

# Scarcity Of Water In Quetta – A Way Forward

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## Abstract

Water scarcity is severe in Quetta, the capital city of Pakistan's largest province Balochistan. This scarcity of water if continued at this high rate can lead to a mass exodus from the province's only large metropolis and can create some gruesome social, political, and demographic issues. Considering these reasons, a study was carried out by adopting a qualitative research methodology using interviews with key officials related to water departments as a tool. The findings of the study suggest that water from the river Indus through the channel of Kachi canal should be pumped to Quetta in the shorter run to fill the gap of the water need. In the longer run, more dams need to be built. Moreover, the mismanagement and bad governance found within the water-related departments need to be taken highly into consideration to resolve the issue and a more balanced approach should be adopted to conserve and store water.

**Keywords:** Water Scarcity, Quetta, Kachi Canal, River Indus, Exodus.

## Introduction

Water is necessary in every aspect for humans and, in fact, for all biological life. Even while water makes up about 70% of Earth's surface, only 3% of it is available for human use, making it a very valuable resource (Water Facts – Worldwide Water Supply, 2020). On the other hand, as the world's population grows swiftly, it is anticipated that 1.1 billion people would experience water scarcity at least once a year. By 2025, it is predicted that more than half of the world's population would experience water shortage. (Water Scarcity, n.d.). The ecosystem is also changing due to global warming, and glaciers are melting more quickly than before. Glaciers, a vital source of water, are in danger of disappearing as a result. In addition, South Asia and Pakistan are among the areas most affected by global warming. Pakistan is predicted to experience full water scarcity by the year 2040, according to the International Monetary Fund (IMF) (ANI, 2021).

Considering Pakistan and its province Balochistan, which in terms of the total area is the largest province is facing a high level of water scarcity. It depends on precipitation brought in by winter westerly weather systems, although practically almost all of it is beyond the monsoon zone. Balochistan has been a semiarid land from the beginning of time. The issue recently has only gotten worse as a result of climate change and global warming. Balochistan lacks rivers and torrential downpours have significantly diminished due to the lack of rain. Nearly 85% of the 12.3 million people who live in Balochistan are thought to lack access to clean, and fresh water.

The only notable city in the province is the capital city Quetta. It was designed by Colonial British officials for 50,000 people, but today it is home to an estimated 2.5 million people, underscoring the scarcity of water (Quetta, Pakistan Metro Area Population 1950-2022, n.d.). Resultantly, the city's water demand is 61 million gallons per

day, but only 34.8 million gallons can be delivered, according to the Water and Sanitation Authority (WASA) (Amir, 2019). Additionally, over 24,000 tube wells have been legally drilled in and around Quetta, creating a severe water shortage. As a result, the impending collapse is considerably riskier since it increases the possibility of large-scale migration from the province's only major city. The hub of the province, Quetta, provides support for economic growth and job generation on a provincial level. Quetta's inhabitants as well as about 20% of the province would be compelled to migrate if Quetta were to dry up owing to a shortage of water. This enormous population migration will inevitably lead to serious demographic, social, and political problems and conflicts wherever it migrates, be it Sindh or Punjab (Focus on Water Crisis, 2002).

Water shortage in Quetta is thus a national security concern since it has far-reaching ramifications for Balochistan, and indeed the entire country. As a result, it is vital to assess the issue of water shortage confronting Quetta City and determine the ways and means to manage it.

### **The Development of Quetta City in 1881 and its Water Situation**

When the British Army returned from Kandahar at the end of the second Anglo-Afghan war in 1881, they chose to create Quetta a permanent military station. Mr. Barnes, the Deputy Commissioner, formed it. Quetta was nearly bereft of trees. Mr. Barnes chose to fill out the station with various trees purchased from Kandahar and planted along the roadsides with the permission of Sir Robert Sandeman. The settlement that surrounded the Miri Fort had a population of around 4,000 people prior to the British occupation of Quetta in 1856 (Buller, 1907).

Towards the end of 1886, an idea was initially put out to supply Quetta with piped water. A sizable spring of water that flowed from the Zarghoon

mountain provided enough water from Urak, which is located around 30 kilometers from the city center. The headworks had a well for purifying the water, a mechanism for controlling it, and other components. A 7-inch cast iron pipe that connected Quetta to an 11-kilometer reservoir at Urak was the first significant supply line. The reservoir was made up of four masonry tanks, each having a capacity of 37,500 gallons; the four tanks held enough water for two days for the whole city of Quetta (Buller, 1907).

The average rainfall in 1905 was 10.52 inches in Quetta. The wettest months of the year were October and March. Only 3.30 inches of rain fell in Quetta throughout the spring and summer. Although winter snow seldom stayed on the ground in Quetta for very long, it remained in the hills and surrounding area (Buller, 1907).

### **Current Situation of Water in Quetta City**

Quetta, which became the capital city of Balochistan in 1970, has grown rapidly due to population expansion, urbanization, the migration of Afghan refugees, and its location as a transit hub for Afghanistan and Iran. Its population was 2.2 million as of the 2017 census (Provincial Census Results – 2017, n.d.). It has a water demand of roughly 61 mgd, however, only 24.5 mgd is given to suit the city's demands (Khan R, 2022). Quetta is located on the Pishin-Lora basin, one of Balochistan's 18 basins (Zainuddin & Maqsood, 2013).

Table 1 provides statistics from the irrigation department indicating that groundwater depletion in Balochistan, particularly in Quetta, is increasing at an alarming rate. The average groundwater level in 2021 is 600 feet, up from 300 feet in 2010. This equates to a depletion of 300 feet to date, with a rate of 25 feet each year and continuing. With further urbanization, Quetta confronts the worst-case scenario of water shortage.

**Table 1** Ground Water Level Data of Balochistan 2010 to 2021

GROUND WATER LEVEL DATA OF BALOCHISTAN 2010 to 2021					
WATER LEVEL IN FEET					
S No	NAME OF DISTRICT	WATER LEVEL		DEPLETION from 2010 to 2021	AVERAGE PER YEAR DEPLETION
		2010	2021		
1	Quetta	300	600	-300	-25
2	Qilla Abdullah	450	800	-350	-29
3	Pishin	300	450	-150	-13
4	Kalat	320	650	-330	-28
5	Mastung	180	480	-300	-25
6	Sibi	80	200	-120	-10
7	Harnai	160	300	-140	-12
8	Ziarat	380	560	-180	-15
9	Loralai	220	500	-280	-23
10	Duki	120	300	-180	-15
11	Musakhel	140	350	-210	-18
12	Kohlu	80	220	-140	-12
13	Dera Bugti	200	300	-100	-8
14	Barkhan	160	280	-120	-10
15	Qila Saifullah	150	550	-400	-33
16	Zhob	130	450	-320	-27
17	Shirani	60	100	-40	-3
18	Naseerabad	80	320	-240	-20

Source: Department, Irrigation, “DISTRICT-WISE GROUNDWATER MONITORING AND FUTURE PLAN FOR BALOCHISTAN.” 2021.

### Literature Review

With no thought for long-term sustainability, groundwater policy has focused only on boosting agricultural production and reducing poverty. These acts have caused groundwater tables to drastically decline. Groundwater levels have decreased in Balochistan as a result of the widespread installation of tube wells, electricity subsidy schemes, and government inaction in preparing for the immediate and long-term consequences (Khair, Shahbaz, & Reardon-Smith, 2015). Additionally, groundwater is impacted by financial activities like selling water in exchange for a crop share (Razzaq, et al., 2022). By minimizing risk to high-value horticultural crops, water markets seem to act as a buffer against the growing water deficit in upland Balochistan (Khair, Mushtaq, & Culas, 2011). Significant groundwater extraction, especially in urban areas, may cause a water shortage. In the Quetta valley, for instance, GPS

data from two sites gathered between the middle of 2006 and the beginning of 2009 indicate a subsidence rate of 10 cm/year. Additionally, agricultural lands have grown in the city's central area, as seen in satellite images taken over nearly three decades, from 1975 to 2009 (Khan, Khan, & Kakar, 2013). Furthermore, in Quetta, the lack of water has also damaged the economy, trees, agriculture, and public health. Many people have been compelled to move due to a lack of water (Barrech, Ainuddin, & Najeebullah, 2018).

The subsidies for electric tube wells, breaches of the regulations governing tube well spacing, the indiscriminate building of tube wells, population growth, the cultivation of high delta crops, and insufficient drought management are the main causes of the worrying water level in the chosen region. Furthermore, the tube wells systematically collapsed and emptied the old Karez irrigation system, leading to ongoing groundwater loss (Kakar, Shah, & Khan, 2018). The districts of Pishin and Quetta are included in

the Pishin Lora Basin (PLB). Water scarcity in PLB is attributed to a significant rise in population and excessive water consumption. While the development of tube wells, their prolonged operation, and the reduction of the water table were significant factors in the study area's water shortage (Kakar & Ahmad, 2016).

In important basins of highland Balochistan, groundwater levels are dropping at an alarming rate of 2 to 3 meters per year. This decrease is attributed to an increase in tube wells, the continuance of the subsidized electric tariff policy, groundwater development plans, an increase in the amount of area watered by tube wells, and lower annual average rainfall. Tube wells and streams provide drinking water for more than 72% of Balochistan's rural residents (Syed, Richard, & Muhammad, 2010).

The majority of recent study has been on the causes and effects of Balochistan's water scarcity. The topic of Quetta's water scarcity and its possible detrimental impact on the province has not received much attention in the literature. The 2.5-million-person metropolis of Quetta is dealing with severe water scarcity. The rapidly dropping groundwater level, notably in Quetta, calls for this research. This study aims to find and provide policymakers with realistic and long-term alternatives that are lacking in the pertinent existing literature.

### **Research Methodology**

This research work is mostly qualitative in nature, with data collected and analyzed using both primary and secondary sources. The article is a case study of the city of Quetta, and it employs descriptive and analytical methods of investigation. A questionnaire containing open-ended questions was created as a tool for this investigation. With this information in hand, important informants from relevant agencies such as Public Health and Engineering (PHE), Water and Sanitation Authority (WASA), Irrigation,

Environmental Protection Agency Balochistan (BEPA), and Agriculture were identified and questioned. These important informants were chosen because they have a greater awareness of the water situation and are in positions of power. The acquired material was utilized for analysis to develop credible findings and suggestions based on their significant expertise and understanding of Quetta city and water-related issues. The detailed profiles of the key informants and questions are attached in Annex A and B.

## **Results and Discussion**

### **Reasons for Water Scarcity in Quetta**

#### **Demand and Supply of Water**

WASA mandates that each person receives 27 gallons of water every day. The production of water is 24.5 mgd, leaving a large 36 mgd shortfall. WASA is only able to provide roughly 600,000 gallons of the 1 million gallons of water that it is meant to deliver from the Urak valley to Quetta. The amount of water wasted is also enormous at 60,000 cubic feet that in return could be utilized. Further adding to the crisis, the water mafia extracts untold amounts of subterranean water while still providing water to meet the demand (H. Rana, personal communication, February 10, 2022).

Based on a thorough literature assessment and research, it is proposed that multiple dams be built to hold water and replenish groundwater in and around Quetta. This, however, is a long-term answer. They will not only take a long time and cost a lot of money, but they are also dependent on elusive rains, which are becoming less often each year (I. Hamid, personal communication, February 10, 2022).

#### **Population Growth**

The city's population growth over the past 20 years has made the water situation worse. The ongoing influx of Afghan refugees, as well as people moving to Quetta for work and trade from

other cities and villages, exacerbates the water shortage (A. Imran, personal communication, February 11, 2022).

According to the comprehensive research, megaprojects and their mega management are necessary to ameliorate the water issue in Quetta by managing the city's population boom. One feasible answer is to expand other towns to become cities in various districts, reducing the population strain on Quetta.

### **Climate Change**

Another important cause of water shortage is adverse climate change. This, along with the removal of trees, leads to less rain and disrupts groundwater recharge. Cutting down trees reduces precipitation while also causing soil erosion and silting up the few existing dams. Regular tree planting programs, which may generate rain to assist replenish the water table, are a possible solution to water scarcity. However, this, too, requires water (A. Batur, personal communication, February 12, 2022).

### **Tube Wells**

Tube wells are a relief in this dry area, but they are also a major source of underground water depletion. Water shortage increases when the water table drops. Illegal tube wells have exacerbated Quetta's water issue. When a Member of the Provincial Assembly (MPA) requests a tube well in his or her area, the appropriate authorities are required by law to comply (I. Hamid, personal communication, February 10, 2022). Such practices must be halted, and long-term strategies should be developed rather than quick fixes that benefit only a few. The involved departments must be permitted to operate independently of political interference. Water mining for commercial reasons should be prohibited for private businesses (bottled water). To control water shortages, the government should charge for water in order to educate the population about

water conservation (A. Batur, personal communication, February 12, 2022).

### **Agriculture**

Water is in short supply in Quetta for agricultural reasons. The general population obtains water from the aquifers via tube wells. Because Balochistan is arid, its economy should rely on cattle and, to a lesser extent, industry, rather than agriculture, and the same is true for Quetta. Agriculture must continue for subsistence purposes, but it must adapt to less water-demanding crops. The continued expansion of agricultural tube wells has generated an imbalance in the groundwater charge-recharge balance.

Quetta is bordered on three sides by mountains. Despite the fact that there is relatively limited room for agriculture, people continue to pursue it. This persuasion has resulted in illegal tube wells and groundwater over-exploitation. To address the issue, the government should boost other business sectors so that people are not solely reliant on agriculture. These steps must be implemented in stages rather than all at once (A. Wahab, personal communication, February 14, 2022).

### **Poor Governance**

Lack of institutional coordination, knowledge and interest within the political and administrative machinery in issues related to water management are further factors contributing to Quetta's water scarcity. For instance, the incompetence of the government results in project delays, and carrying out the same projects at various times tends to increase the cost of projects like the Mangi and Halq dams. Similarly, the Quetta Development Authority (QDA) trusted the Urban Unit Lahore with a project like the Quetta master plan despite the fact that the organization lacked familiarity with the region (I. Hamid, personal communication, February 10, 2022). Likewise, little coordination

exists across provincial departments such as the Environmental Protection Agency (EPA), Public Health and Engineering (PHE), Irrigation, WASA, and Agriculture, leading to the mismanagement of available water resources. The provincial government should strengthen institutional cooperation at the management level. Overlooking such collaboration may further deplete the city's existing water supplies. Capacity building of local institutions is required before awarding contracts to organizations that do not have the appropriate knowledge and skills to address water challenges at the local and provincial levels (A. Batur, personal communication, February 12, 2022).

### **Management Crisis**

The District Coordination Committee for Water should not have been chaired by the Deputy Commissioner of Quetta, but by the Managing Director (MD) WASA, who is a concerned authority on the subject (I. Hamid, personal communication, February 10, 2022). Furthermore, large expenditures in megaprojects need extensive monitoring procedures, which rarely exist in the relevant departments. Each entity holds the other responsible for the shortage of water. For example, one of the responders questioned WASA's claim of successfully putting down 1600 kilometers of pipeline, claiming that it was a waste of cash granted. The pipes were meant to be used to install a water meter in each home, but this never happened. This is only one example of an occurrence that was mentioned. However, numerous more significant challenges related to inadequate management are exacerbating the issue of water in Quetta (A. Imran, personal communication, February 11, 2022).

### **Measures Taken to Address the Issue of Water Scarcity - General**

Various efforts have been attempted to manage water shortages, including an Rs.1 billion investment in drip irrigation and a proposal to the

federal and provincial governments to prolong the program by providing another Rs.30 billion. Additional initiative in conjunction with the World Bank has committed stakeholders such as livestock, agriculture, irrigation, and the PHE to provide technical assistance in reducing erosion and making water accessible for better use. Recently, the 300-kilometer-long Kacchi Canal has provided water to 70-72,000 acres of land in Balochistan. It has the operating capability to deliver irrigation water for 750,000 acres.

Given the efforts done along similar lines, the agricultural department developed initiatives to minimize losses in canals, which were later extended during the 2002 drought. The initiative cost Rs. 4 billion in total, which was used to construct 13,000 paved grooves and pools. The initiative continued, and until 2018-19, Rs.1.5 to 2 billion was spent each year to decrease water losses. Furthermore, a project called Command Area Development was launched with Rs.7 billion in order to direct precipitation toward the land (A. Wahab, personal communication, February 14, 2022).

### **Conclusion**

Quetta, the capital city has great significance for Pakistan. A resourceful province having a water-starved capital will likely have ramifications for the entire region. The city is growing into a bustling metropolis with a population of about 2.2 million people and is experiencing numerous major issues, one of which is the lack of water. Water shortages were felt several times in the past when droughts struck the region at different periods. But now it is crucial to not repeat the mistakes of the past and build a more sustainable environment that can provide for future generations.

As previously described in various sections of the article, there are multiple explanations for this unresolved issue. One of the numerous causes is the city's rapid expansion and the general public's

lack of knowledge about water conservation. More innovations were implemented as technology advanced, such as the advent of tube wells. Prior to such progress, karez - an old system that was an excellent method to collect groundwater - began to decline. Excessive tube wells depleted the water table, and the groundwater charge-recharge equation (precipitation and ground soaking water) faltered. Climate change is occurring on a large scale, and it has intensified the precipitation cycle and halted the normal process of groundwater recharge.

Furthermore, Pakistan is an agricultural country, and under President Ayub's administration, a wave of green revolution gained priority. That agricultural program was obliged to be adopted by every province, including Balochistan, which was a section of West Pakistan. This strategy was mindlessly implemented despite the fact that Balochistan is not an agricultural zone. These measures encouraged local residents, particularly those in Quetta, to choose agriculture as a means of subsistence. The consequences of that policy are seen now in the form of groundwater depletion.

Additionally, the management vacuum has resulted in water-selling mafias seizing and exploiting groundwater for their own gain. If water-selling groups can meet the demands of the local populace, relevant departments can do the same if adequate governance and accountability are in place. This suggests that there is enough water, but it is being used without the required check and balances of inept administration in essential areas.

### **Policy Recommendations**

Based on the results and conclusions drawn we recommend the following recommendations:

### **Supply of Water from the river Indus**

To address the city's developing water scarcity, the only practical alternative is to raise water from the Indus River at the tail of the Kacchi Canal, some 150 kilometers south of Quetta. Pumping water from the Kacchi Canal to satisfy the city's needs will undoubtedly be costly, but it will still be less expensive than the approaching mass exodus of Quetta's people and, indeed, the cascading migration from the interior of Balochistan in the coming years. According to IRSA, Balochistan's share of Indus Water is 12%, however, only 3.5/3.8% of the water is given by the Frontier, Pat Feeder, and Kacchi Canals. Balochistan receives less than half of its share due to infrastructural constraints. The Kacchi Canal can provide enough water to fulfill Quetta's needs without surpassing Balochistan's share of water from the Indus River. Apart from the steady increase of the water table, this water may be pushed through 4-5 banks of pumping stations elevating water from roughly 800 ft altitude at Kacchi Canals Tail to Spin Karez and Hanna storage ponds at 5700 ft height from whence it can subsequently be given to Quetta City.

There is one proposed route for pumping water from the Kacchi canal; 1) The pipeline can travel the Sibi-Dhadar and Bolan Pass to Quetta, which is one planned route for pumping water from the Kacchi canal. WAPDA has determined its feasibility and cost. The concept is for pumping surface water from the Kacchi Canal in four stages. The total capacity of water will be 78 MGD or 145 Cusecs. According to the feasibility report, the first phase will cost roughly 42.13 billion rupees, with an annual operating and maintenance cost of 3.06 billion rupees (Gauff, 2018).

### **Dams**

Dams are another possible answer to Quetta's water issue. Dams like Babarkach, with a capacity of 27 mgd, Burjaziz, with a capacity of 21 mgd, Halq, with a capacity of 4 mgd, and

Mangi, with a capacity of 8.1 mgd, would be able to provide 61 mgd, which will be enough to alleviate the water crisis in Quetta until 2035. Once operational, the groundwater should not be disturbed by terminating tube wells so that it can replenish naturally (A. Imran, personal communication, February 11, 2022).

### **Plantation Drive**

Another recommended option to manage water scarcity is to plant more trees in Quetta, which may assist to alleviate water scarcity in the long run by modifying weather patterns and precipitation cycles, as evidenced by various research. Plant evaporation and transpiration account for 40% or more of the precipitation that falls on land. Forests like the Amazon not only flourish in wet environments, but they also contribute to creating and preserving them by increasing rainfall and decreasing the dry season.

### **Waste Water System**

To reduce water waste, an integrated sewage system must be implemented. Because Quetta lies on a hill, this research advises letting the water flow naturally via several Nullahs. Thus, the development of multi-scale small wastewater purification facilities is advised to recycle water and minimize water waste by up to 60,000 cubic feet.

A decentralized wastewater system is required, which includes several ways for collecting wastewater from residences, companies, and a complete community in order to utilize the wastewater. A decentralized wastewater system is a long-term option for getting the most out of wastewater. Septic or onsite systems are often used to describe treatment solutions ranging from simple water purification to dirt disposal. Before releasing water to the surface or soil, the advanced treatment may collect and treat wastewater from several buildings. Wastewater treatment plants are often built near regions where waste is generated.

This system can service a whole town while being safe for public health and water quality. These plants may be built anywhere, including urban and rural locations. Decentralized wastewater treatment is cost-effective and economical. This, like any other system, requires regular maintenance and operational personnel. The bottom line is that this type of treatment will result in the recovery of around 60,000 cubic feet of wastewater, which may then be utilized to feed the plantation drive, if not for potable reasons.

### **Awareness and Education**

Education is a critical component in determining any society's development and advancement. Primary education is a crucial period in which developing youngsters learn about topics that will affect their thinking process. Teachers have a significant effect in this critical time of children's development. Teachers often teach a curriculum pre-planned by their local education boards, which seldom includes any subject relating to the necessity of water or its conservation. As a result, the time has come for a water conservation-centric education curriculum to be implemented in every school in Pakistan, particularly in Quetta, Balochistan, as a crucial instrument in teaching kids about the significance and conservation of water. Similarly, there are other relevant curricula available across the world that may be used as a reference or inspiration for designing a local curriculum.

Second, training media professionals on water issues may play an important role in improving public awareness of water-related difficulties and issues. However, very little thought or effort has been given to teaching people about water conservation. If journalists, bloggers, radio, television, cinema, and other members of the media understand the importance of local, regional, and global water issues, this will be a powerful instrument for raising general public awareness.



## Urban Planning and Population Management

Urban planning is a study and science that deals with regulating the population load in cities in order to keep the available resources from diminishing. Unfortunately, because Quetta is the only metropolitan hub of its sort in Balochistan, people from other parts of the province have begun to rush here in search of better work, health, and education opportunities. The surge of Afghan migrants has exacerbated the strain on Quetta's resources.

A total of 16 townships were proposed to the World Bank in order to establish a fund to alleviate the enormous strain on Quetta (I. Hamid, personal communication, February 10, 2022). Similarly, improvement of already existing cities in Balochistan is required to alleviate the tension of the vast majority of the population in Quetta. Water conservation must be regarded as an emergency, and investment in rangelands, livestock, oil, and gas should be prioritized above agriculture. As a result, a critical strategy pertaining to the aforementioned ideas is necessary in order to manage and utilize the available water resources in a timely and effective manner (A. Batur, personal communication, February 12, 2022).

## Data Availability

Data for this research can be obtained at a reasonable request from the corresponding author.

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