



## Exploring Water Scarcity and its Effects on Indigenous Communities in Quetta, Balochistan

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**Abstract:** Water stays critical to global economic growth and human survival. Balochistan the largest Province of Pakistan is facing drought, water scarcity, and quality problems, which have adversely impacted the life of the community. The cause for conducting research across the province on water scarcity across the province was limited due to the accommodation, transportation, time constraint, and data collection. Primary and secondary data both data as collected. The primary data was based on questionnaire and the secondary one was taken from the literature. The results indicated that the water level has reached alarming levels, mainly due to subsidy on electric tube wells, indiscriminate installation of tube wells, violation of tube well spacing norms, high delta cropping, population increase, and poor drought management. The paper describes social and environmental consequences of water shortage issues and analyzes the causes of water scarcity including the mismanagement issues of water resources which has intensified over the years. To address the challenges of water scarcity and resource management, this study purposes to find out the reasons plus effects of water scarcity in Quetta city. Additionally, it will also suggest solutions to overcome the water scarcity problem.

**Keywords:** Water scarcity, Indigenous communities, Quetta.

### 1. Introduction

Water is one of the most significant components in life and is a basic need for people's economic and cultural activities in most developing countries (Muhammad Umar Munir, 2021). Today, one fourth of the population faces water scarcity issues including financial ones (Pretty, 2013). Quetta, Balochistan's capital, is located in a steep valley at a height of 1700m above sea level, and there are no rivers, streams, or other natural resources in Balochistan, therefore the area is barren. The Quetta is bordered in sharp mountains. It has commercial lines with Iran, Afghanistan, and Europe, and it has also hosted huge cantonments since British times (Asghar, K. 2011). The city's population was 845,000 in 1998, with an anticipated increase upto 1.8 million in 2010 (IUCN and GoB 2000). The current metro populace of Quetta trendy 2022 is 1,160,000, a 2.75% growth over 2021 (Dawn, 2018). This increase in population has put significant strain on limited water resources, resulting in persistent water shortages over time (Salim Khoso, 2015). According to census data, given the present pace of people increase, overall inhabitants in Balochistan, in which Quetta came, might reach 14 million by 2030, with 50% living in urban areas (Flannery Dolan, 2021). The growing demand for water in a variety of areas, mainly industrial, residential usage, and environment, makes it

difficult for individuals to access the resources (Cosgrove 2015). Increased competition for scarce resources disproportionately affects poor and rural areas (Cosgrove 2015). Water consumption in agriculture comprises household irrigation, crop irrigation, and other field use, whereas food production demands significant amounts of water (Waqas, 2018). Currently, water distribution in areas is complex, which is understandable given weak water resource management. This pushes back citizens who are not adequately protected against the effects of floods or calamities (Dawn, 2018). As a result, this study discusses the reasons, consequences, and potential solutions to address water scarcity.

### **1.2 Rational of the Study**

Water scarcity is a pressing issue for the Quetta populace right now. However, little is known about its causes and effects, as well as how it evolved over time. Consequently, this research provides the brief of water situation, a thorough knowledge of its effects on urban consumers, and recommendations for addressing water scarcity. As a result, the justification for this study is based on the current decline in Quetta's water status, which is caused by the indiscriminate and unplanned use of groundwater resources, resulting in water overexploitation. The research findings can be used by stakeholders and concerned authorities to identify potential solutions to Quetta City's water scarcity and to launch awareness campaigns about the social and economic worth of water, with the active participation of civil society and all institutions. Furthermore, to ensure water supply reliability, regulatory measures must be enforced and unauthorized connections controlled. Finally, ensure that the water supply is effectively managed.

### **1.3 Objectives of the Study**

The objective of the study is to explore the causes and effects of water scarcity on local populace, with a special emphasis on the issues encountered by indigenous populations.

## **2. Literature Review**

Rapid population increase has overwhelmed the residential water supply. And water demand is increasing. Despite extensive groundwater extraction, the city Quetta faces severe water shortage (IUCN and GoB 2000). The population of Quetta is the primary driver of water consumption. Furthermore, substantial financing is required for restructuring the public usage of social sectors and the waste system, which has illicit connections and significant leakage from the supply (IUCN and GoB 2000). Water scarcity has had a significant effect on the economy of impact of Pakistan. The tube wells drought led to a fall in land agriculture due to trees. Land and water are natural partners in agricultural development. And the province of Balochistan and its areas are still the worst affected because they rely primarily on livestock and farming. According to a poll conducted in Pakistan (2006), the government recognizes a clear link between water, health, and economic production. Pakistan consumes barely 10% of its river water per year, as opposed to global average of 40 percent. Funds deficiency has resulted in significant financial consequences. For example, the lasting three year floods (2010, 2011,2012) wreaked havoc on the economy of the Country. So, water plays an important part in the growth of any economy. The decades-long exploitation of natural resources is now creating a challenge to environmentalists and planners to devise acceptable short and long-term solutions to address the water scarcity problem while also protecting the country's already fragile ecosystem.

Pakistan used to have abundant water resources. When it was founded in 1947, it had 35 million inhabitants and roughly the same yearly renewable water availability as now. Pakistan today has around 140 million people, and the annual water availability is 1000 m<sup>3</sup> per person (UN OCHA IRIN, 2002). The water demand forecast for Pakistan Specifically, the Balochistan province demonstrates that water constraint will become more serious in the future as the population grows rapidly. Shah et al. (2002) highlighted that due to overpopulation and lack of water, the Quetta District of Balochistan would require more water for residents, that increases 3-6 percent which is quite serious. Balochistan Groundwater Administration Ordinance 1978 has a clause that directs regulators on tube well spacing limits. However, the survey revealed that the majority of farmers don't follow the rule of 750 feet for minimum distance. According to a research conducted by Ashraf and Majeed (2006), water supplies were scarce for both home and agricultural purposes practically throughout the province. The shortage of water was caused by the increase of high delta farming, which resulted in crop over irrigation. Pakistan is dealing with an extraordinary water deficit and mismanagement. That increases the removal of aquatic, resulting in increasing water shortages. Ineffective coordination and no cooperation between relevant departments have further exacerbated the situation. Furthermore, inadequate water management has led to increased water consumption, which is directly leading to water scarcity

situations. According to a study conducted by Shah et al, agriculturalists in Balochistan are experiencing major challenges as a result of overharvesting water reservoirs.

Nasrullah et al. investigated the financial implications shortage of water in the district Pishin of Balochistan and discovered that annual water usage is increasing from 10 to 60 feet. Water overuse and unselective draining of water have made managing water resource more difficult (GoB, 2006). During the survey, it was discovered that, despite the fall in groundwater and the water table, farmers continued to drill additional tube wells to satisfy their agricultural needs. These indiscriminate tube well installations, which lacked suitable drilling technique, design, and material, exacerbated the situation. Due to the unrestrained tube wells construction and pumping of water over previous two and a half decades, the country is currently facing a significant problem of groundwater table depletion each year. Installation of new agricultural tube wells should be prohibited; alternatively, installation of additional drinking tube wells should be permitted only when dry tube wells are replaced (Halcrow 2007). Unchecked tube well installations have absorbed massive amounts of water, resulting in a significant water scarcity issue (GoB, 2008).

**3. Material and Methods**

This study used a varied kind of informants from the universities of Quetta, Balochistan. The people of Quetta depend on ground water. Therefore, an attempt was made to study and to give a broader image of shortage of water on the indigenous population of Quetta city. To assess the condition water scarcity in Quetta, Quantitative design is used due to the nature of the topic, similarly, many other studies suggest a quantitative method. This methodology was chosen because of the topic nature and since in most of the previous studies, the same research design was used.

**3.1 Instrument**

The survey method was used as a technique for data collection. The specification found in this technique was based on random sampling (University students and teachers) where the data collection was based on due period. This method was employed to gather the best data to generalize the responses from the whole population

**3.2 Universe**

The research was carried out in Quetta, Balochistan Province.

**4. Data Analysis**

To analyze the data, researchers have used the quantitative technique. The collected data were first organized, analyzed, and then presented to meet the objectives of the study. To analyze the data SPSS (Special Package for Social Sciences) is used. After the completion of coding the data in the SPSS process, the data were subjected to a variety of analyses, including reliability, frequency, correlation, and descriptive.

**4.1 Reliability Analysis**

To assess the accuracy of the research's data. A study was conducted to determine the variables also items used in this study were reliable sources of data.

Table 1: Reliability analysis

NO.	VARIABLES	CRONBACH'S ALPHA	NO. OF ITEMS
1	C_SC	.703	12
2	C_SS	.744	6
3	C_SE	.725	6

As a result of the reliability study mentioned above, the results show that variable 1 has a Cronbach's Alpha of 0.703 and has 12 No of items, variable 2 has a Cronbach's Alpha of 0.744 and has 6 No of items, and variable 3 has a Cronbach's Alpha of 0.725 and has 6 No of items. These findings demonstrate the reliability of the variables and other study components, and they also support the possibility of additional analyses based on reliability analysis.

**4.2 Correlation Analysis**

In correlation analysis, the relationship between the variables is determined, along with how strong it is. Additionally, this analysis demonstrates if the association is positive or negative.

Table 2: Correlation analysis C\_SC – C\_SS

		C_SC	C_SS
C_SC	Pearson Correlation	1	.347**
	Sig. (2-tailed)		.000
	N	380	380
C_SS	Pearson Correlation	.347**	1
	Sig. (2-tailed)	.000	
	N	380	380

From the above analysis table, the outcomes reveal the variable C\_SC strong relationship with C\_SS which is = .347\*\*, which means variable C\_SC (Causes) and the variable C\_SS (solutions) positively correlate with each other. The relationship of the variables indicates that the given solutions can eliminate the causes of the water shortage.

Table 3: Correlation analysis C\_SC – C\_SE

		C_SC	C_SS
C_SC	Pearson Correlation	1	.343**
	Sig. (2-tailed)		.000
	N	380	380
C_SE	Pearson Correlation	.343**	1
	Sig. (2-tailed)	.000	
	N	380	380

From the above analysis table, the data give the outcome that the variable C\_SC is having strong relationship with C\_SE which is = .343\*\*, which means variable C\_SC (Causes) and the variable C\_SE (Effects) positively correlate with each other. The relationship of the variables indicates that the causes of the water shortage have major impacts on socio-economic concerns.

Table 4: Correlation analysis C\_SE – C\_SS

		C_SE	C_SS
C_SE	Pearson Correlation	1	.287**
	Sig. (2-tailed)		.000
	N	380	380
C_SS	Pearson Correlation	.287**	1
	Sig. (2-tailed)	.000	
	N	380	380

From the above analysis table, the result shows that the variable C\_SE has a positive relationship with C\_SS which is = .287\*\* which means variable C\_SE (Effects) and the variable C\_SS (solutions) positively correlate with each other. By the relationship of the above variables, the result indicates that the effects can be eliminated by the potential solutions provided.

### 4.3 Descriptive Analysis

Table 5: Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
C_SC	380	17.9132	2.89943	.435	.125	.322	.250
C_SS	380	9.3105	1.89107	.288	.125	-.228	.250
C_SE	380	6.8263	1.02287	1.320	.125	2.025	.250
Valid N (list-wise)	80						

From the above analysis table, the C\_SC bears a mean of 17.9132, a S.D (standard deviation) 2.89943, a skewness statistic of 0.435, a skewness standard error of 0.125, and a kurtosis statistic of 0.322, a kurtosis standard error of 0.250. The C\_SS possess a mean of 9.3105, a S.D (standard deviation) 1.89107, a skewness statistic of 0.288, a skewness standard error of 0.125, and a kurtosis statistic of -0.228, a kurtosis standard error of 0.250. The C\_SE mean of 6.8263, a S.D (standard deviation) 1.02287, a skewness statistic of 1.320, a skewness standard error of 0.125, and a kurtosis statistic of 2.025, a kurtosis standard error of 0.250. So overall, the above values of variables and results, show clearly that the data are normally distributed and relation is existing among each variable.

### 4.4 Findings

The water scarcity issue in Quetta is the city's is due to the rapid population growth, which leads to water scarcity and migration. This study considers causes, effects and possible solutions, all of which are interconnected. Several tests were conducted, and the results were real and reliable. The statistics provided were comprehensive and regularly distributed.

### 4.5 Discussion

According to the literature review, in Quetta the fresh water comes from the mountains. The valley's geological conditions favor the basins for fresh water. Due to the population enhancement the demand for water also increases. Furthermore, before the 1980s, the irrigation was done by using the old-style like well, springs, and karezes. However, over time the old methods were changed due to advancement and that led to misuse of water, as a result the water table reached to below the average line. According to the previous studies the farmers were well known about the

over exploitation of water due that water table lower, which is used for the irrigation as at that time there is no other source that used for irrigation purpose. The different hypothesis was generated to get the result of the study. In this study survey was used for data collection was done to known about the causes, impacts, and solutions to the research problem. Moreover, the descriptive and quantitative method were used to known about the data.

## 5. Conclusion

For this research study, the researchers had three primary goals. The goal of the current study was to ascertain how Quetta's residents were affected by water constraint. There are very few systematic scientific studies on how Quetta City's local populace is affected by water scarcity. Regarding causes and effects and their evolutionary history, however, nothing is known. As a result, the study aim is to calculate the supply of water, comprehend its effects on urban consumers, and recommend solutions to the problem of water shortage. According to recent studies, Quetta district currently has the worst water issue. There is not enough water in this severely low level to meet household needs and agricultural output. Lack of water has a negative impact on the economy and is the root cause of numerous other social issues. Increased unemployment, environmental pollution, and health issues including typhoid fever, fatal diarrhea, and other water-borne illnesses are the outcomes of this economic harm. The survey's findings show that the extreme water stress has impacted children's schooling and migration, as well as contributing to poverty. Thus, all these conclusions demand that the appropriate authorities engage in thorough and efficient management and enforcement. Building more dams and water reservoirs, and above all educating the public about responsible water usage and pushing for groundwater mining rules.

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