Hydro Politics in Pakistan: A Challenge to the National Unity

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Received on: 16-07-2024 Accepted on: 18-08-2024

Abstract

Pakistan has one of the largest canal irrigation systems in the world, ironically, the country lacks an effective water management system. The per capita availability of water, has dropped to 1000 cubic meters, from 5650 cubic meters, per person, since inception. This study aimed to identify the causes and consequences of water shortage in Pakistan and suggests they ways to cope water crisis. The research identified three sets of issue are responsible for present water crisis. First is, irregular rain falls due to climate change, secondly, high handedness of the eastern and western neighbors over international water reservoir regulations. Lastly, domestic causes such as inadequate water storage infrastructure, political conspiracies against the construction of new dams, deteriorating condition of existing irrigation system, extravagant use of water, by agriculturists, industrialists, and households, and the widely accepted norm of dumping waste into water. Such a situation has unfolded complex challenges of food shortage, energy crisis and climate security. Government needs to act on war footing basis, to deal with this non-traditional security threat of economic water scarcity, comprising of diverse initiatives. First, a bilateral or a multilateral dialogue, with the neighboring states of India and Afghanistan is needed to settle down the cross-border water dispute. Secondly, there is need to develop a national level consensus, between provinces of Pakistan, for the construction of new dams. Thirdly, existing infrastructure for water storage should be renovated, to avoid huge water losses through leakage and seepage.

Keywords: Water Scarcity, IRSA, Indus Water Treaty, World Bank, Kalabagh Dam

INTRODUCTION

Water is an essential commodity for sustaining life on the earth, without which we can not even imagine survival. It is used in drinking, cultivating crops and manufacturing industrial goods therefore no other thing can either replace or fulfill our water needs. Although, abundant water (70%) is available on earth's surface but all is not useable. Approximately, 97% of earth's water compartments are oceans which are highly saline in nature while only 2.5% of water is fresh available in rivers, streams and lakes. Viewing fresh water's scarce quantity and its socio-economic importance nations have had always fought wars over its distribution (Khalid & Begum, 2013).

Presently, water issue at global level has many fronts such as, increasing pressure on usage of water due to growing population, shrinking of global water reservoirs due to infrequent rainfalls as a result of climate change, cross-border water conflicts, mismanagement of water resources at national level and poor water storage infrastructure. As per the report of International Monitory Fund (IMF) June, 2015 Saharan African (SSA) countries, South Asia, Middle East, Europe and Central Asia have low per capita water supply on average. According to this report, three sets of water issues are faced by these regions: 1) Subsidies or lack of metering 2) Infrastructure issue and water management, and 3) Cross Boarder Coordination issues.

Pakistan has one of the largest canal irrigation systems in the world namely Indus Basin Irrigation System (IBIS) having size approximately 56,073 Km which is irrigating area of 14.87 million hectares (FAO, 2011) and ironically, the country lacks an effective water management system. The per capita availability of water, has dropped to 1000 cubic meters, from 5650 cubic meters, per person, during the last five decades (Asad, 2016). Such a situation has unfolded complex challenges of food shortage, energy crisis and climate security (GOP, 2012). It is viewed that changes in the water flow in Indus Basin Irrigation system (IBIS) are critical and have significant impact on country's economy and particularly agriculture production which is heavily dependent on IBIS flows (Qureshi, 2011).

Problem statement

Agriculture sector is largest water consumer and it holds the 20% weight of the country's Gross Domestic Product (Kundi, 2017). According to Rana (2019) The present water crisis is costing government and nation a loss of 4% in Gross Domestic Product (GDP) annually. This means if the water crisis in Pakistan persists for next five years there will be 20% loss to country's fragile economy, in other words the 5 year's economic loss will be equal to 1 year's agricultural contribution of GDP on average. This is a critical situation for country like Pakistan whose economic dependence is mainly on agriculture. Additionally, Pakistan has capacity of producing about 60,000 MW electricity from water resources but the installed capacity is just only 6481 MW (30% of country's energy mix) (WEC, 2019). This is mainly due to inadequate water infrastructure. Thus, country's energy sector, which is responsible for industrial growth, is also at decline stage. According to economic survey of Pakistan (2017), energy crisis especially electricity and gas shortage to industries badly impact on overall all production level of industries. Akram (2018) reported that indigenous energy can be the key

to sustained growth.
No study has recently been conducted to assess the massive impact of water shortage on Pakistani economy and its physical security from the non-traditional security threats like water shortage and droughts. Therefore, this study aims to explore the causes and consequences of water shortage in Pakistan and tries to suggest the durable solution against persistent water issue to achieve economic prosperity and national unity.
This study addresses to following research questions:

Research Questions
1. What are the causes of water crisis in Pakistan?
2. What are the impacts of water shortage on the economy of Pakistan?
3. How does water shortage and distribution issue impact national unity?
4. What are the solutions of water crisis in Pakistan?

Research Objectives
The present study aims:
1. To identify the factors responsible for water crisis in Pakistan
2. To analyze the impact of water shortage on economic conditions of Pakistan
3. To understand the whether national unity can be achieved by solving water distribution issue among and between provinces.
4. To find the durable solution for water crisis in Pakistan.

RESEARCH METHODOLOGY
Following research methodology has been used to carry out this research.
Research Design
Exploratory and qualitative research design are used to conduct the current research, because, these methods allow researcher to have a better understanding of the identified problem or situation. Reiter (2017), argues that exploratory research, if conducted in honest and transparent way, provides an opportunity to analyze a problem in an innovative way thus researcher can easily achieve the research objectives.

Data Collection
Secondary data sources such as reports, newspaper articles, journal articles, books and magazines were used in this research.

LITERATURE REVIEW
Source of water in Pakistan
Pakistan has mainly two sources of water. First, *ground water* which is available in 1600 Km long Indus plain from Himalayan to Arabian Sea. Pakistan is as of now taking out 50 MAF from underground aquifers — this has officially crossed the practical furthest reaches of safe yield. Groundwater is used for agricultural, domestic primarily for drinking, and industrial purposes (Kamal, 2009) it is extracted trough pumps, tube wells and dug wells. Pakistan's consumption of ground water has increased due to increasing population and unavailability of surface water which is only available from seasonal inflows of Indus river and its

tributaries. The quality of ground water is not same everywhere in the country, Raza et. al., (2017) reported that more than 85% of water sources in the country has water quality below the standards recommended for human consumption. Interestingly the country lacks the mechanized institution for monitoring the level and quality of the ground water.
Second source of water in Pakistan is *surface water* which is available from the mighty 2000 miles long Indus River and its tributaries Jhelum, Chenab, Ravi, Beas and the Sutlej (Khalid & Begum, 2013). Indus Basin River System (IBIS) carries approximately 145 million-acre feet (MAF) water annually and feeds 207.7 million people of Pakistan across 796,096 square kilometers from Kashmir to Karachi. The surface water in country is channeled through 56,000 Km long canal irrigation system consisting of infrastructure of dams, barrages, water feeders and streams. However, present surface water supply in country is insufficient viewing increasing number of populations and dependence on seasonal flows of IBIS. Demand of water is expected to reach to 274 MAF while the supply will be 191 MAF by year 2025 (IMF, 2015) creating a water deficit about 83 MAF. Ironically, country's main water reservoirs capacity stands around 13.8 MAF (Pakistan Today, 2018). Table 1. Shows the water infrastructure which is under development to store huge water which is wasted due to inadequate capacity. Even after construction of all these dams the storage capacity will be insufficient compared to volume of water which is wasted.

Table 1. Priority Dam Projects in Pakistan

Dam	River	Capacity (GW)	Live storage (BCM)	Estimated cost (US$, billions)	Status
Diamer Bhasha	Indus	4.50	7.9	11.18	Construction ready
Kurram Tangi	Kurram	0.08	1.1	0.70	Under construction
Tarbela 4th Extension	Indus	1.35	—	0.83	Ready for construction
Munda	Swat	0.74	0.9	1.40	Under study
Kohala	Jhelum	1.10	run-of-river	2.40	Design/procurement
Bunji	Indus	7.10	run-of-river	6.84	Construction ready
Dasu	Indus	4.32	0.8	5.21	Under construction
Total		**19.19**	**10.7**	**28.55**	

Sources: FoDP 2012; WAPDA 2016.
Note: — = not available.

Water Crisis in Pakistan: Main Causes
According to a report by the International Monetary Fund (IMF), Pakistan positions third on the planet among nations confronting intense water deficiency (IMF, 2015). Reports by the United Nations Development Program (UNDP) and the Pakistan Council of Research in Water Resources (PCRWR) additionally caution the experts that the South Asian nation will reach a total water shortage by 2025.

Pakistan is on eighth position, with a loss of 523.1 lives every year and economic misfortunes worth US $ 3.8 billion — proportionate to 0.605 percent of the GDP in the multiyear time span. Amid this time, Pakistan had experienced 141 extraordinary climate occasions — let it be violent winds, storms, floods, Glacial Lake Outburst Floods (GLOFs) and heatwaves, and so

forth. In a year ago's long haul file (1996 to 2017 average), Pakistan held the equivalent eighth position (Eckstein, Hutfils & Winges, 2019).

Some of the major causes of the shortage have been highlighted as follows:

Trans-boundary water issue with India

Ever since Pakistan came into existence, water has been a root cause of disputes with India. Pakistan faces tremendous constraints and water management issues with her. Deciding on "playing by the rules" lead to negotiations, and Indus water treaty was signed in 1960, with World Bank as guarantor. Despite the fact that Indo-Pak relations have become colder with every passing day, the Indus Water Treaty of 1960, is still considered valid and also considered as a model for water disputes.

History has it that India violated the treaty several times. In 1984, Wullar Barrage was constructed on river Jehlum, and Baghliar Dam, in the IOK, was constructed on river Chenab. India and Pakistan are reliant on the waters of Kashmir for their farming, hydropower, water system, route and civilization sustenance. Kashmir is a massive benefactor of hydropower to the two countries, our eastern neighbor plans to generate 22,000 Megawatts of electricity from the occupied Kashmir and has already left Pakistan behind in constructing dams (Gupta, 2019).

Pakistan addressed the World Bank to help stop the construction of Baglihar Dam, to which the World Bank responded by allowing India to continue with the venture, but didn't license the agreed water quota to Pakistan. Considering this an opportunity to make a notorious move, India made several irregularities when constructing hydro power projects on western tributaries, namely Kishanganga and Ratle (DAWN, 2018). A 330 MW hydropower station was inaugurated by Indian Prime Minister - Narendera Modi, on 19th of May 2018, called the Kishanganga Dam, which was a violation of the Indus Water Treaty and a threat to Pakistan's inflow of waters (Akmali, 2018).

Earlier, India threatened to isolate Pakistan on the international level and then claimed it would stop the flow of water into the country. Nitin Gadkari, the Minister of Water Resources in India, said that Prime Minister Narendra Modi had taken the decision to block the water flow to Pakistan (Gettleman, 2019),

In 2011, a report published by the Senate Committee and Foreign Relations of the US, said:

> *"The cumulative effect of these projects could give India the ability to store enough water to limit the supply to supply to Pakistan at crucial moments in growing season."* (Dutta, 2018)

Trans-boundary water issue with Afghanistan

Being India's "friend of utility", Afghanistan is its active ally and seeks to cause distress in Pakistan with the same enthusiasm, ignoring the fact that Pakistan has been providing refuge to 1.3 million Afghanis for the past 20 years (UNHCR Pakistan, 2019).

Drought conditions in Afghanistan, global change in climate, and increasing population near the Kabul river, are the major concerns for Afghanistan in the current scenario. The solution to these concerns is building new infrastructure.

Afghanistan plans to build 12 dams on Kabul river (Hessami, 2018), and India is not only providing technical support to the country, but is also ready to invest in their project. Giving birth to "water war", India plans to make Pakistan a sandwich between water aggression from both sides. The unignorable fact regarding Afghan-Pak water relations is that Afghanistan has already constructed a few dams with American assistance, and now the World Bank is ready to provide around $8 million to Afghanistan for the construction of water management infrastructure (Bhatti, 2018). These dams are expected to generate 2400 megawatts of electricity for Afghanistan and their construction has already drastically reduced the water flow to Pakistan by 50% (Dawn, 2018).
Even though, Pakistan has already constructed Warsak dam on the river, coming from Afghanistan. Kabul river irrigates 80% of Khyber Pakhtunkhwa's agri-cultivations for nine months a year, and 60% of Noshera's population, along with 85% of Charsadda's population depends on it. (Majidyar, 2018)

It's nothing unexpected, that in the district of Chahar Asiab in Kabul, on a tributary of the Kabul River, the Maidan, work is booked to start soon on the Shahtoot Dam. The dam will hold 146 million cubic meters of consumable water for 2 million Kabul inhabitants and flood 4,000 hectares of land. It will likewise give drinking water to another city on the edges of Kabul called "Deh Sabz". After years of war, Afghanistan is in a situation to build up its economy and electricity from hydropower.
The previous political leadership of Pakistan has been taking the situation in a very lenient

> *''Beyond reducing water flow to Pakistan, the Shahtoot Dam has a unique capacity to escalate tensions in the region thanks to its funding from India. India has made major investments in Afghanistan's infrastructure in recent years—from highway construction to repair of government buildings and dams damaged by conflict'' (Hessami, 2018).*

manner and now the situation has worsened, leaving Pakistan with no other option but to work on war footing grounds and construct new water management infrastructure along with maintaining the existing ones.

The biggest zone of the Khyber Pakhtunkhwa area lies around the rivers of Swat and Kabul. Construction of Dam on Kabul river by Afghanistan may make gigantic live water stockpiles upstream, empowering it to temper with the stream of water to bring down riparian Pakistan. This will cause a shortage of water, along these lines unfavorably influencing Pakistan's agri-economy. Regardless of the World Bank and USAID supporting the possibility of Pakistan and Afghanistan marking an arrangement in 2006, and the US Congress issuing a report, on how water shortage could fuel unsafe pressures, in 2011, the issue remains without a solution (Hassan & Awan, 2018).

Kalabagh dam controversy

The plausibility of the Kalabagh dam isn't the issue, on the grounds that the administrative work and other critical insights concerning water stockpiling and power projects over the Indus river, at Kalabagh, were prepared a very long time ago. Tragically, the construction of Kalabagh dam lacks consensus among provinces. Three out of four provinces of the country express reservations against the construction of this dam and have also passed resolutions against it in their respective assemblies (Khalid & Begum, 2013)

Khyber Pakhtunkhwa believes that Noshera will be submerged under water if this dam is developed, Sindh believes that construction of this dam would leave the province dry due to less or no availability of water, and Baluchistan usually stands out of the matter by showing little concern to this national cause. Punjab is the only province that supports the idea for the development of Kalabagh dam, as it anticipates the facilitation of power deficiencies and the accessibility of more water for farming. With such solid reservations, it has been fairly incomprehensible for any government, since 1984 to continue with the development of Kalabagh dam, and this dam has been considered a threat to national unity and integrity.

> *"Due to the politicization of the issue, the Kalabagh Dam has been put in cold storage and no serious effort has been made to remove the reservations of smaller provinces about its construction. Kalabagh dam is our best chance at stopping the wastage of billions of gallons of water during the monsoon season. It will also produce around 4,500 megawatts of cheap electricity"*
>
> (Ahmar, 2018).

In the event that the dam isn't developed, at that point Pakistan will confront a significantly progressive extreme emergency of high fuel costs. On the other hand, (if constructed) energy produced by Kalabagh dam would be equivalent to 20 million barrels of oil (Tariq, 2018).

Water wastage due to poor infrastructure

Aside from the water stockpiling issue, specialists state that water wastage is additionally a major issue in the nation. The bungle happens at numerous dimensions, main are two. Water leakage and seepage by broken irrigation system and annual water drain to sea. This trouble can to a great extent be bifurcated into issues of value and amount. Presently, due to inadequate water storage infrastructure and siltation of dams about 38 MAF is wasted to sea

annually while 52 MAF is wasted by unlined canal irrigation system (Khalid & Begum, 2013). According to Indus River System Authority (IRSA), value of water dumbed to sea annually is $ 21 billion (Guramani, 2017). The water coming into our frameworks over the previous decades hasn't changed much. In any case, need has taken off because of an exponential increase in populace. Existing repositories' stockpiling limit can't continue this populace blast while its ability has likewise been diminished throughout the years (Abubakar, 2019). As the water emergency exacerbates in Pakistan, outside negotiators and activists have taken to web-based social networking, asking individuals to spare water. Martin Kobler, German representative to Pakistan tweeted:
"Using a bucket to save water while washing my car! #Pakistan ranks third amongst countries facing water shortage. One major reason is excessive use. 100 liters wasted washing a car with running tap water. Many ways to #SaveWater in our daily life! #SaveWaterforPak,"

Climate change

Beside dependence on inflows of Indus, monsoon rains are the secondary source of water supply in the country. It is estimated that country's 85% percent river inflows are coming from snow or glacial melt (IMF, 2015) while remaining water is available from average 255 mm rainfalls during monsoon season. Interestingly, yearly river inflows and seasonal rainfalls both coincides in the months from June to September. Pakistan receive an adequate rainfall in specific months such as in monsoon season however, most of the water is wasted due to lack of rainwater storing system (Chandio, 2012).
The volume of rainfall varies all across Pakistan, northern Punjab receives the maximum while areas of Sindh and Baluchistan receives minimum rain. According to Pakistan Metrological Department (PMD), Pakistan received half rainfall (approx. 47% reduction in volume) on average in month of August 2018 than the 2017. Punjab saw just 9% decline in annual rainfall while Sindh witnessed massive decline of 87% on average. It had been predicted long ago that Pakistan will be water scared country due to infrequent rainfalls as a result of climate changes (Pomeranz, 2013).

Poor water-governance

Indus Water System Authority (IRSA) was established in year 1993 by the parliament to regulate and monitor the distribution of available water resources between and among provinces of Pakistan as per water apportionment accord, 1991. However, amidst scares seasonal inflows and hydro-politics by provinces IRSA is unable to implement the accord and govern water management according to set criterion. Table. 2 Shows the water apportionment accord 1991.

Table 2
Water share of provinces according to water accord 1991

Province	Water Shares		Total	Balance Supply Shares (%)*
	Kharif	Rabi		
Punjab	37.07	18.87	55.94	37
Sindh	33.94	14.82	48.76	37
K.PK	3.48	2.30	5.78	14
Civil Canals**	1.80	1.20	3.00	
Baluchistan	2.85	1.02	3.87	12
Total	77.34	37.01	114.35	100

Source: Author's adoption from Khalid & Begum (2013)
***Including flood flows & future storage**
**** Ungagged civil canals in K.PK**

The IRSA, practically, is unable to distribute water according to traditional rules in which people on downstream has right to use required water first. The accord of 1991 is never achieved because its implementation has failed due insufficient water availability as result slitting up of existing reservoirs and also because huge water is wasted in leakage and seepage (Khalid & Begum, 2013).

The water issue in Pakistan is also getting worse as IRSA is potentially weak to take action against mismanagement of water against either province. Punjab province is taking undue water share from Indus river through Chama-Jhelum and Tonsa-Punjnand link canals. Sindh province is stealing Baluchistan's water from Pat-Feeder canal. While, Khyber Pukhtune (KP) is unable to recover its water royalties from Punjab and federal government. In all case, authority is helpless to govern water management effectively.

Water Crisis in Pakistan: It's Impacts

Pakistan's massive water crisis has huge harmful impacts on the Agri-Industrial economy, health of people and ecosystem of the country. Presently, Pakistan ranks 36 in world among most water stressed countries. But, the situation of water crisis is getting worse day by day because of continuous and enormous population growth. It is estimated that by 2025 per capita water availability in country will be well below 800 cubic meters which is against world required standards of per capita water availability. The next section presents detailed analysis of impacts of water crisis on the national economy, people and ecosystem of the country.

Impacts on economy

Pakistan is getting repetitively influenced from extraordinary climate change both for the time being and long run. The floods of 2010 put Pakistan on the very top of the list of nations most affected by environmental change as it lost US $25.3 billion and 5.4 percent of the GDP (Eckstein et al., 2019). After, 2010 the government did not work seriously to improve water infrastructure to avoid such huge losses in coming time. At present still 4% of GDP losses are caused by poor water sanitation, floods and droughts this makes $12 billion per year economic loss to country (Rana, 2019). These water losses do not include the potential economic losses incurred as result of dumping of 38 MAF water to sea which worth around additional $ 21 billion annual loss.

- **Agricultural and Livestock losses**

Agriculture sector is direct victim of water shortages. Due to seasonal inflows and changes in weather cycles agriculture suffers the most. often, unpredictable water inflows get uncontrolled because of huge rain and international inflows thus all crops are washed away by floods like in 2010 and 2012. In other case, when water is short lands of Sindh and Baluchistan get barren. In either case, agroeconomic of the country faces huge setbacks. Asad (2016) reported that Pakistan faces significant reduction in the cash crops production such as maize, cotton, wheat, sugarcane, and rice. The longer droughts and competition over limited resources has also caused the approx. 30 per cent decline in production of livestock as both humans and animals need food and water for the survival. Since, livestock is highest contributor of total 20% GDP produced by agriculture; thus, decline in production of livestock is actually reduction of agricultural contribution towards economy. Dehydrated grasslands have directly affected grazing of livestock which results in their malnutrition and subsequently lowered milk and meat production. Viewing the growing population, it is estimated that agriculture sector will need additional 10 MAF water by 2025 than its present needs thus its likely "adding insult to injury".

- **Industrial losses**

The industrial sector of Pakistan which is also among top contributors of economy also suffers huge losses due to water shortages. Presently, about a half million small, medium and large industries are operating in Pakistan theirs water requirement to continue their manufacturing activities are increasing gradually. Currently Industry uses 3.5 MAF of water which is projected to go up to 4.8 MAF by 2025. Thus, additional, 1.3 MAF of water will be required to complete industrial water needs (Water Planning Commission Plan, 2013-2018).

Water shortages affects industry in two ways. 1) Unavailability water my hinder the plant processing activities, and 2) Interrupted and inadequate hydel power causes shutting down of manufacturing plants permanently or bear the loss due inconsistent operations because of load shedding. A report on project *The Vulnerability of Pakistan's Water Sector to the Impacts of Climate Change* (Asad, 2016) noted that "Indus basin water flows also play a critical role in……. supporting the country's energy production, manufacturing and industrial processes". There is mutual consensus among scholars that energy shortages in Pakistan badly affects the industry and commerce (Chandio, 2012).

- **Hydel energy losses**

Pakistan has huge hydropower production capacity however, it is not fully utilized viewing poor water management infrastructure. The country can go up to producing about 60000 megawatts of hydro energy from Indus water flow system, however, current hydro power production capacity just stands around approx. 7320 megawatts as of 2016. Viewing that much capacity Pakistan can be a strong water economy (Kundi, 2017) presently the federal government has launched program for hydropower development and produce up to 17-20 thousand megawatts from water but the construction of the small and medium dams to provide fresh water is jeopardized by the hydro politics at federal and provincial level (Raza et al., 2017). Therefore, it will take about three decades (till, 2047) to government of Pakistan, if it continues to construct required dams and other hydro power generation infrastructure with the same pace (Rana, 2019) till country's industries and households have to face load shedding amidst growing number of populations.

Impact on people and their health

Because water is essential for sustaining life, its shortage has heavily influenced the life of common people. There are multiple effects of both – the water shortage and - the unsafe drinking water on the health and life being of people all across Pakistan. If the issue of fresh water shortage is not ruled out soon it may lead to civil war among people. Such a war like situation over the water distribution can largely and clearly be seen at provincial level (Khalid & Begum, 2013).

At present the municipal water withdrawal is increasing immensely and will reach 7.15 billion m3 in 2030 calculated by (Parry, 2016). Moreover, all the available fresh water is not safe and clean. Half of the population is drinking dirty water (Raza et al., 2017) due which people are suffering from diarrhea, typhoid, and hepatitis mainly in remote areas of Baluchistan and Sindh. The drought conditions compel residents to use contaminated water for growing crops and vegetables on it. This practice is common in big cities of Pakistan where wide open lands and fresh water are not available for the irrigation, thus vendors are unable to meet the supply of fresh vegetables and fruits because of masses of population.

Impact on ecosystem

A World Bank report, Pakistan's Hotspots — The Impact of Temperature and Precipitation Changes on Living Standards, claims that by 2050, yearly normal temperatures are anticipated to increment to 2.5°C under the atmosphere and up 3.0°C under the carbon. Roughly 49 million, or 25 percent of Pakistan's all out populace, lives in areas that will progress toward becoming 'moderate hotspots' by 2050 under the carbon escalated situation. Containing the temperature is fundamental to keep real regions of Pakistan from getting to be appalling in a future not very far away (Sheikh, 2019).

Due to climate changes such as rising temperature, infrequent rainfalls, floods and water shortages ecosystem in Pakistan has completely disturbed. The glacial melting along with frequent rains in northern part of country and droughts in south has changed the ecology.

The quality and quantity of water both are affected. Bates et al., (2008) reported that floods will affect quality of water as metals, sediments, and organic pollutants mixes up with the natural water and causes surface water pollution. As opposite to it, droughts in South (Sindh and Baluchistan) has converted once fertile lands in to forest and the timing of crop production and harvesting have completely changed.

Due to insufficient water supply to sea, life of people living around delta has been sullen. The sea water has already engulfed 100 km land and increased salination. Thus, people living there have started migrating to urban areas because of change in their agriculture and fishing patterns. Moreover, mangroves trees which only grows on fresh water has also been endangered. These trees, work as first defense line against flood caused by sea or river, are depleted by 38% just in thirteen years from 1977-1990. Thus, people in delta are threatened by changing ecosystem (Khalid & Begum, 2013).

SUGGESTIONS TO OVERCOME WATER ISSUE

Based on above mentioned detail analysis of causes and consequences of water shortage in Pakistan following suggestions are made to develop a long-term comprehensive water management policy.

- Trans-boundary water issue with Afghanistan should be solved. State level especial hydro-dialogue should be initiated to stop them constructing additional dams on Kabul river. The root cause of the water issue is that, there is no Pak-Afghan bargain on the sharing and utilization of water from River Kabul, similar to the Indus Waters Treaty among India and Pakistan on the utilization of water from the Indus water framework (Malik, 2019). Afghan government can be convinced by offering them a serious and tangible support to deal with non-state actors on their land. Because for over decades people of Afghanistan are yearning for peace, a genuine effort by Pakistani side to bring them peace will help Pakistan to solve water issue with them. Water threat by Afghanistan to our country is more lethal than traditional threat. Afghanistan is trying to get out of the failed American invasion and the "recent peace talks" are a proof that the landlocked country may start to get back on its feet with a new political leadership. Considering this situation, Afghan new political leadership needs to take appropriate steps for harmony to prevail in the country, and water crisis should be one of its top priority.
- In 1960, the World Bank expedited the Indus Water Treaty (IWT) that gives Pakistan selective rights to utilize the area's western waterways — Indus, Jhelum and Chenab — while India has the authority on more than three eastern streams. However, New Delhi isn't satisfying its obligations under the IWT rather building the Kishangaga hydroelectric plant in the north of Bandipore in India-regulated Jammu and Kashmir area. Pakistan and India need to implement already established regulations to avoid water conflict. In this regard Pakistan has already moved many times toward the World Bank whining that India abused the IWT by structure the dam on a Jehlum River bowl, which it lays guarantee on (Baloch, 2019). Pakistan should use South Asian Association for Regional Cooperation (SAARC) and other regional as well as international forums to develop a 'Regional Water Regulating Authority' (RWRA) and involve guarantors so that both parties abide laws set by RWRA.

- Pakistan need to establish water infrastructure such as dams on war footing basis to avoid huge water economics loss. A national level consensus is needed to construct national asset like Kalabagh Dam. The dam will serve both purposes the – hydropower purpose with its capacity of producing 3600 megawatts and the – water saving purpose by which 35 MAF water can be saved in case of heavy rains. With its massive storage capacity about 8 million acres barren land can be cultivated. There is need to educate the people about potential of Kalabagh dam against small dams. However, not to dis-harm national integration over construction of small dams would also be viable option. The nation already divided over award of National Finance Commission (NFC), military role, and federal taxation issues cannot sustain more division on construction of dams.
- The present water infrastructure should be renovated to avoid huge water leakage and seepage issue. For this purpose, allocated budget in Public Sector Development Program (PSDP) for the said projects should be doubled or projects can be financed on traditional and innovate methods of financing through the involvement of private sector. The public private partnership can be preferred as mode of financing.
- Mismanagement of water should be controlled at the industrial, agricultural and domestic levels. The government is already considering to put water tariffs on industries there is need to start water metering system for farmers and households. Agriculture sector uses 85% of all available water resources of the country however, its contribution to national GDP is just 20%. There is need to charge water tariffs from agricultural lands or at least agricultural profits should be charged with meager amount of tax. The recovered amount of money can be reinvested in hydro projects. Additionally, household water metering should be started to control misuse of water at domestic level.

Conclusion

The Pakistani experts need to venture up endeavors to defeat the water emergency, which is incompletely man-made. "As a matter of first importance, Pakistan's pioneers and partners need to take responsibility for test and proclaim their goal to handle it. Just accusing past governments, or censuring India, for the emergency won't explain anything. Next, the administration needs to found a noteworthy change in perspective that advances progressively sensible utilization of water.

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