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INTRODUCTION

‘One of the most water-stressed countries in the world, not far from being classified as water scarce’, Pakistan faces an existential threat- one that could potentially hobble its already modest economic growth. In a country where growth is largely driven by agriculture, a shortage of water could have serious ramifications. Pakistan’s storage capacity, ideally recommended to hover around 1,000 days given its climate, stands at a meager 30-day supply (“Water storage capacity just for 30 days”, 2013). With water availability on the decline and high rates of population growth, Pakistan appears to be destined to make the transition to a water scarce country.

In stark contrast to the burgeoning population and hence the surging demand for water, large volumes from the Indus (Pakistan’s main river system) have also been diverted upstream to Punjab province to meet the demand for agriculture and consumption creating not only a deficit downstream but upsetting the ecological balance and affecting livelihoods as well. The fishermen that depend on the Indus to earn a living have also had to bear the brunt and in a strange twist of irony now purchase water from trucks at a higher price.

In an increasingly volatile political landscape, stewardship of water resources has also become difficult as various sectors compete with each other. Failures at the institutional and governance levels have allowed water to become a heavily politicized issue within the country often used to “express discontent” over management of the resource (Akhter, Mustafa and Nasrallah, 2013: 5). The water issue has been a bone of contention with the neighboring India, which is not only home to the glaciers that feed the Indus river- the backbone of Pakistan’s irrigation system but also planning more large-scale diversions.

To add fuel to fire, there is the undeniable effect of global warming in deepening Pakistan’s water crisis. Glacial retreats, rising sea levels, increased droughts and floods, more intense storms, more extreme heat episodes and the shortage of fresh water are all problems that can be traced back to climate change. With the issue getting the spotlight on international forums and media, the view that a shared sense of responsibility to combat global warming and the consequent climate change is essential and very much in synchrony with the ideals of achieving sustainable development to pave way for a brighter and more secure future.
LAND RESOURCES
Pakistan’s geographical area is 79.61 mha (million hectares) out of which 22.05 mha is classified as cultivated area. The reported area is a 72% (57.07 mha) of the total 79.61 mha meaning thereby a complete picture of Pakistan’s land resources is still not available; out of the reported area, approximately 8.1 mha are available for future agriculture depending on availability of water (Ahmad, 2007:911). It can be inferred that the true potential of Pakistan’s land resources has not been fully explored and hence, remains unexploited.

Like others within the league of developing countries, Pakistan’s growth is challenged by land degradation and desertification which are leading to environmental problems such as soil erosion, loss of soil fertility, flash floods, salinity, deforestation and the associated loss of biodiversity and carbon sequestration.

WATER LOGGING AND SALINITY
Water logging and salinity are two major factors that jeopardize the sustainability of irrigated agriculture and impact crop production in Pakistan. Nearly 6.3 mha have fallen prey to the menace of salinity with almost half of this area being under irrigated agriculture. Several efforts have been made to control waterlogging and salinity in the Indus Basin through the use of tubewells, leaching of salts by excess irrigation, application of chemicals, and the use of biological and physical methods. (Qureshi et al, 2008)

<table>
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<tr>
<th>Type of land degradation</th>
<th>Dry zone</th>
<th>Humid zone</th>
<th>Region</th>
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</thead>
<tbody>
<tr>
<td>Water erosion</td>
<td>32</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>39</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Soil fertility decline</td>
<td>5</td>
<td>20</td>
<td>13</td>
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<tr>
<td>Waterlogging</td>
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<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Salinization</td>
<td>19</td>
<td>&lt;1</td>
<td>9</td>
</tr>
<tr>
<td>Lowering of the water table</td>
<td>13</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 1: Percentages of agricultural land affected by degradation (summary)
Source: http://www.fao.org/docrep/v4360e/V4360E07.htm#Summary
Figure-3: Waterlogging, salinity and lowering of the water table (GLASOD assessment)
Source: http://www.fao.org/docrep/v4360e/V4360E05.gif

Figure-4: Map showing severity of degradation across the region
Source: http://www.fao.org/docrep/v4360e/V4360E07.gif
CLIMATE
Pakistan’s agro-climatic classification puts a good two-thirds of the country in the semi-arid to arid zone which is generally characterized by low erratic rainfall. In the past few years, the situation has worsened and signs of global warming are becoming evident. With climate change, in addition to higher average temperatures, there is an increased risk of rising sea levels, melting of glaciers, flooding and higher frequency of droughts. Crop yields are expected to decrease as a result, affecting livelihoods and food production.

On the global level, climate change has become an issue of grave and immediate concern having far-reaching effects not only on agricultural productivity but also on the demand for water and energy. During the past century, global temperatures have risen by nearly 1 degree Celsius (due to burning of hydrocarbons and deforestation) and are expected to increase further by 1.4-5.8 degree Celsius by 2100.

Pakistan’s glaciers are expected to melt by 2035 according to Zahid Hamid, (the federal minister for Science and Technology) which will have a disastrous effect on fresh water flows. Being an agro-based economy, Pakistan is extremely vulnerable to climate change as the sector contributes 21% to GDP. The country, like others in the developing world, has had to bear the brunt of climate change despite having a lower carbon footprint. It has the 135th position in terms of carbon dioxide emissions and ironically, has been ranked 3rd in terms of vulnerability to climate change. This means that extreme weather conditions such as heavy rainfall, intense cyclones and drought could become routine and determine the flow of freshwater into the Indus Delta.

Arguably the impact of these changes in temperature on the environment may be the most direct but the changing climate could also give birth to several challenging social and political issues for those at the helm of affairs. Decreasing water availability, for instance, could drive up poverty indices as access to safe and adequate quantities of water is serves as a precondition for an acceptable standard of development in accordance with the UN Millennium Declaration targets for 2015.
Figure 5: “The poor will be the first victims [of desertification] and the last to recover”. (UN Secretary General Ban Ki-moon)

Figure 6: Salt collects at Keti Bandar
Source: http://www.internationalrivers.org/files/signature-images/salt_near_keti_bandar.jpg
DEMAND AND AVAILABILITY
Given its arid climate and dependency on agriculture as a driver of growth, a massive share of Pakistan’s already shrinking water resources is used for irrigation purposes leaving less than 10% for drinking water and sanitation. Its storage capacity stands at merely 30 days as opposed to the minimum requirement of 120 days while India has the ability to store water for 120-220 days.

According to Jamshed Iqbal Cheema (Chairman: Pakistan Agriculture Scientists Association), per capita water availability at the time of independence was 5,600 cubic meters against the current measure of 1,000 cubic meters and the shortage is expected to rise to 31% of people’s needs by 2025. (“Water storage capacity just for 30 days”, 2013) It is estimated that at present, about a quarter to a third of the country’s total population does not have access to safe drinking water and on a daily basis, 630 children lose their lives to diarrhea.(Husain, 2012)

Pakistan loses 13 million cusecs of water every year into the sea while seawater encroachment damages land up to 100 kilometres of cultivable land during periods of reduced river flow—for a country that uses nearly 90 per cent of its water resources for agriculture and depends on the sector to remain buoyant, this is a dangerous trend. (Ashraf, 2013)

Figure-7: With the lack of a clear conservation strategy and population on the rise, the demand-supply gap is expected to widen further.
Source: http://cache.pakistantoday.com.pk/2012/07/WATER-480x238.jpg
Water Resources

RAINFALL
The major sources of rainfall in Pakistan are Western Depression (December-March) and Monsoons (July-September). During the Kharif and Rabi seasons, the entire Indus plain receives an average rainfall of 212mm and 53mm respectively. Changing rainfall trends directly affect agricultural productivity, disaster management besides availability of water.

In recent years, there has been an increase in the intensity and the incidence of floods which is unfortunate for a country where nearly 40% of the people are directly affected by climate change especially as rainfall patterns have become unpredictable. From 1998-2001, the southern and central parts of the country experienced extreme drought conditions while in 2010, severe flooding destroyed over 700,000 homes.

GLACIERS
Of Pakistan’s total area, nearly 13,680 sq km is covered by glaciers that help boost river turnover in warm weather. According to scientists, in just a period of 30 years, glaciers in the Himalayas have diminished by nearly one-fifth and it is believed that glaciers in this region will have disappeared by 2035 the effects of which will be devastating for the 1.3 billion people living in downstream river basins provides food and energy. (AFP, 2011)

The Hindu Kush-Himalayan-Tibetan region is also known as the ‘third pole’ for its potential in contributing to rising sea levels as the area has experienced a rise in temperature of 1.2 degrees Celsius over the past 120 years which is greater than the increase in the global temperature. (AFP,2011) As a result of this enhanced warming, glacial retreat is accelerating across much of the region, with Himalayan glaciers retreating faster than the world average.

THE INDUS RIVER SYSTEM
Watered by the glaciers of the Hindu Kush and the Karakoram, Indus is the largest river of Pakistan and the primary source of freshwater—it helps fulfill household and industrial needs and support nearly 90% of agriculture. The eastern tributaries of the Indus are Jhelum, Ravi, Chenab and Sutlej. According to the Indus Water Treaty (1960), India was given control over Beas, Ravi and Sutlej due to which they are left with less water as they flow into Pakistan.
There are number of small rivers which join the west of the Indus of which biggest river is Kabul. Other rivers include Swat, Tochi, Kurram and Gomal. The volume of these rivers increases during summers due to the melting of snows but decreases during the winter season.
Figure-7: Chart showing percentage of water resources originating from outside the territory for various countries.

DAMS
Of the two major dams, the Mangla reservoir had an initial capacity of 5.88 Million Acre-feet (MAF), which came down to 4.674 MAF in 2005 owing to sedimentation. This created the need for a dam raising project aimed at raising the height by that was completed in 2009 at a cost of Rs. 101.384 billion. This project effectively raised the dam height to 1242 feet from 1202 feet and increased storage capacity to 7.39 MAF.

The Tarbela Dam (constructed to store water for the Indus) is the largest earth filled dam in the world and the reservoir has a surface area of nearly 250-square-kilometre (97 sq mi). It was initially predicted that the lifespan of the dam would be around 50 years due to the fact that the river carries huge amounts of sediment (estimated at about 430 million tons per year) which is now expected to extend to 85 years since inception.

SURFACE WATER
River Indus and its tributaries supply 154 MAF of water annually: the westerns rivers contribute 144.91 MAF of water while the eastern rivers bring 9.14 MAF. Of the 154 MAF, 104.73 MAF is used for irrigation purposes, 39.4 MAF flows to sea and about 9.9 MAF is lost to seepage, evaporation and spill during floods. (Ahmed, Chaudhry and Iftikhar, 2007:7)

The Indus Basin Irrigation System consists of 16 barrages, 3 major reservoirs, 2 head-works, 2 siphons across major rivers, 44 canal systems, (23 in Punjab, 14 in Sindh, 5 in NWFP and 2 in Balochistan), 12 inter river link canals and more than 107,000 water courses where the total length of canals is nearly 56,073 km. According to Pakistan Water Strategy Report, the system also makes use of 41.6 MAF of ground water in addition to canal supply with the help of 500,000 tube wells.

However, with increasing pollution owing to inadequate sewage disposal systems and dumping of industrial and agricultural waste, the quality of surface water is deteriorating. The effects of pollution are not just limited to surface water-groundwater is equally threatened by it. Already about 36% of groundwater is classified as highly saline due to salt intrusion and excessive mining has caused water tables to fall.
CONCLUSION

The severity of the water crisis cannot be ignored while pursuing economic development as it serves as the backbone of the economy. The deficit is growing with population growth rates on the rise and coupled with problems such as global warming and climate change, the issue has become a serious challenge for those working at the policy-making level.

The role of regional politics too cannot be denied in aggravating Pakistan’s water woes as the relationship dynamic with India determines the flow in the western rivers since the source lies in disputed territory Kashmir and as a corollary, has implications for internal politics vis-à-vis distribution of water within the provinces. With the once mighty Indus delta now reduced to a mere canal, there is more cause to worry as the inland flow of sea water can render cultivable land unfit for cultivation and hence, completely useless.

There is an abundance of evidence that underlines the utmost necessity of developing a strategy to cope and overcome the crisis—Pakistan’s economic and social stability depends on the very resource that it is believed to run out of. Critical food shortages, increased frequency of natural disasters, large scale dislocations of citizens and an increasingly destabilizing conflict between upper and lower riparian regions.

There is a dire need to chalk out a holistic policy that helps conserve and manage the resource effectively to meet food security and energy needs as well. This does not only highlight a need to inculcate water sense among citizens to avoid wastage but also emphasizes the significance of close cooperation with India in joint watershed management, increasing the efficiency of water usage and working towards matching goals such as development of efficient technologies, sustainable agriculture practices and safeguarding both peoples against food shortages.
BIBLIOGRAPHY

"8 Mighty Rivers Run Dry From Overuse." National Geographic.

AFP. "Scientists confirm Himalayan glacial melting." Pakistan Today.


