Multi-Dimensional Implication Of Water Scarcity On Inhabitants Of District Quetta, Balochistan, Pakistan

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Abstract

Water is the fundamental need of living beings. It is necessary for manageable advancement, including the protection of common habitat, mitigation of destitution and craving. Like other nations a number of areas in Pakistan are also facing the problem of water scarcity. The present investigation has been made to explore various implications of water scarcity on inhabitants of Quetta district Balochistan. The study depends on essential information gathered from agriculturists and different personals through focused group discussions and questionnaire survey. Stratified random sampling method was used whereas the sample size comprised of 400. For analyzing the data, chi-square method is applied to find out the existing relationships between variables, where alpha value is standardised at 0.05. Although no association could be established among the study groups, however, the results clearly indicated that the level of ground and surface water is scarce. The scarcity of Water has negatively impacted the agriculture, trees, economy and health of the people in the study area. The scarcity of water has also compelled people for migration to other areas. The results suggested that government should make further dams, guiding the population and the farmers on proper use of water and advocating the general public to obey regulations regarding water mining.

Keywords: Water Scarcity, Inhabitants, Chi-Square Test, Water Mining.

تلخيص

پانی ہر ذی روح کی بنیادی ضرورت ہے۔ یہ انتظامی ترقی بشمول عام رہائش انتظام کے تحفظ، غربت اور افلاس میں کمی کے لئے نہایت ضروری ہے۔ دوسری اقوام کی طرح پاکستان کے بھی کئی علاقوں کو پانی کی کمی کے مسئلے کا سامنا ہے۔ زیر نظر تحقیق صوبہ بلوچیتان کے ضلع کو ئٹہ کے رہوکہ یہ ں پر پانی کی کمی کے انثرات کو کھوجنے کے لئے کی گئی ہے۔ یہ تحقیق زراعت پیشہ اور مختلف افراد سے بذریعہ باہمی مباحثہ اور سوالنامے پر مشتمل سروے سے حاصل شدہ معلومات پر مبنی ہے۔ نمونہ حاصل کرنے کا طریقہ سمپل رینڈم سیمپلنگ اور نمونے کی مقدار ۲۰۰ تقلی۔ شاریاتی اہمینی پیش نظر کائی اسکوائر کو ۵۰ء کی حد پر استعال کیا گیا ہے۔ اگر چہ زیرِ تحقیق گر وہوں کے در میان کوئی ربط قائم نہ ہو سکا مگر دتائے واضح طور پر زیر زمین اور سطحی پانی کی کمی کو ظاہر کرتے ہیں۔ پانی کی کمی نے زیرِ تحقیق علاقے ک زراعت، اشجار، معاشیات اور لوگوں کی صحت پر منفی اثرات مرتب کئے ہیں۔ پانی کی کمی نے لوگوں کو دوسرے علاقوں میں نقل مکانی پر مجبور کیا ہے۔ اس تحقیق کے دتائے حکومت کہ یہ تجویز پیش کرتے ہیں کہ مزید ڈیم بنائے جائیں، آبادی اور کسانوں کو پانی کے صحیح استعال اور عوام کو پانی کی کان کنی کے متعلق قوانین پر عمل کرنے کے لئے

کلیدی الفاظ: پانی کی کمی، آبادی، کائی اسکوائر ٹیسٹ، پانی کی کان کنی۔

Introduction

The existence of living beings is dependent upon several factors including food, water and air. All these three needs of life are not only dependent upon one another but also affect every segment of life encountered by the living beings. It is very much justified to place water the key block in the chain of factors driving the life.

It is an essential source driving the economy of nations hence, crucial for their wellbeing and prosperity (Halcrow, 2007). All foods and fruiticious supplements use ingredients dependent upon water (Harvard Medical School, 2013). It is observed that number of countries are facing water scarcity and primary reasons are associated with the rising population and economic activities (David Seckler et al., 2010). Water places a key role in areas of social interests like industrialization and urbanization (King, 2004). The administration and management of water supplies is subjected to political, social and monitory problems (Louw, 2002).

The socio-economic effects of water resources have been become a global concern. Recent study conducted in China, which founds various soico-economic aspects of water shortages, and attributed with the climatical changes and increased human consumptions domestic and insdustrial needs (Yuanyuan et al., 2017).

In another study the relationship of water scarcity and socio-economic development has been analyzed using social accounting matrix (Qing Zhou et al., 2017). Results of the study show that due to water scarcity, prices of water have also increased along with agricultural products. According to Walter et al., industrial products have value added aspects according to the demands to attract the consumers, which effects Consumer Price index (CPI), that is stands at 0.005

unit where as Creative methodologies can be used to understand efficient water distribution (Walter et al., 2011).

Pakistan is one of the most water stressed countries in the world (Qadir M et al., 2003). The situation is worsening day by day. As per estimates of some studies (Pakistan Economic Survey, 2016-2017, Lalzad, 2007) in 1947 approximately 5650 m³ water was available per capita whereas in 2013 it is only 990 m³. This is highly sensitive situation and if persists with such a pace water resources will reduce to 800 m³ in 2020 (Innovateus, 2014, Waterinfo, 2013, Kahlown et al., 2002).

The province of Balochistan is facing water scarcity issue since long. Climate of Balochistan is very dry, rare rainfalls and high rate of evaporation, due to these reasons they have issues in accessibility of water as compared to other areas of the country. It is observed that water scarcity is due to high stream slobs which may not provide sustainable space to reserve water for long time period (Bhatti et. al., 2008).

The economy of Balochistan is mainly dependent upon farming and livestocks. A number of crops, vegetables and fruits are produced by the farmers in Balochistan due to vide agro-environmental conditions (Bajoi, 2004). The agri business depends on both ground and surface water reservoirs. Flood, feeder and Khirthar canals from Indus Basin irrigation system are the means of surface water whereas, the main sources of ground water include springs, karez, tube wells and wells. Wastage of surface water and misuse of ground water has made a complex issue in Balochistan for administration of water. The increased installation of tube wells with passage of time has also worsen the problem.

Pakistan has an agricultural based economy, which needs huge water consumption for the production process, in such water scarcity, demands of water is increasing day by day. In region of Balochistan, water is considered rare due to its existing weather and climate (Bhatti et al., 2008). However, there are two important drivers of the economy such as farming and livestock, which is a contribution about 50 percent to the GDP. Whereas; across the country there are changeable weather situations in the region, where variety of cultivation possible including various crops, vegetables, tropical fruits, and many deciduous cycles (Bajoi, 2004).

In 1880's, it is evident that first ever artisan well was built at Quetta railway station, 140 feet depth measured, whereas; the discharge rate was at about 20,000 gallons per/hour with head of 50 feet. It is revealed under one of study that the valley recharged around 61 million cubic meter and discharge 97 million cubic meter with having a deficit of around 36.5 million cubic meter, as per groundwater resources of Quetta (Ahmed, 2015). In 2000, WASA had installed wells in order to monitor the varying groundwater condition.

More recent study (Najeebullah et al., 2016) stated that around 41 wells were installed, and the planning and monitoring team was constituted for taken observations from 1987 to 2015 at Irrigation Department by the Water and Sanitation Authority (WASA). It observed there is a declining rate from 5 to 15 meters on annual basis in the water table of Quetta valley during 2010 to 2015 while central part of valley is heavily populated due to the reason water table is ranging from 90 to 180 meters. Whereas, the remaining parts of the valley's water table ranged from 60 to 90 meters (Najeebullah et al., 2016).

It is estimated that agriculture consumed 70 percent of groundwater in Quetta, which has been further increased to manyfolds as number of local residence are earning from agriculture sector of the economy. Extra usage of water is actually causing the groundwater depletion at sub basin, Quetta. It is observed under two satellite images from 1987 that ground area is increased till 2011 (Najeebullah, 2016).

This situation has not only affected the agricultural activities but mushroomed social issues like migration of people, un-employment and terrorism. To assess thoroughly the socio-economic effects of water scarcity in Quetta district the current study has been carried out. The study will not reaffirm the gravity of the issue but will also provide authentic source for the policy makers to develop plans and strategies to effectively manage the problem of water scarcity.

Literature Review

The scarcity of water is a global issue therefore, attracted a number of investigators to study different aspects of this challenge. Various scientists have also worked on the water issues of Pakistan. (Iqbal, A.R, 2013, Iqbal A.R, 2010, Khalid, I, 2013, Mustafa, D, et al., 2008, Mustafa, D, et al., 2011 and Mustafa, D, et al., 2013).

In a related study the impact of tubewell irrigation on underground water, soil quality and crop yields have been explored in Sindh Province (Tehmina et al., 2016). The study has concluded that due to shortage of canal water farmers usually use tube wells water for irrigation due to which cost of production of crops is increased along with deterioration of soil quality. A recent study has communicated that irrigation system is turning to tube wells from canal water which promotes soil salinity problems hence endangered the crops production (Anam et al., 2017).

It is observed through a case study the role of economic measures as a mechanism for controlling groundwater depletion in Pakistan. Recently, there has been vested interest for increasing prices of water, as it may reduce water consumption, considering it a mechanism to optimize water use. For improvement in groundwater management the prospectus for pricing intervention was the solution.

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The price has significant impact on demand only when the price is appreciable in relation to the benefits derived from the commodity. The price of groundwater pumping and delivery is low as compared to its value in irrigated agriculture in Pakistan. Therefore increase in electricity price to reduce the demand would be politically unacceptable and would in any case lead to a shift towards the use of diesel power without reducing extractions (Ali and Kakar, 2018). A combination of pricing and rationing is likely to be difficult to enforce if not impossible.

One of research indicated that the groundwater is an important source of irrigation water in Balochistan. It is hard in consolidate rock and unconsolidated in alluvium rock. In hard rock good aquifer exist in many joints, fractures and caverns unconsolidated deposit good aquifer in gravel and sand. It is extracted from dug well, tube well on a limited scale through Karez system. There has been rapid increase in drilling over the last 20 years resulting in some major benefits but with accompanying disadvantages until 1989 almost 22 percent area of land in the province was irrigated from underground source such as Karez, springs open well and tube well, by 1998 however land irrigated from these sources was 34.5 percent, tube well along accounting for 22.8 percent. Domestic water requirement is largely fulfill from groundwater (Steenbergen et al., 2015).United Nations in 2005 report reflects that the ESCWA regions are contributing 4.5 percent of world's total population, however, world's fresh water only available at 0.62 percent in such areas.

In 1970's, the provincial governments had taken many steps to overcome the issue of water scarcity and declined of groundwater table. In this regard, many of subsidies were allocated for digging tubewells and artificial groundwater recharge. However, the outcomes of such projects were nominal because of delays in construction of dams, which can infilterate the stored water of rain and may contribute to the groundwater table. Whereas, the proposed cost and hydrological effectiviness of dams were questioned; but later after 110 delays, dams were constructed in Balochistan till 1997. It had noticed significant impacts on overall groundwater availability in the province (Samad, 2018).

In other study water has been reported as a key input in agriculture production in Pakistan (Iqbal, A.R., 2013). Another research study has reported water scarcity to be a major human security challenge to Pakistan (Iram, K., 2016).

In a related study conducted in Pashin Lora Basin it has been reported that reservoirs of water are depleting with time which may lead to catastrophe if proper measures are not taken for preservation (Bhatti et al. 2008). In another study it has been stated that due to overexploitation and mishandling the agriculturists are facing serious water problems in Balochistan (Shah, et al., 2002).

It is investigated that there is massive financial burden while managing water shortages in Tahsel Karezat District Pishin Balochistan, as the annual rate for water table consumption is ranging from 10 to 60 feet (Nasurullah, et. al., 2011). Whereas, other studies highlighted that groundwater levels are showing declining trends of about 2 to 3 meters annually (Khair, et al., 2010). The researchers have urged the concerned authorities to make strategies in a way to plan for groundwater administration and should bring investors and partners to work for increasing the groundwater tables.

Materials and Methods

Sample Size

The district Quetta, which consists of Chiltan and Zarghoon towns, was selected as study population in this investigation. As objectives of the very drudgery were to analyze the socio-economic impact of the scarcity of water in District Quetta, therefore, farming community and Urban consumers of Quetta were mainly targeted. The total population of district Quetta is about 759941 District Census Reports (1998), however, a sample size of four hundred people through stratified random sampling technique was calculated for the study using Arkin and Colton formula (Arkin& Colton, 1963) as shown below.

$$n = \frac{NZ^2 \times P \times (1 - P)}{Ne^2 + \{Z^2 \times P \times (1 - P)\}}$$

Where;

n = sample size, N = population size, Z = confidence level (95 % = 1.96), P = degree of variability (50 %) and E = level of precision or sampling error which is 50 %.

Sampling Tool

Focused group discussion and structured questionnaire were used to collect the data. The questionnaire was validated by pretesting small sample size before using at larger level.

Statistical Analysis

The collected data was coded and then double entered using software MS Excel version 2007. MS Excel (Version 2007) and Statistical Package for the Social Sciences (SPSS, version 2015) were used for descriptive (Max, Min) and inferential statistics (Chi Square Test), respectively. The significance threshold was set at 0.05.

Results and Discussion

On the basis of the every section the consequences and discussion of the study are focused. Furthermore, the every segment is distributed into 2 sub-sections. The first

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sub-section elaborates the opinion of local population in regards to the social impact of the scarcity of water in Quetta. The other sub part delineates the economic impact of water shortage on distinct agronomic segments of the economy.

Water Scarcity Causes Poverty

Water being the most essential part of the wellbeing has occupied the life's verbum part. The survival could even not be thought without it. The under discussion survey has depicted that not only the survival is impossible without water but it also has effect on the other grounds of life. In Quetta region, this is one of the key causes of poverty. As shown in Figure 1, out of 400 individuals 238 (59.5% of the total sample size) were of opinion that water scarcity causes poverty while the rest 162 (40.5%) have of the view that water scarcity does not cause any poverty. A chi-square test of independence was used to find any association between the two groups. The p value of 0.157 was obtained which is greater than the chosen significance level ($\alpha = 0.05$) hence it is concluded that there is no association between the two groups at 0.05 significance level.



Figure 1 Survey response showing water scarcity causing poverty in Quetta Balochistan. The figure shows that around 59.5% respondents positively link poverty with water scarcity whereas, 41.5% respondents are in disagreement.

The survey results are in agreement with the previous studies (Nasrullah et al., 2011) wherein severe financial problems have been reported in District Pishin, Balochistan due to water scarcity.

Poverty caused by water scarcity has mainly affected the traditional ceremonies, children education, migration of families from rural to urban areas and annual income as shown in Figure 2. Around 238 (30.7%), 162 (40.4%), 115 (28.7%) and 205 (51.1%) respondents respectively link traditional ceremonies, children education, migration of families from rural to urban areas and annual income with water scarcity whereas, 162 (69.3%), 238 (59.6%), 385 (71.3%) and 195 (48.9%) respondents respectively disagree on this subject. The p-value was obtained as 0.157.



Figure 2 Survey response showing water scarcity effect on traditional ceremonies, children education, migration of families from rural to urban areas and annual income in Quetta Balochistan. The figure shows 30.7%, 40.4%, 28.7% and 51.1% positive response from respondents for traditional ceremonies, children education, migration of families from rural to urban areas and annual income respectively.

These findings are in agreement to that reported in Asian Development Bank report, 2002.

Poverty Causes Water Scarcity

Poverty and water scarcity go hand by hand as reported by many investigators (Sharad, K et al., 2010). The response of individuals on statement that poverty is the cause of water scarcity has been reported in Figure 3. Around 281 individuals (70.25% of the total sample size) were thinking that poverty causing water scarcity in Quetta, Balochistan whereas, the rest 119 (29.75%) did not agree with the statement. The chi-square,p-value of 0.157 was obtained which is greater than the chosen significance level ($\alpha = 0.05$) hence it is concluded that there is no association between the two groups at 0.05 significance level.



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Figure 3 Survey response showing poverty causing water scarcity in Quetta Balochistan. The figure shows that around 70.25% respondents consider poverty as a causing factor of water scarcity in Quetta, Balochistan whereas, 29.75% respondents are in disagreement.

These results of the current study are also comparable to the results as reported earlier for other areas of the province (Shah et al., 2002).

Water Scarcity Impact on Agriculture

The life of agriculture relies on water. The scarcity of water one of the big threats to agriculture. Water scarcity not only affect the life of trees but also deprives the masses from food supplements. Agriculture is one of the best sources of the economy of the people of Quetta. A study conducted by (Zainuddin, Kakar et al., 2017) has reported that owing to water scarcity a large number of distinct fruity plants have dried. In the current survey, it was found that around 202 (50.5%) of the sampled population was of the thought that water scarcity has direct impact on the economy of the agriculture dependent people whereas the rest half were denying its effect on the economy. The results have been shown in Figure 4.

The chi square p value for this data is also 0.157 which is greater than the chosen significance level ($\alpha = 0.05$) hence it is concluded that there is no association between the two groups at 0.05 significance level.



Figure 4 Survey response showing water scarcity impact on income of farmers. The figure shows that 50.5% of the sampled population considers direct impact of water scarcity on the economy of farmers in Quetta, Balochistan.

Since the study of population is mainly associated with farming therefore, their economy is mainly dependent upon agricultural products for which availability of water is a key driver. To assess the availability of water the survey also focused on this area and the results are reported in Figure 5. Around 126 (31.4%) respondents consider water availability as abundant whereas, 127 (32.2%), 129 (31.7%) and 18 (4.7%) have the opinion that water availability for farming is less than requirements, just fulfill the requirements and scarce respectively. The p value was obtained as 0.213.



Figure 5 Survey response showing the availability of water for farming in Quetta, Balochistan. The figure shows that 31.4% respondents consider abundant availability of water for farming whereas, 32.2%, 31.7% and 4.7% consider it less than requirements, just to fulfill the requirements and scarce respectively.

Conclusions

The results of the study indicated that the present condition of water in district Quetta is worst. The extremely low level of water which cannot fulfill the needs required for household consumption and agricultural production. Similar conclusion was drawn previously by Khair, et al. (2010). The water scarcity have badly affected the economy of the study population hence, increase the level of poverty manifold which has further triggered the water scarcity and a number of other social issues.

The scarcity of water has also affected green and fruity trees which has not only affected the nutritional needs of the population but have also negatively impacted the climate. The survey results also show that very small segment of the study population get sufficient water for the activities of their daily life.

The loss in economy due to water shortage has also increased unemployment and enhanced environment pollutants and triggered diseases and health issues. Furthermore, the poverty caused by water scarcity has affected the traditional ceremonies, children education and migration of families from rural to urban areas which are social issues of great concern for any nation.

All these findings ask for comprehensive and effective policies promulgation and management activities on the part of related institutions, building of new dams and water reservoirs and more importantly educating the population on proper utilization of water and advocating for follow of regulations about groundwater mining.

Recommendations

1. Declaration of 'Water Emergency' in Quetta Valley is urgent need of the time. Government should Ban on installation of tube wells and

immediately withdraw subsidy on irrigation tube wells, and shift existing irrigation on efficient irrigation to minimize the use of water consumption.

- 2. All existing tube wells in Quetta valley needed to be registered. Also phase wise closing down of illegal tube wells with provision of piped water to each and every house to full filled their domestic need.
- 3. Restrictions be made on use of sweet water for agriculture, in case of violation, Imposition of heavy fines for water extravagance or theft.
- 4. Autonomous & Empowered 'Water Body' be set up to oversee all water sector projects. Community and water managers must in liaison to control the situation.
- 5. Conservation & Efficient Use of Water be made part of school curriculums. Periodic Water Awareness Drives be run on the lines of Polio Campaigns Optimizing.
- 6. Strategic plantation and effective control over new housing schemes in Quetta valley be made to overcome the issue.

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