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Policy

Pakistan's Urban Water Challenges and Prospects

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Cities in Pakistan are increasingly faced with problems of erratic supply of piped water and unsafe and declining levels of groundwater. Additionally, over one-third (35 to 40 percent) of piped water is wasted through leakages and theft in the water distribution networks.[1] By 2050, the country's urban population is expected to double in size (from 81 million in 2022 to 160 million in 2050 or from 37.7 percent of the total population to 52.2 percent) (see table 1). Providing water for these citizens is a challenging task; finding money to pay for the provision of that water is at least as daunting. Urban water tariffs are low and infrequently adjusted, even with current efforts at reform.

1. INTRODUCTION AND BACKGROUND

Pakistan is rapidly urbanising. From 1980 to 2022, the Pakistani population living in cities increased from 21.9 million (28.1 percent) to 81.4 billion (37.7 percent) and is projected to reach 160.2 million (52.2 percent) by 2050 (table 1). At present, a majority of Pakistan's urban population faces water scarcity—water demand exceeding water supply. Declining groundwater, expanding populations, aging infrastructure and changing weather patterns have placed significant pressure on water supplies. Population growth, urbanisation, and socioeconomic development are expected to increase urban water demand by over 100 percent by 2050 (Figure 1). Climate change will also affect the spatial distribution and timing of water availability. As a result, urban water scarcity is likely to become much more serious in the future. Pakistan's urban population facing water scarcity is projected to increase from 39.9 million (57 percent of Pakistani urban population) in 2016 to 97.5 million people (61 percent of Pakistani urban population) in 2050.[2]

Table 1

Trends in Urban Population in Pakistan, 1980-2050

	1980	1990	2000	2010	2022	2050
% of Total Population	28.1%	30.6%	33.0%	35.0%	37.7%	52.2%
in Millions	21.9	32.9	45.7	59.7	81.4	160.2

Source: DESA 2024.

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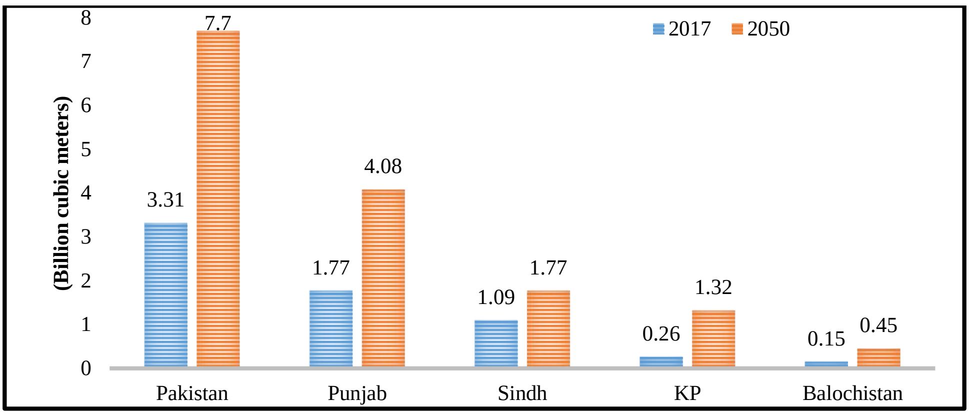
[1] GOP 2012.

[2] Liu et al., 2021.

Water services in Pakistan's major cities and urban centres remain fragmented and intermittent, as no city currently has 24-hour of water supply for seven days a week. Current water use in most cities is approaching or exceeds local sustainable supplies of surface and groundwater. Pakistani cities that are dependent on groundwater for municipal supply, such as Lahore, observe falling water tables requiring increased drilling and pumping costs. Cities that depend on surface water, such as Hyderabad, Karachi and Islamabad, face intermittent or insufficient supply. Reliable water supply is already challenging in many cities due to growing demand combined with ageing and insufficient infrastructure.

A mismatch between urban water supply and demand will impact in several ways. First, the health of (poorer) urban populations will suffer, due to drinking contaminated water or unsanitary conditions resulting from water scarcity. Second, the economic potential of urban areas will be reduced, due to disproportionate spending by municipalities, households and industries to ensure adequate water supply. Ensuring a reliable water supply has become an urgent policy concern for municipal leaders and city authorities.

Fig. 1. Annual Domestic Water Demand Projections for Urban Households in Pakistan



Source: World Bank 2021.

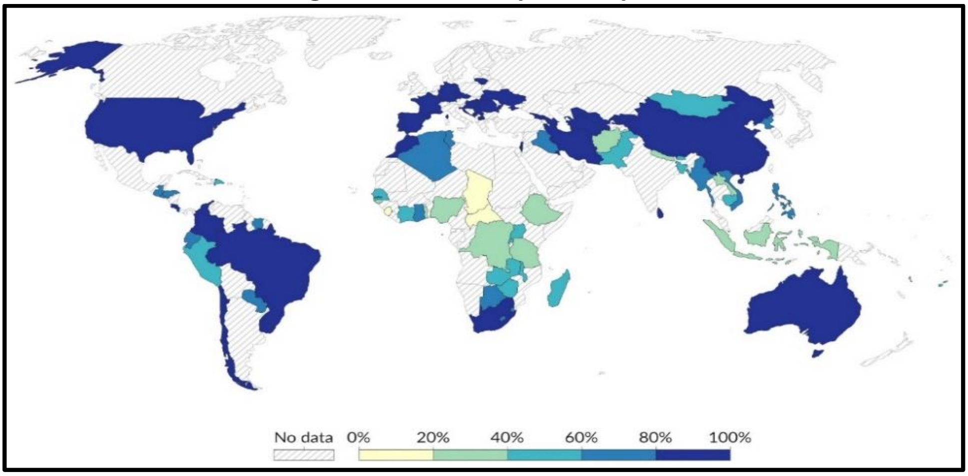
2. URBAN WATER ISSUES AND CHALLENGES

Too often, cities in Pakistan operate under ill-informed and unsustainable water management and end up facing grave risks from coastal and inland flooding, scarcity of quality water, access inequalities and climate change. *The problems range from poor management of water sources, contaminated supplies, leaky distribution networks and vast volumes of untreated wastewater being poured into Pakistan's rivers.*

2.1. Water Availability

In urban areas of Pakistan, about 43 percent of the population does not have access to safely managed water (Figure 2). That means that over 35 million people do not have safe water. By the year 2050, there will be nearly 180 million people in urban areas needing these services.

Fig. 2. Share of the Urban Population Using Safely Managed Drinking Water Sources by Country, 2022



Source: Ritchie, *et al.*, 2022.

Urban areas in Pakistan are increasingly facing water scarcity and poor quality of water supplies due to depletion in underground sources of water and leakages and theft in water distribution networks. The main source of drinking water in cities is piped water, 36 percent of urban households have piped water connections but with substantial provincial variations. The rest rely mainly on self-provided hand pumps and motorised pumps or at the worst on unprotected water sources. For instance, about 33 and 36 percent of households in urban Punjab and Khyber Pakhtunkhwa respectively use motorised pumps for drinking water (Figure 3 and Table 2).

Trends in providing piped water to urban citizens portray a picture of deterioration in the level of public services. Reliance on piped water has been decreasing, replaced by water from motorised and hand pumps and tankers. Overall, a decrease of almost 40 percent in the provision of piped water is noted between 2007 and 2020 (Table 3). As compared to 2008, about 66 percent fewer households reported having piped water connections in Punjab. The data reveals that during this period, the use of filtration plants has increased for obtaining water. There has been a shift from tap water to motorised pumping, largely due to the unreliability of government provision leading to households turning to self-provision.

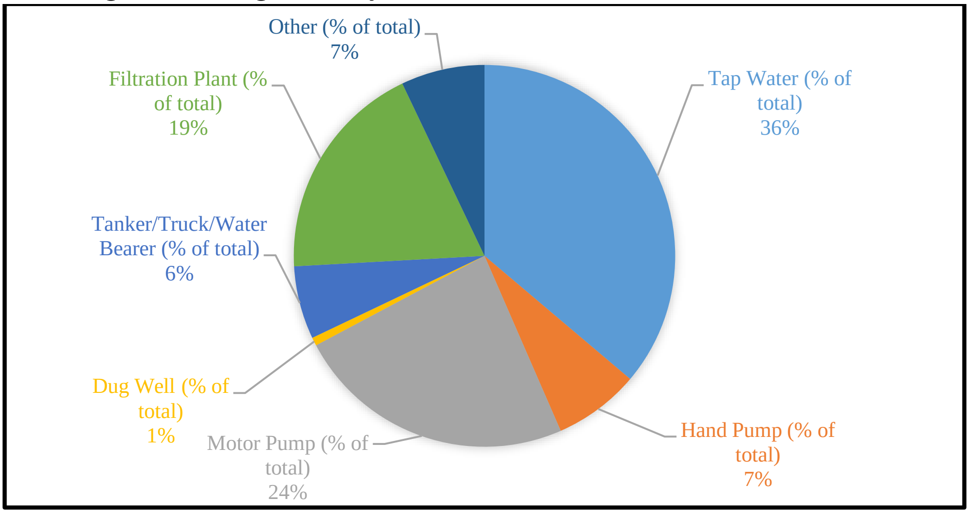
Simply having access to water does not ensure the availability and reliability of water. The situation is deplorable, excluding Punjab. For instance, over 93 and 98 percent of urban households in Balochistan and Sindh respectively receive water for less than 6 hours per day, compared to the national average of 73 percent (in 2014). Households get water from installing ground or roof tanks for collecting water when it is available and hoarding it, buying water from tankers, or using shallow wells and/or river water. A few private tankers are licensed by water utilities, but all tanker owners benefit from the irregular water supply.

In Pakistan's largest city Karachi alone, one-fourth of households depended upon tanker water, which was 29 times more expensive than municipal water supply in 2019.[3]

[3] Mustafa and Ginn 2020.

In the city, over 10,000 tankers operate across the city, completing roughly 50,000 trips a day (prices vary between Rs1,200 to Rs7,000 PER tanker/trip), according to Noman Ahmed. The business is so lucrative that more than 100 illegal hydrants operate across the city, tapping into the city's mains to steal water. stealing water in Karachi is an industry worth more than half a billion dollars annually.[4]

Fig. 3. Drinking Water by Source in Urban Areas of Pakistan, 2019-20



Source: GOP 2021.

Table 2

Main Sources of Water in Urban Areas of Pakistan, 2019-20

	Pakistan	Punjab	Sindh	Balochistan	KP (Including Merged Areas)
Tap Water (% of total)	36.2	18.3	56.9	55.0	49.1
Hand Pump (% of total)	7.3	6.3	9.5	1.3	6.2
Motor Pump (% of total)	23.8	33.2	10.2	11.6	35.5
Dug Well (% of total)	0.7	0.4	0.4	0.7	5.0
Tanker/Truck/Water Bearer (% of total)	6.2	4.8	6.5	29.3	0.9
Filtration Plant (% of total)	18.8	33.9	2.6	0.2	0.5
Other (% of total)	7.1	3.1	13.8	1.9	2.7
Total (%)	100	100	100	100.01	100

Source: GOP 2021.

Table 3

Trends in Piped Water Supply (%) in Urban Areas of Pakistan by Province

	2006-07	2008-09	2010-11	2012-13	2014-15	2019-20
Pakistan	62.0	61.8	57.7	55.9	50.6	36.2
Punjab	53.2	52.3	46.2	42.6	34.8	18.3
Sindh	74.2	74.1	71.6	72.2	69.2	56.9
Balochistan	81.4	84.6	86.8	80.2	69.0	55.0
KP (Including Merged Areas)	62.9	65.9	63.4	62.3	55.0	49.1

Source: GOP 2021.

[4] Hashim, 2017.

2.2. Water Quality

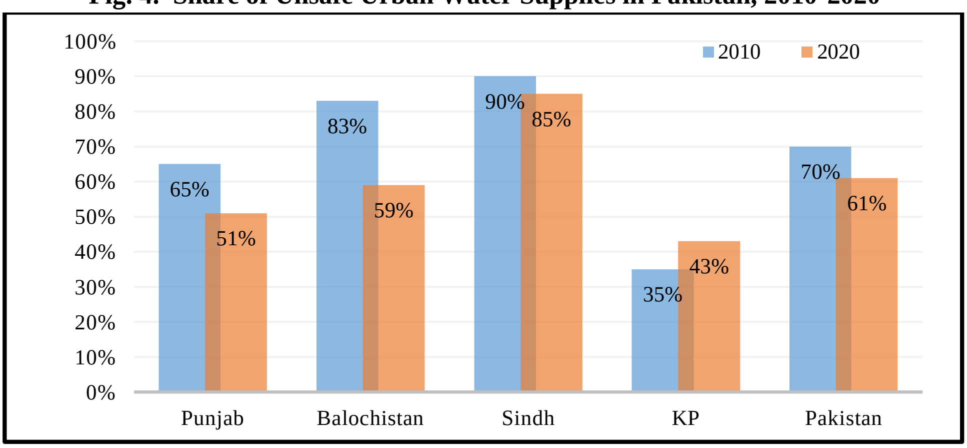
An overwhelming majority of the cities, including the mega cities, in Pakistan do not have safe drinking water for citizens. Both surface and groundwater have become polluted mainly due to domestic sewage, industrial effluents and solid waste with devastating consequences of people's health. Groundwater sources across the country are increasingly being polluted through intensive agriculture, industry and poor sanitation.

Sixty-one percent of the monitored water sources were found safe for drinking in 29 main cities. Out of the 29 cities, there are 20 cities where more than 50 percent water of obtained from various sources was found to be unsafe. A provincial-level analysis shows that 85 percent of water was unsafe for consumption in Sindh and 59 percent in Balochistan. Over the last decade, major improvements have been made in Punjab (65percent to 51 percent) and Balochistan (83 percent to 59 percent), a slight improvement in Sindh (90 percent to 85 percent), while the poor quality in KP has worsened (from 35 percent to 43 percent) (Figure 4).

The water was found to be contaminated mainly with arsenic, iron, fluoride and bacteria. Consuming unsafe water may cause health problems such as diarrhoea, dysentery, typhoid, hepatitis, skeletal and dental fluorosis, methemoglobinemia, and cancer (see table 4). Overall analysis of 29 cities has identified 11 major water quality problems in drinking water sources of Pakistan i.e. 41 percent bacteriological contamination, TDS (14 percent), Iron (14 percent), Hardness (10 percent), Turbidity (9 percent), Chlorides (8 percent), Arsenic (5 percent), Nitrates (4 percent), Fluoride (4 percent), and pH (1 percent).

Bacteria is a major factor in diseases of the intestinal tract—some of them potentially fatal especially for children and infants, among whom diarrhoea is the leading cause of mortality. Prolonged exposure to contaminants like arsenic in drinking water can lead to cancer and skin lesions and is also associated with cardiovascular disease and diabetes. In utero and in early childhood, it may even have a negative impact on cognitive development. Poor quality of drinking water has been found to be responsible for nearly 30pc of diseases and 40pc of deaths in the country.[5]

Fig. 4. Share of Unsafe Urban Water Supplies in Pakistan, 2010-2020



Source: PCRWR 2021.

[5] *Dawn*, 2021.

Table 4

Potential Health Impacts of Drinking Water Contaminants in Major Cities of Pakistan, 2020-21

Contaminants	Hotspot cities	Health impacts
Microbiological Contamination	Islamabad, Bahawalpur, Faisalabad, Gujranwala, Kasur, Lahore, Multan, Rawalpindi, Sheikhupura, Sargodha, Khuzdar, Loralai, Quetta, Ziarat, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Shaheed Benazirabad, Tando Allahyar Muzaffarabad, and Gilgit	Cholera Diarrhoea Typhoid Dysentery Gastroenteritis Hepatitis A & E
Arsenic	Bahawalpur, Lahore, Multan, and Sheikhupura	Skin hyperpigmentation Oxidative stress Peripheral neuropathy Cancer of bladder, skin, liver, lung, and lymphatic cancer
Nitrate	Sargodha, Sheikhupura and Khuzdar	Blue baby syndrome in infants: Symptoms include shortness of breath
Fluoride	Bahawalpur, Faisalabad, Sargodha, Quetta, Loralai, Karachi and Sukkur	Skeletal Fluorosis: Bone disease (pain and tenderness of the bones); Dental Fluorosis: Children may get mottled teeth
Turbidity	Bahawalpur, Kasur, Lahore, Sheikhupura, Khuzdar, Loralai, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Shaheed Benazirabad Muzaffarabad, and Gilgit	Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria
Hardness	Bahawalpur, Faisalabad Sheikhupura, Sargodha, Khuzdar, Loralai, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Tando Allahyar and Shaheed Benazirabad	Hardness is not a health concern, but it can cause mineral buildup in plumbing, fixtures, and water heaters, and poor performance of soaps and detergents
TDS	Bahawalpur, Faisalabad, Lahore, Rawalpindi, Sheikhupura, Sargodha, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Tando Allahyar and Shaheed Benazirabad	High TDS level alters the taste of water and makes it salty, bitter, or metallic High TDS levels also indicate the presence of health-hazardous toxic minerals
Chlorides	Faisalabad, Sargodha, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Shaheed Benazirabad	Chloride in drinking water is not harmful, however, the sodium part of table salt has been linked to heart and kidney disease
Iron	Islamabad, Bahawalpur, Faisalabad, Lahore, Sheikhupura, Sargodha, Abbottabad, Mangora, Mardan, Peshawar, Sukkur and Shaheed Benazirabad	Iron is not hazardous to health, but it is considered a secondary or aesthetic contaminant

Source: PCRWR 2021.

2.3. Groundwater Over Extraction

Pakistan has the 4th largest groundwater aquifer- covering an area of 1,137,819 km, making it slightly larger than England. On the other hand, Pakistan is the third largest groundwater user in the world and fourth-largest groundwater withdrawing country contributing to 9 percent of the global groundwater extraction and making the Indus Basin aquifer the second most “overstressed” groundwater basin in the world. Annual groundwater withdrawal is estimated to be 65 bcm while annual renewable groundwater resources are estimated to be 55 bcm.[6]

Since the 1960s, Pakistan has turned from a surface water-dependent country to a groundwater-dependent country, and from a groundwater surplus country to a country with significant issues of groundwater overdraft, exacerbated by increasing salinity issues due to the use of poor-quality groundwater for irrigation. Approximately 21 percent of the irrigated area is affected by salinity.[7] The use of groundwater varies in each of the provinces. Sindh has minimal groundwater exploitation because of its poor quality. In Khyber Pakhtunkhwa and Baluchistan, there are high costs because of greater depths and aquifer characteristics. Punjab has groundwater at shallow depths with relatively good quality, resulting in its widespread use. It has 50 million acre-feet of groundwater and accounts for 90 percent of total groundwater pumping in Pakistan.[8]

Almost half of Pakistan's groundwater is used for domestic purposes, mostly in urban areas. In Punjab, for example, about 70pc of the groundwater is said to be used for drinking and other domestic and commercial purposes. Punjab's heavily degraded groundwater meets around 90 percent of the province's drinking water requirements. This unregulated access, with over 1.2 million tube wells and millions of individual pumping machines belonging to urban residents, has seriously degraded water quality in every nook and corner of the country.[9]

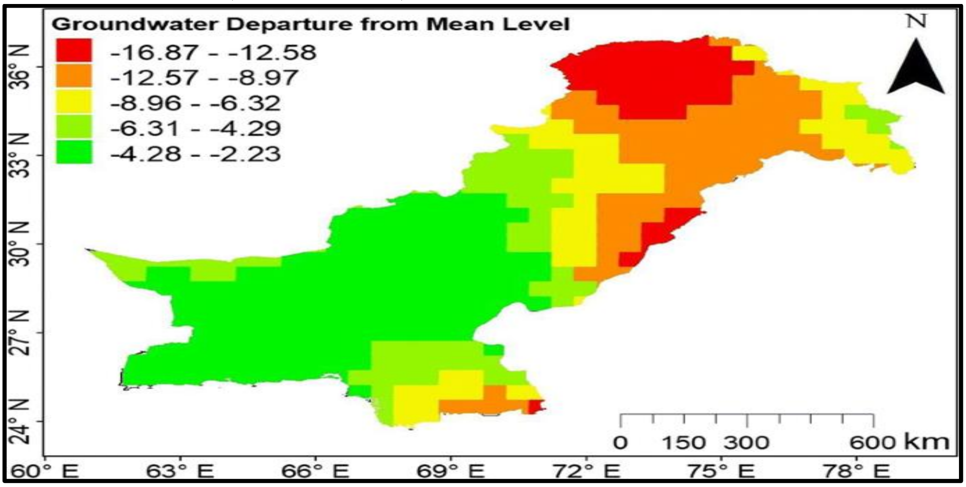
The water supply of the Lahore city is solely dependent on groundwater. Presently, about 1,800 public and private tubewells are extracting about 4.32 million cubic meter (MCM) of water daily. Similarly, there are about 190 tube wells managed by the Capital Development Authority (CDA) in Islamabad, extracting about 127 MCM annually to manage water supply. In Rawalpindi, the estimated annual groundwater abstraction through 490 tubewells is about 58 MCM for the provision of drinking water supply.[10]

The extensive extraction has caused groundwater depletion. Figure 5 shows that the highest decrease was noticed in the range of −16.87 to −12.58 cm/year in the north (Himalaya region of Pakistan) and some grid points in the central east. Groundwater decline in the north may be due to rapid glacial melting due to rising temperatures and a decrease in precipitation over Himalaya regions, and due to excessive use of groundwater for irrigation in the northeast of Pakistan. The groundwater storage was found to decrease in the south-western parts in the range of −4.28 to −2.23 cm/year, mainly due to decrease in precipitation.

The highest groundwater depletion of about 6 m per year is recorded in Quetta Valley, where tube well drilling depth has crossed 350 m. The situation in other metropolitan cities such as Rawalpindi (2.5 m/year), Lahore (1 m/year) and Islamabad (1 m/year) is also a matter of grave concern for long-term drinking water supplies, besides issues of deteriorating quality.[11]

[6] Imran 2019.
[7] UN Water 2022.
[8] Kamal 2023.
[9] Sheikh 2022.
[10] Arshad, et al. 2023.
[11] Arshad, et al. 2023.

Fig. 5. Spatial Patterns of Changes in Groundwater Storage (from the mean) in Pakistan from 2002 to 2016



Source: Ahmed, *et al.*, 2019.

2.4. System Inefficiency/Cost Recovery

The municipal water system in a typical city of Pakistan is characterised by poor service delivery, inadequate maintenance of physical systems, and very low recovery of costs resulting in inadequate resources for the maintenance of physical systems/ investments.

Intermittent water supply (IWS) is an important factor in the poor performance of water utilities. Water is not available continuously to all households and industries but instead is provided in turn to different urban zones, each for a limited period. Table 5 shows the average hours of water supply in a day in major cities of Pakistan. Low reliability reflects poor customer orientation by water service providers. Intermittent services discourage users from paying water tariffs, impacting the financial sustainability of service providers, which further undermines service quality. There are many drivers of IWS, including physical water supply constraints due to seasonal and population trends, limiting water leakage from damaged pipes, and prioritising access due to privatisation or local governance policy.

Table 5

Water Supply by Daily Hours in Major Cities of Pakistan

Faisalabad	Karachi	Lahore	Multan	Peshawar	Rawalpindi
8	4	11	8	9	8

Source: Abbas, *et al.,* 2022 and World Bank 2014.

Municipal utilities suffer from high levels of non-revenue water[12]—a measure of Water supply technical operations efficiency. NRW losses of 50 percent are not uncommon in South Asian cities (see Figure 6). Losses can be in the form of leakages as well as theft.

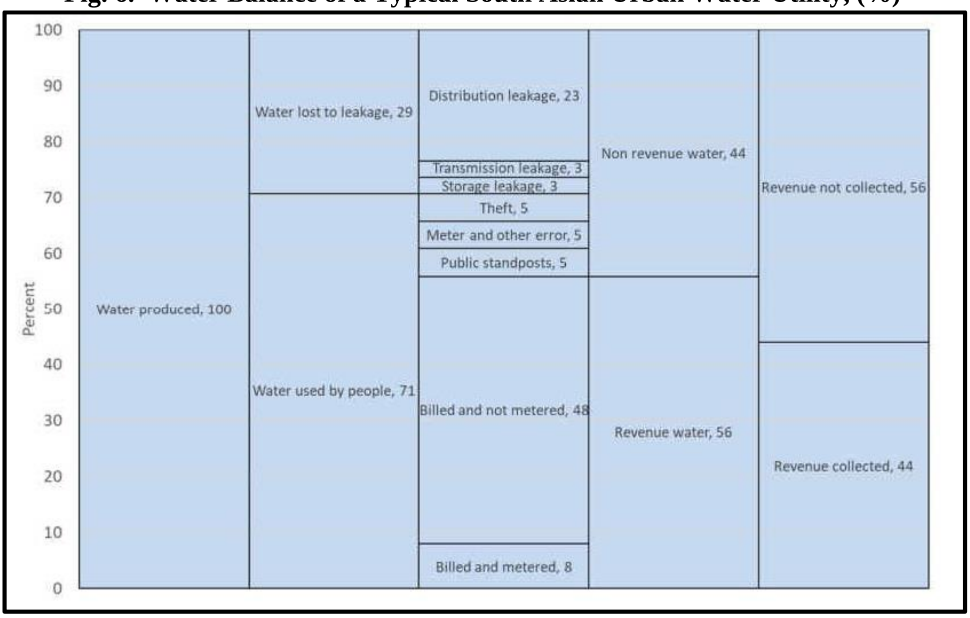
[12] Water that has been sourced and prepared for distribution but is lost before it reaches the customer.

About three-quarters of NRW is real physical loss of water, and one-quarter is apparent loss. Non-revenue water (unbilled water) is estimated at between 24 percent and 68 percent (Figure 7). The ratio is very high compared to value of 4 percent for Singapore, 9 percent for Japan and 19 percent for private companies in the UK. Coupled with collection inefficiency, the water effectively paid for by the customers ranges from 16 percent of production in Quetta to 52 percent in Rawalpindi and Lahore.[13] Urban service tariffs cover only 16 percent of the cost of urban water supply and sanitation services.[14]

More recently, water tariff rates have gone up in most of cities. Between July 2022 and July 2023, water tariffs in all cities of Punjab, Northern areas and Islamabad increased significantly due to rising energy costs. The urban areas of Punjab witnessed an average tariff surge of 213 percent, with Lahore — where water tariffs had remained unchanged since 2004 — bearing the most significant impact with a staggering 591.9 percent increase. However, for the two lowest plot size categories, the government of Punjab is subsidising water rates, reducing them by half.[15] Despite the substantial tariff hikes after no change for decades, water tariffs in Punjab remain low at US$0.12/$m^3$ which is very low compared to the global average of $2.36 for water tariffs.[16]

In Lahore, 98 percent of the customer connections in Lahore are unmetered. WASA Lahore is facing financial constraints due to high energy costs and low water tariff rates, which has resulted in the reduction of supply hours by the tube wells from 14–18 h per day in 2013 to 10–11 h per day in 2020.[17]

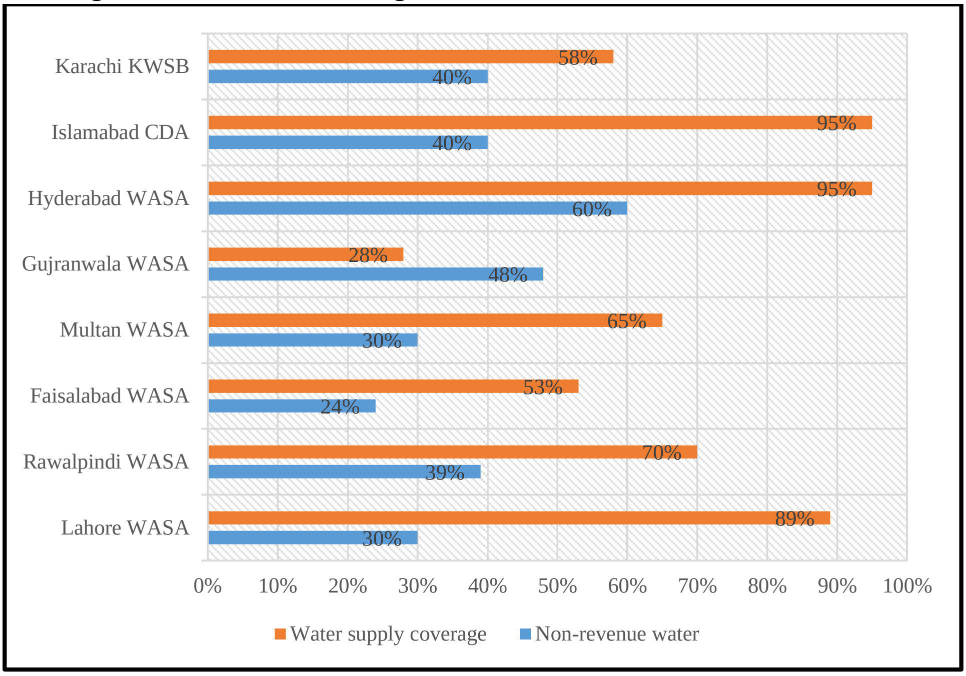
Fig. 6. Water Balance of a Typical South Asian Urban Water Utility, (%)



Source: Sathre, *et al.*, 2022.

[13] GOP 2012.
[14] World Bank. 2019.
[15] In Punjab, tariff rates are calculated based on the plot size of each household.
[16] Yuno 2023.
[17] Abbas, *et al.*, 2022.

Fig. 7. Urban Water Coverage and Non-revenue Water in Pakistan, 2012



Source: World Bank. 2014.

2.5. Urban Flooding

Flooding in cities of Pakistan is linked with the destruction of green areas that absorb water, encroachments on water run-offs, blocking of drainage systems, flyovers/roads, and urban sprawls (see Figure 8). With the number of people living in urban areas increasing rapidly—owing to a high population growth rate and migration from the rural areas—and cities projected to house half the Pakistani population by 2050, the rising incidence of urban flooding presents a major challenge to planners.[18]

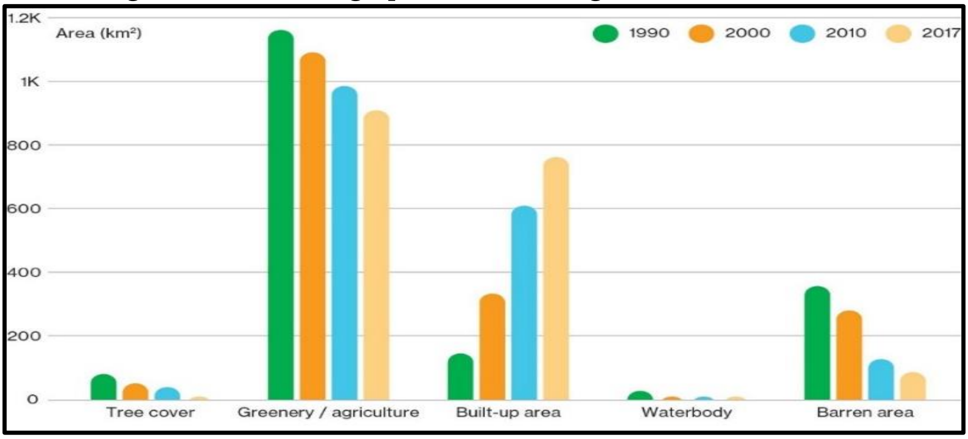
For instance, intense rainfalls in Lahore in 2010, 2014 and 2018 caused extensive flooding in the most densely populated areas of the city such as Bhatti Gate and Lakshmi Chowk.[19]

In 2020, Karachi experienced its heaviest rains in almost a century, killing dozens and leaving hundreds of thousands trapped. Natural drainage channels, already clogged with solid waste choked Karachi's natural stormwater management system.[20] As a result, rainwater had nowhere to go and once severe weather events occurred, existing infrastructure in its marginalised state of disrepair, was overwhelmed.

There is a need to address weak administrative and operational infrastructure in Pakistan's megacities, poor solid waste management, and inadequate urban drainage systems in order to mitigate the urban flooding challenge.

[18] *Dawn*, 2023.
[19] Talbot and Ranjan, 2023.
[20] Shams, 2020.

Fig. 8. Trends in Geographic Area Coverage of Lahore, 1990-2017



Source: Iqbal, 2019.

2.6. Weak Institutional and Regulatory Framework

In Lahore, Rawalpindi, Faisalabad, Multan, Gujranwala, Quetta and Hyderabad, Water and Sanitation Agencies (WASAs) are responsible for planning, designing, development and maintenance, repair and operations of water supply and sewerage and draining system, as well as collection of Aquifer Water charges. Karachi Water and Sewerage Board (KWSB) and Capital Development Authority (CDA) are in charge of water and sanitation in Karachi and Islamabad respectively. Water and Sanitation Services Companies (WSSC) are responsible for water and sanitation services in Peshawar, Mardan, Kohat, Abbottabad and Swat. Tehsil Municipal Administrations (TMAs) and Municipal Corporations govern small and medium-sized cities across the country.

WASAs, TMAs and other urban management authorities suffer from a lack of capacity in terms of both human resources and management systems. They cannot make their own investment and operational decisions and lack performance incentives. Regarding wastewater, they also lack capacity, infrastructure and systems, including functioning water treatment plants.[21]

3. RECOMMENDATIONS AND THE WAY FORWARD

The solution requires efficient management and conservation of water and political ownership to resolve the issue. The supply-side interventions include recycling wastewater by encouraging private sector participation and optimal pricing of water. This needs to be coupled with investment in cost-effective brackish groundwater and seawater desalinisation. Demand-side interventions include enforcement of efficiency standards/practices, conservation and population control. In addition, water pricing needs to be implemented.

The government needs to institute a major paradigm shift that promotes the more judicious use of water. This will include water infrastructure maintenance, water conservation technologies and awareness-raising.

[21] Cooper 2018.

Following are a few recommendations:

3.1. Recycling of Wastewater

Pakistan treats only 1 percent of its wastewater, while in cities about 8 percent of wastewater is treated in municipal treatment plants.[22] There is little or no regulation to check or restrict the flow of contaminated wastewater into canals and rivers across the country. This contaminated water not only reaches cultivated lands for irrigation purposes but also makes its way into supply lines that take water to homes for use by domestic consumers. The policy-makers need to rethink water policy by urging effective collection, treatment and recycling of wastewater as is done in Israel and Singapore based on the principle of private sector participation and optimal pricing of water.

Israel, which was water-deficient with 70 percent desert, has achieved water security by reusing around 90 percent of its (collected and treated) wastewater, meeting 25 percent of its total water demand. Similarly, Singapore – another water-scarce country – is meeting 40 percent of its water demand from recycled wastewater which is expected to reach 55 percent by 2060.[23]

3.2. Rainwater Harvesting to Address Issues of Urban Flood and Groundwater Recharge

There is a need to use innovative methods to solve problems of urban flooding and recharge groundwater. Rainwater harvesting can address issues of urban flood and solve the problem of depleting groundwater in cities of Pakistan. *"rainwater harvesting is essential to institutionalise the response to yearly urban floods and with a little ingenuity turn a crisis into an opportunity to utilise this water resource and recharge our depleting groundwater aquifers"*, says Malik Amin Aslam, former adviser to the prime minister on climate change.[24] Instead of storing rainwater water in tanks for reuse, recharging (the water table) is cost-effective, and can help address urban flooding and improve the water table. It will help to reduce abstraction [of groundwater] and boost recharging. *"Any water that is collected from rain (like in Lahore) is good news but perhaps concrete storage tanks are not the answer. The water should be used to recharge the aquifer"*, says Simi Kamal, former chair of the Hisaar Foundation.[25] Recharging wells receive water from rooftops and roads, filter it and channel it underground to increase the water table.

3.3. Water Metering/Pricing to Reduce Non-revenue/Unaccounted Water

People should pay a price that reflects both direct and indirect costs of water consumption. This has to be coupled with removal of subsidies that promote increased water extraction (e.g., in Balochistan) or water pollution. Affordability issue may be addressed using instruments such as vouchers, cash transfers or rebates.

Once the amount of utilisation is known, it enables better planning and management of the precious resource. The current pricing regime offers little incentive to consumers to conserve water. Pricing may be linked with income levels along with several other

[22] Hifza, *et al.*, 2020.
[23] UNEP, 2023.
[24] The Third Pole, 2020.
[25] The Third Pole, 2020.

dimensions. Increasing the cost of water consumption will not only push consumers to use water more judicially but also generate sufficient revenues for the maintenance of infrastructure and water-conserving technologies. It is vital to introduce a transparent, effective, and modern system for water metering in Pakistan so that water misappropriation and waste can be controlled. There is also a need to remove groundwater subsidy and make water users pay their electricity bills. This will result in water use efficiency and, circular debt will go down.

3.4. PROMOTE WATER CONSERVATION

Pakistan needs to adopt a culture of water conservation - using water efficiently and avoiding wasteful use. There is a need to employ rational water resource practices, implement water-saving technologies, and prevent unauthorised use of drinking groundwater. Through aggressive water conservation measures, including strict watering restrictions and the replacement of water-intensive landscaping with drought-tolerant plants, Las Vegas has significantly reduced its water consumption.[26] The Minnesota state's (in the US) largest cities are among the conservation leaders: Minneapolis homes and businesses used 10 billion gallons less than 35 years ago; St. Paul cut its use by a third; Duluth by more than half in the same time frame. Success is attributed to changes by consumers, businesses and, investment in water infrastructure to reduce usage and minimise waste.[27]

3.5. CONTROL URBAN SPRAWL

Rapid urbanisation has left a sprawling growth of residential, commercial and industrial areas. There is a need to stop the wasteful urban sprawl. up to 70 percent of urban water is used on horticulture and golf courses. Denser, walkable urban design is also water-efficient. Ban the import of exotic plants and use local Xeric plants.

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