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Most of the surface and drinking water sources (88 per cent) levels of lead higher than the World Health Organization (WHO) recommended value.

Water consumers and all stakeholders need to be educated regarding the responsible use of water so that the water wastage can be minimized.



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Why we are here:

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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ISSUE BRIEF

SITUATIONAL ANALYSIS OF WATER RESOURCES OF KARACHI

Karachi-The city of lights

The city of Karachi inhabits approximately 14.9 million people¹. Housing almost 60 per cent of the industries in the country, it is recognized as the industrial and financial centre of Pakistan². Its significance in Pakistan's economy is evident through the fact that it contributes 12-15 per cent to the national Gross Domestic Product³.

Located on the coast of the Arabian Sea in the south of Pakistan, Karachi's water supply is dependent on surface water and groundwater sources. Surface water sources include Lake Haleji (Plate 1), Lake Keenjhar (Plate 2) and Hub Dam (Plate 3) while the groundwater source includes Dumlottee well-fields. However, the water supply from these wells is negligible, providing only 1.4 million gallon per day (MGD) of water after the rainy season. The wells are dry for rest of the year⁴.



Plate 1: Lake Haleji

¹ Pakistan Bureau of Statistics, 2017 Census

² IUCN. (2004). Sindh State Of Environment And Development

³ Young, W. J., Anwar, A., Bhatti, T., Borgomeo, E., & Davies, S. (2018). Pakistan Getting More From Water. World Bank Group

⁴ JICA. (2008). The Study On Water Supply And Sewerage System In Karachi In The Islamic Republic Of Pakistan (Vol. 2)



Water situation in Karachi: facts and figures

- Karachi Water and Sewerage Board (KWSB) supplies approximately 665 MGD⁵ to Karachi, against a demand of 820 to 1,200 MGD resulting in a shortfall of 155 to 535 MGD⁶. The water supply network for Karachi is shown in Figure 1.
- Approximately 210 MGD of water supplied is not filtered⁵.
- Water supply system of the city is at least 40 to 45 years old⁶ and an estimated 35 per cent (232 MGD) of the supplied water is lost during transmission thus decreasing the water availability to 433 MGD^{5,7}.
- There is no metering for retail customers and only 25 per cent of commercial and industrial customers have a metered supply³. Hence water consumption data for these sectors is not available.
- Almost 60 per cent of the houses are connected to the water supply network and water availability ranges from 2 hours after every two days to 2 to 4 hours every day^{8,3}.
- In order to fulfil the demand gap, regulated and unregulated water hydrants are spread across the city. After the closing down of 948 unregulated water hydrants since 2009, six regulated and metered hydrants supply water to the city^{3,6}. Despite that, the issue of unregulated hydrants needs attention.
- K-IV project phase-I, designed to supply an additional 260 MGD of water was to be completed by 2018, however only 20 per cent of the work have been completed till date⁹.

⁵Karachi Water and Sewerage Board (KWSB). (2019) Retrieved from <http://www.kwsb.gos.pk/View.aspx?Page=26>

⁶World Bank Group. (2019). Karachi Water and Sewerage Services Improvement Project

⁷World Bank Group. (2018). Transforming Karachi into a Livable and competitive Megacity

⁸Dawn. (2016). Tapping into Trouble. Retrieved from: <https://herald.dawn.com/news/1152875>

⁹ Express Tribune. (2019). Fate of K-IV and S-III projects in doldrums

Retrieved from: <https://tribune.com.pk/story/1993891/1-fate-k-iv-s-iii-projects-doldrums/>

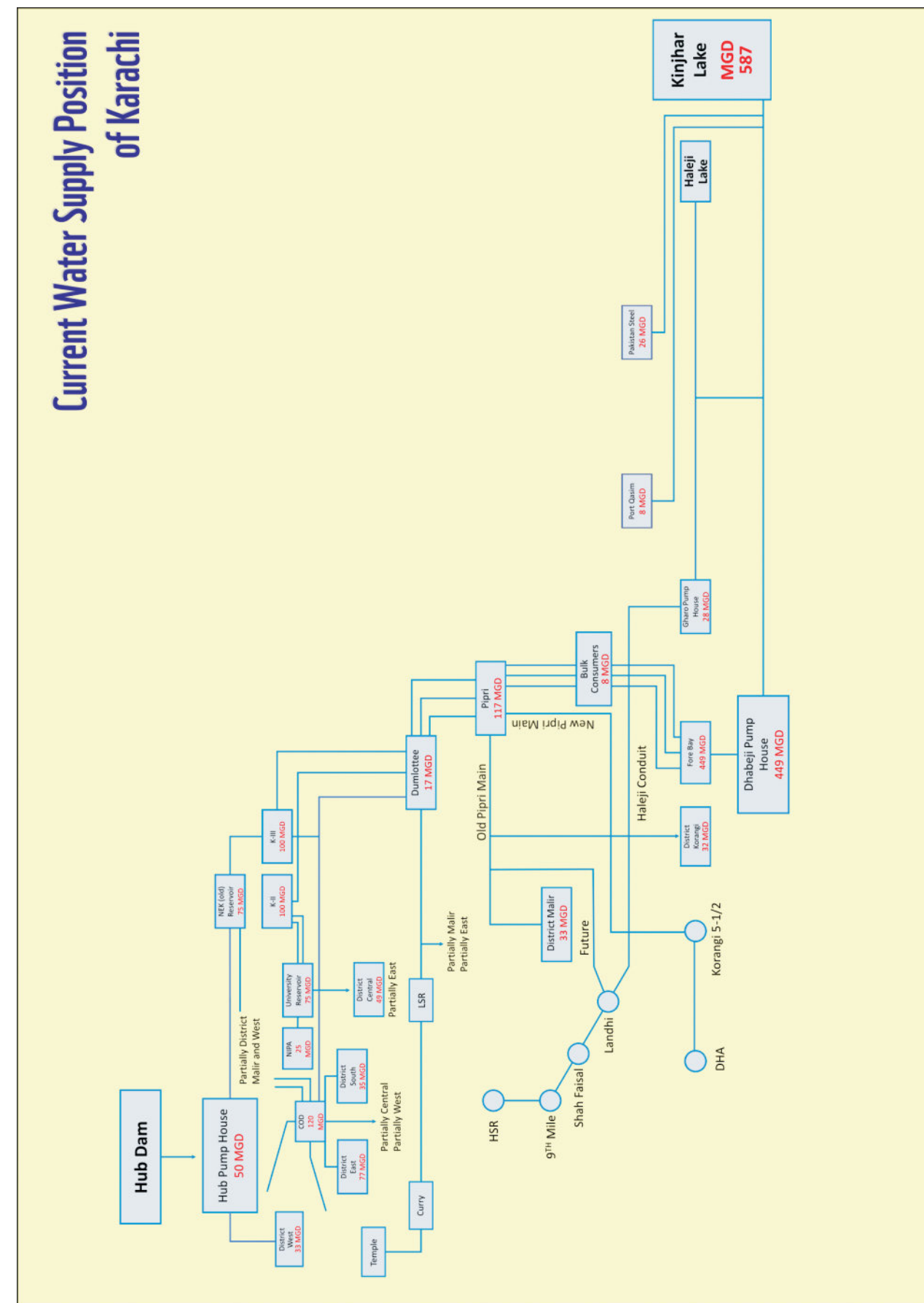


Figure 1: Current water supply situation of Karachi¹⁰

¹⁰KWSB. (2019). Retrieved from: <http://www.kwsb.gos.pk/View.aspx?Page=212>

- Most of the surface and drinking water sources (88 per cent) have levels of lead higher than the World Health Organization (WHO) recommended value¹¹. A study in 18 towns of Karachi showed high levels of lead in blood in 89 per cent of the samples⁷.
- Pakistan Council of Research in Water Resources (PCRWR) reports that 86 per cent of the water sources are contaminated with Coliform and are considered unsafe for drinking¹².
- According to an estimate, less than 60 per cent people have access to sewerage facilities⁹ and almost 40 per cent of the city's population lives in slums with limited water supply and poor sanitary infrastructure¹³.
- The sewerage system of Karachi consists of 5,670 kilometers of sewers, six major pumping stations, 32 minor pumping stations and 250,000 manholes¹⁴.
- A total of 475 MGD of sewage is generated in Karachi. Out of this, approximately 54 MGD is treated at Sewage Treatment Plant-I Site and Sewage Treatment Plant-III, Mauripur while a third treatment plant remains non-functional.
- Over 12,000 industries of 65 different types exist in Karachi including tanneries, foundries, metal processors, manufacturers of plastic, rubber, glass, ceramics, tiles, cement, textiles, pharmaceuticals, soap, fish processing units, producers of fertilizers, pesticides, and other chemicals.
- A Combined Effluent Treatment Plant has been installed at Korangi Industrial Area, originally designed to treat wastewater from tanneries in the area and domestic sewage from KWSB Pumping Station-II. However, it does not run at full capacity and also receives waste from 280 or so other factories, affecting its performance.
- 420 MGD of untreated sewage (municipal and industrial) is disposed off into Lyrai and Malir rivers, ultimately ending up in the Arabian Sea. This is causing coastal pollution and environmental degradation^{15,3}.
- Due to changing climatic conditions, torrential rains are becoming more common resulting in urban flooding. Lack of planning, ineffective drains and wastewater channels further aggravates the situation. There is a dire need to include storm water in the overall water management plan for Karachi.
- A comparison of industries in Karachi and the presence of wastewater treatment plants in these is given in Figure 2¹⁶.



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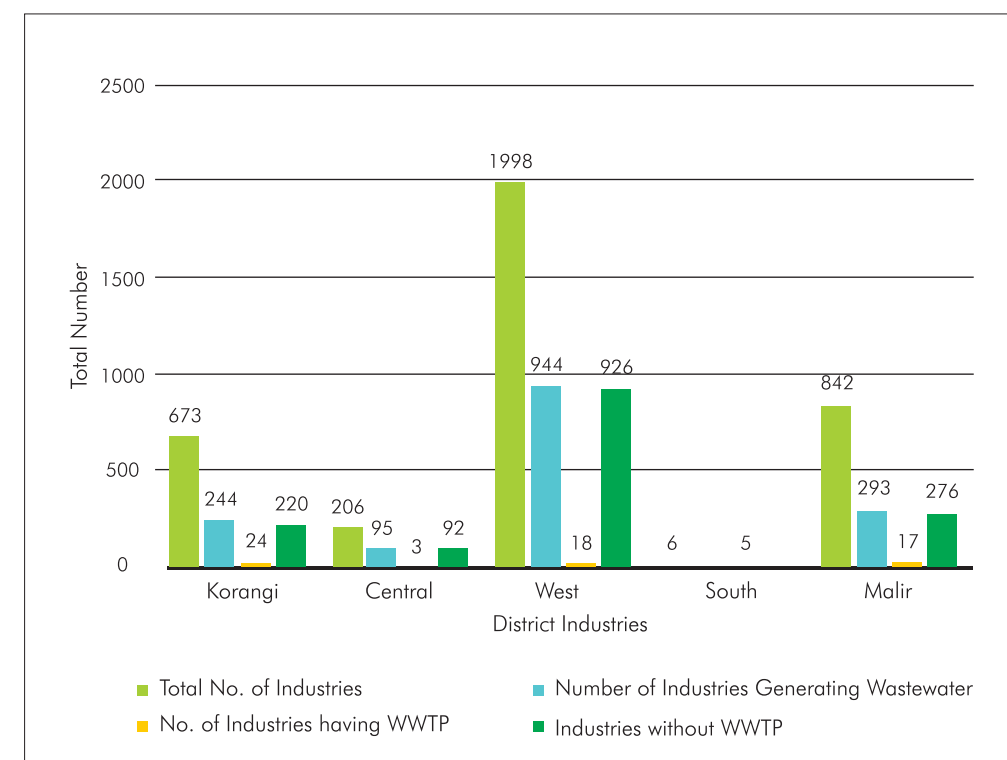


Figure 2: Comparison of industries in Karachi and the presence of wastewater treatment plants¹⁶

Why we need to understand the water situation of Karachi:

- Population of Karachi increased from 9.339 million in 1998 to 14.9 million in 2017 showing a 62.5 per cent growth in the population in 19 years. Recent studies suggest that population will grow by 30 per cent from 2017 to 2030¹⁷. This will translate in an increased water demand which will in turn put pressure on the already scarce water resources.
- Water supply pipelines and sewerage pipelines are corroded and often lie parallel to each other causing cross-contamination. As a result, majority of Karachi does not receive safe and clean water and around 30,000 people, mostly children, die each year in the city due to consumption of contaminated water¹⁸.
- Toxic effluents without any treatment are released by the industries into the natural water bodies of Karachi. This contaminates surface and groundwater sources. The use of industrial wastewater for irrigation is a common practice among farmers. However, this results in harmful chemicals entering the food chain and contamination of surface and groundwater sources as well.
- Climate change poses a threat to the water security of Karachi in the form of variable river flows due to change in rainfall pattern and rising of sea levels at the rate of 1.1 mm/year putting population residing by the water bodies at increased risk. Variation in rainfall patterns will also affect the Hub Dam, which is rain-fed, thereby creating a further uncertainty in Karachi's water supply.
- Water scarcity will severely affect the industries operating within the city. A recent report suggests that 300 to 400 industries in SITE Super Highway Industrial Area are on the verge of closure due to water scarcity¹⁹.
- Due to shortage of water supply, many industrial units and agricultural farmers heavily depend on local

¹¹N. Ul-Haq, M.A. Arain, N. Badar, M. Rasheed & Z. Haque. (2011). Drinking water: a major source of lead exposure in Karachi, Pakistan. Eastern Mediterranean Health Journal

¹²PCRWR. (2016). Water Quality Status of Major Cities of Pakistan (2015-16)

¹³Anon, (2000). Karachi Development Plan, United Nation Centre for Human Settlements. UNDP Project Pak/80/019, Karachi Master Plan 1986-2000, p.20

¹⁴KWSB. (2019). Retrieved from: <http://www.kwsb.gos.pk/View.aspx?Page=32>

¹⁵Khattak, M. I., & Khattak, M. I. (2013). Ground water analysis of Karachi with reference to adverse effect on human health and its comparison with other cities of Pakistan. Journal of Environmental Science and Water Resources, 2(11), 410-418

¹⁶Sindh Environmental Protection Agency, Statement showing details of Industries in Karachi Having Wastewater Treatment Facility. Retrieved from <http://epasindh.gov.pk/statement%20karachi.htm>

¹⁷EuroMonitor. (2018). Global Overview of Megacities.

¹⁸Engel, K., Jokiel, D., Kraljevic, A., Geiger, M., & Smith, K. (2011).

Big Cities. Big Water. Big Challenges. Water in an Urbanizing World. WWF Germany, Berlin.

¹⁹Express Tribune. (2018). 400 Industrial units 'on verge of closure'. Retrieved from: <https://nation.com.pk/18-Apr-2018/400-industrial-units-on-verge-of-closure>

groundwater sources resulting in increased groundwater abstraction and further lowering of groundwater table.

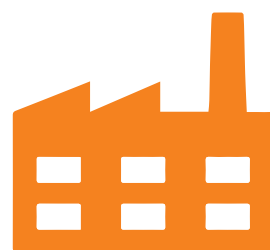
- Since retail customers are not metered, there is very little conscious effort on their part to make responsible use of water and often large amount of water is wasted.

What needs to be done?

WWF-Pakistan recommends the following steps to be taken in order to improve the worsening water condition:

Policy and regulations

- Sindh Environment Protection Agency should ensure the monitoring of wastewater being discharged from the industries and that it meets the Sindh Environment Quality Standards (SEQS) 2016 guidelines.
- KWSB need restructuring and revamping in terms of its service delivery, governance structure, operations and infrastructure. This can be aided by strong donor support and technical assistance in implementing the reform process.
- KWSB should ensure timely leak detection, repair and maintenance of pipelines and work towards dismantling the illegal hydrants in order to stop contamination, water loss and theft. Existing leaking pipes should be replaced with high density polyethylene (HDPE) pipes in the water supply infrastructure. Moreover, pumping efficiency needs to be improved and backup pumps need to be installed at the pumping stations.
- KWSB should formulate a strategy to meter all its consumers particularly bulk-water supply consumers so that an accurate water database and information system can be made regarding the volume of water being consumed.
- Policy should be made for the provision of water supply and sanitation services to the 8 million residents of informal settlements in Karachi on priority basis who lack access to water supply and sanitation.
- KWSB should establish Water Quality Labs at town level near water supply schemes for monitoring quality of drinking water before and after its supply to the people, and results must be uploaded on various websites for public reference.
- SEPA should identify critical effluent discharge points in the surface waters so that the Lyari and Malir rivers and the Arabian Sea can be protected from major contamination.
- Expedite completion of K-IV project to ensure that the water demand and supply gap is decreased. Also, areas where the water supply system is not available, new distribution lines of water supply must be laid before the start of K-IV.
- Strong and effective storm water management plan is needed for the city as currently both major drains for the city namely Lyari and Malir rivers are badly affected due to dumping of solid waste.
- Government departments may extend financial support to promote research and innovation for the development of low cost, improved, resilient, and environment friendly water and sanitation projects.



Sindh Environment Protection Agency should ensure the **monitoring of wastewater** being discharged from the industries and that it meets the Sindh Environment Quality Standards (SEQS) 2016 guidelines.



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KWSB should formulate a **strategy** to meter all its consumers particularly bulk-water supply consumers so that an accurate water database and information system can be made regarding the **volume of water** being consumed.



Ensure that institutions at all levels (school, colleges and universities) teach about impending water crisis and the need to **manage water resources** sustainably. It can be done through lectures, seminars, and workshops.



Industries should focus on **reducing pollution** at the source by using cleaner production techniques and reduce, reuse and recycle principles so that they produce less pollution load and save cost of its treatment.

Water conservation through public awareness

- The citizens of Karachi should use home based cost-effective water purification and storage systems i.e. boiling, solar disinfection, bio-sand filters, flocculation and chlorination techniques.
- Water consumers and all stakeholders need to be educated regarding the responsible use of water so that water wastage can be minimized. In this regard, electronic, print and social media can play a vital role. Moreover, trainings on better water management practices should be conducted. In this case, NGOs and civil society can prove to be useful.
- Ensure that institutions at all levels (school, colleges and universities) teach about impending water crisis and the need to manage water resources sustainably. It can be done through lectures, seminars, and workshops.

Use of smart environmental management practices

- Industrial toxic wastewater contains heavy metals. It can be treated using financially viable and environment-friendly technologies. One such example is floating wetlands which is effective and sustainable technology for industrial wastewater treatment.
- Textile industries in Karachi should consider compliance of Zero Discharge for Hazardous Chemical (ZDHC) by 2020 as international buyers will actively start to pursue their suppliers for ZDHC.
- Industries should be encouraged to conduct their water audit in order to understand ways in which water consumption can be reduced.
- Not all industrial processes require potable water. Recycling grey water in industrial processes wherever potable water is not required can save freshwater. It can also be used to water gardens, flush toilets or for any other non-potable use.
- Industries should focus on reducing pollution at the source by using cleaner production techniques and reduce, reuse and recycle principles so that they produce less pollution load and save cost of its treatment.