottleneck. K-IV was intended to add 260 MGD but has encountered decades of delays, cost increases, and is currently suspended because of objections by the World Bank (Daily Qudrat English, 2026). The cost of the project has grown to Rs120 billion to Rs170 billion (Dawn, 2026) and there is no form of certain deadline of the project despite the recently announced completion date of December 2026.

The Hub Canal needs to be rehabilitated urgently; the government has budgeted to do so in the 2025-26 budget (Minute Mirror, 2025) with an allocation of Rs3.1 billion, but slow progress is being made. Such transmission limits imply that in spite of the perfect functioning of the distribution networks, there is not enough raw water to reach the city.

Intermittency in Supply and its Implications.

The intermittent nature of supply, whereby the majority of the areas get the water in a few hours daily and some (such as Orangi Town) do not get any water at all, has a trickle-down effect. Households have to invest in storage tanks (usually overhead and underground), booster pumps, and alternative sources, which poor households cannot afford to invest in. The quality of water becomes worse when there is low pressure and contamination can get into pipes. The inequity and inefficiency continue to be perpetuated by the cycle of intermittent supply, household storage and groundwater pumping.

The remarks made by the Sindh High Court, that no water is supplied by the pipeline network yet it is available (Express Tribune, 2026b) points to the inability of infrastructure to solely explain the service failures. Water is diverted and tankers are filled as pipelines run dry, an indication that there is a problem of governance and not physical scarcity.

Patterns and Interconnections that are emergent.

The results show that governance bottlenecks are interrelated and reinforcing to each other:

Politics of stealing works best with a lack of transparency (secret hydrant contracts, lack of public information) and institutional disunity (the many agencies with overlapping mandates allowing blame-shifting). The lack of infrastructure gives a reason to keep tanker dependency and consequently, the hydrant mafia that is not ready to change brings revenues.

Enforcement actions should be considered an exception and not the norm, although they are symbolically important. The 204 illegally manufactured hydrants destroyed and 165 people detained (Samaa TV, 2026) are a step in the right direction, yet the continued existence of theft networks implies that enforcement that fails to target the roots of the political economy will not lead to a long-term resolution.

Judicial accountability has become an important mechanism of accountability,

and the Sindh High Court has intervened severally to demand the delivery of services (Express Tribune, 2026b; Dunya News, 2026; Minute Mirror, 2026b). But judicial intervention is by its nature reactive and cannot replace operational administrative responsibility

Political will at higher levels is evidenced by reform efforts, such as mayoral promises of hydrant withdrawal (Express Tribune, 2026a) and federal government efforts to complete K-IV (Dawn, 2026). Nevertheless, there are still gaps in implementation and the gap between word and deed is still a big one.

CONCLUSION

This paper has explored governance and management bottlenecks in Indus water supply in Karachi with a focus on three research questions: the main governance issues, how institutional inefficiencies and corruption affect water distribution, and how governance could be improved. The results indicate that the water crisis in Karachi is more of a governance crisis than a physical scarcity issue.

The initial research question aimed at determining major governance and management issues. The analysis shows that bottlenecks work on various levels that are interconnected. Fragmentation remains institutionally, as the KWSC Act 2023 presents, as do parallel utility systems, KMC-KWSC boundary ambiguities and failures in inter-governmental coordination such as the decades-long delays of the K-IV project. The Water and Sewerage Tribunal is still non-functional which weakens the accountability mechanisms of the Act. Ageing infrastructure technically leads to 35-40% non-revenue water, transmission restrictions that limit supply and intermittent service that perpetuates inequity.

The second research question was the effect of institutional inefficiencies, corruption, and lack of transparency on the distribution of water. The results are shocking: as high as 30 percent of the water in Karachi is stolen via illegal hydrant systems that work with political patronization and bureaucratic collusion. The seven functional hydrants generate Rs300 million monthly on dead contracts and this is an indication of how illegality has become normal. The political economy of scarcity and resistance to reforms that the hydrant mafia has over distribution to 48% of unconnected households results in is a form of political economy that favors the strong. Lack of transparency facilitates these processes: unpublicized hydrant contracts, the lack of publicly available information, and dramatic differences in complaint resolution (74% in District Central and 37% in District West) does not hold the citizens accountable.

The third research question was on the possible reforms. There are encouraging initiatives: the KWSC Act 2023 offers an enabling framework; enforcement actions have demolished 204 unauthorized hydrants and apprehended 165 people; the first desalination PPP is being implemented; research on smart meters has given empirical data on consumption; IoT-based solutions, such as Asani.io, have proven the technological potential; and community efforts by Water-Aid and a Nevertheless, these are not comprehensive and unrelated to systemic change.

The theoretical contribution of this research is that it is possible to show that the dynamics of political economy can undermine institutional reform. The KWSC Act 2023 is a legal change in the spirit of international good practice, but there are still gaps in implementation since informal norms, depending interests, and power relations influence operationalization of legal provisions. The political embeddedness of the hydrant mafia reflects the idea of informality form above created by Roy (2009) into which state approved illegality supports those in positions of power and does not disrupt regulatory facades.

Recommendations

According to the results, the subsequent combined recommendations are given to deal with bottlenecks at institutional, political-economic and technical levels:

Institutional Strengthening

To begin with, operationalize the Water and Sewerage Tribunal under the KWSC Act 2023. The absence of this specialized forum means that the dispute resolution is in the already overwhelmed regular courts and citizens such as the Orangi Town petitioner have to litigate the provision of simple services. Second, KMC-KWSC roles should be clarified with a formal memorandum of understanding, which is going to eliminate blame-shifting and allow to define the responsibility clearly. Third, create a metropolitan water coordination committee with KWSC, cantonment boards and DHA to coordinate planning and resource distribution.

Combating Water Theft

The first is to launch the hydrant phase-out plan by Mayor Wahab, with a clear schedule and a compensation system to those who are legitimate tanker operators and switch to formal delivery models. Second, create a special cell of prosecution in water theft cases where those who are arrested are subjected to justice at the right time and not released on political grounds. Third, carry out periodic third-party audits of all hydrant off-takes and report them, breaking the veil of secrecy that facilitates operation of expired contracts. Fourth, increase joint KWSC-Ranger's operation and develop KWSC own ability to enforce sustainability.

Enhancing Transparency and Accountability

First, require that the data on complaint resolution in the district levels are publicly disclosed on a monthly basis so that citizens can have an opportunity to compare performance with others and ensure that the officials are held accountable when differences such as those in District West are 37% higher. Second, create a live dashboard with the amount of water supplied, complaints, and the time it took to resolve the complaints, all of which are available on both web and mobile. Third, make mayoral surprise visits and citizen feedback systems routine, and not extraordinary. Fourth, enhance the 1334 helpline by adding SMS and app-based complaints, especially to underserved districts.

Scaling Technology Solutions

To start with, scale up smart metering pilots recently out of research into demand management and leakage detection real-time consumption data. Second,

implement IoT solutions, such as Asani.io, in KWSC business processes, relying on sensors to monitor network traffic and identify theft. Third, optimize supply scheduling using consumption data, involving adjustments on Fridays based on 7% increase patterns identified.

Infrastructure Investment

To start with, the World Bank objections to K-IV must be resolved immediately and the deadline of December 2026 deadline of completion upheld with monthly review of progress. Second, speed up rehabilitation of Hub Canal with the available funds of Rs3.1 billion. Third, focus on non-revenue water strategy in which the priority is placed on leakage reduction, focusing on the majority of deteriorated network segments.

Leveraging Partnerships

First, accelerate the process of desalination PPP and make sure that the contract terms contain strict anti-theft conditions. Second, institutionalize NGO-community cooperation models, so that water user committees can interface with KWSC. Third, replicate successful community models such as pumps in Anosh Foundation by KWSC support and not parallel operation.

These recommendations acknowledge that there is no single intervention that is adequate. It is important to improve each of these pillars in a simultaneous way to achieve systemic reform and in order to address the political economy of theft, transparency, scale technology, infrastructure investment and partnerships. It has a base in the KWSC Act 2023; the future of the promise rests with maintaining political will, the involvement of citizens, and the ability to implement. The 20 million people of Karachi have nothing to be proud of.

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