The crisis of water shortage and pollution in Pakistan: risk to public health, biodiversity, and ecosystem

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Dear Editor,

According to the International Monetary Fund (IMF), Pakistan ranked third among the countries facing severe water shortage. In May 2018, the Pakistan Council of Research in Water Resources (PCRWR) announced that by 2025, there will be very little or no clean water available in the country (Shukla 2018). It must be noted that while per capita availability in the 1950s was approximately 5000 m³ per annum, it has now declined to below 1000 m³, which is an internationally recognized threshold of water scarcity (Aziz et al. 2018). Currently, only 20% of the country's population has access to clean drinking water. The remaining 80% populations depends on polluted water primarily contaminated by sewerage (fecal, total coliforms, *E. coli* colonies), and secondarily by fertilizer, pesticides, and industrial effluents (Daud et al. 2017; Sahoutara 2017). Such water pollution is responsible for approximately 80% of all diseases and 30% of deaths (Daud et al. 2017). In the dried-out pipeline, a single *E. coli* bacterium can multiply into trillions in just a week (Ebrahim 2017), and such pipes are used for the water supply without any treatment. Consuming such polluted waters has not only resulted in the death of several people, but also cause bone and teeth diseases, diarrhea, dysentery, typhoid, hepatitis, cancer, and other waterborne diseases (Daud et al. 2017). According

to World Health Organization (WHO), waterborne diarrheal diseases are responsible for over 2 million deaths annually across the world, with the majority occurring in children under 5 years (WHO 2018).

In Pakistan, approximately 60 million people are at risk of being affected by high concentrations of arsenic in drinking water; the largest mass poisoning in history (Guglielmi 2017). Arsenic poisoning can cause cancer, restrictive pulmonary disease, skin lesions, cardiovascular problems, diabetes mellitus, gangrene, neurological impairments, and problems in endocrine glands, immunity, liver, kidney, and bladder as well as socio-economic hazards (Rahman et al. 2018). Unfortunately, still, no epidemiological data of arsenic poisoning, alternate drinking water, and health interventions are available to the people at risk.

Taking into consideration the drought-hit deaths of approximately 1832 children in the last 4 years (The Newspaper's Staff Reporter 2018), drying lakes (Ali 2015), rivers (Channa 2010), lowering water table, excessive use of water, lack of storage mechanism, population explosion, and climatic changes warrant serious attention (Kirby 2018). Furthermore, the lack of sound national water policy, lack of federal and provincial government's interest, water conflict between nuclear-armed Pakistan and India (Kirby 2018), deforestation, the overwhelming potential threat to the country's glacier reserves (Nabi et al. 2017, 2018), and the poor water supply will likely negatively affect agriculture, ecology, and local biodiversity. The wildlife has already entered the red zone (Shaikh 2018) and can possibly turn into human crisis with the danger of large-scale regional migration of people due to drought-like situation. We have recommended some suggestions that could possibly help the people of Pakistan to get rid of water shortage and pollution, maintain an ecology, improve agriculture, and conserve local biodiversity.

- (1) Sound National Water Policy: An effective National Water Policy and management are needed to conserve and enhance water resources, minimize drinking water

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pollution, and improve the country's water supply with proper sewerage facilities.

- (2) Switch to bottled drinking water: Although this seems to be an expensive option, but keeping in view the higher concentration of arsenic (50 µg/L) (Guglielmi 2017), fecal, bacterial, and other contamination in drinking water (Sahoutara 2017), it is time to switch to the bottled drinking water. The polluted water can be used for other household activities. Indirectly, this will also bring the attention of public towards water pollution and conservation.
- (3) Building dams: Both large- and small-scale dams are needed, but every effort must be made to minimize their social and ecological cost in terms of population displacement and shock to the existing ecosystem. Hence, small dams having minimal environmental and social cost should be prioritized whose waters can be used for drinking, agriculture, electricity, and fisheries. It will also help in the conservation of aquatic biodiversity and other animals, especially during seasonal migration. Instead of the many dams that are under consideration (Qureshi and Akintug 2014), the authors report that hundreds of small dams can be built in the Khyber Pakhtunkhwa province, which is rich in both aquatic and terrestrial biodiversity and can also possibly help them in conservation by providing habitat and protection from flooding.
- (4) Reforestation: Annually, Pakistan loses approximately 2.1% of its forests. If this rate continues, Pakistan will run out of forests within the next 50 years (Randhawa 2017). Therefore, reforestation and its management in Pakistan are intensely needed and will help in bringing rain, stabilize climate, temperature, pollution, and siltation. It will also help in controlling recurring floods and will provide suitable habitat for the local biodiversity.
- (5) Steam-based car washing: There are hundreds of thousand car washing centers in Pakistan. They not only consume a huge amount of freshwater for cleaning, but also pose a great threat to public health, biodiversity, and ecology by polluting the rivers and environment. Switching to steam-based car washing system will not only conserve the freshwater but will also reduce the water and environmental pollution.
- (6) Artificial rain: Like China, Pakistan needs a rainmaking network throughout the country. This will help in solving the problems of water shortage, protecting the ecology, reducing natural disaster, and conserving biodiversity. China is developing the world's largest weather-manipulating system comprising tens of thousands of fuel-burning chambers. This system will increase rainfall over an area of approximately 1.6 million square kilometers (Chen 2018). The friendly relation, and with the execution of China-Pakistan Economic Corridor (CPEC), Pakistan can take advantage to establish this technology in Pakistan.
- (7) Trans-boundary level initiatives: Currently, India is damming Pakistani River water which was allocated to Pakistan under the 1960 Indus Waters Treaty with the help of World Bank (News Desk 2018). Constructive bilateral discussions can help solve the problem of water shortage and threats to the rivers dependent biodiversity.
- (8) Installation of low-cost water filters: The installation of a large number of low-cost water filters throughout the country and especially in polluted areas can provide clean drinkable water to the poor people who cannot afford the expensive bottled water.
- (9) Glaciers conservation: Outside the polar region, Pakistan has the highest numbers of glaciers (> 7200) than any other country (Khan 2017). Unfortunately, they are melting faster than any other part of the world to an extent that by the year 2035, the country will have no more glaciers (Dawn 2013). Furthermore, with the execution of CPEC, humongous quantity of black carbon (Nabi et al. 2017) will be blown by the air to the glaciers that will further accelerate melting. Therefore, a national plan for the management of these glaciers is needed. The impact on glaciers can be minimized by allowing only electric vehicles in the nearby highways, providing solar energy systems to the local inhabitants, reforestation, and control over greenhouse gasses.
- (10) Restoring lakes. Pakistan has a total of 60 lakes and most of them are highly polluted. Due to pollution, only in Manchar Lake; Asia's largest freshwater lakes, 14 fish species have become extinct (Ebrahim 2015). Restoring these lakes will provide better habitat for the biodiversity, promote ecotourism and agriculture, and water to the lake-dependent.
- (11) Regulating tube-wells drilling: Due to increase in population, demand for water increases. Whether it is domestic use, commercial or agriculture, there has been an unregulated use of tube-wells across the country where people extract as much water as they like. Because of this practice, there has been an exponential rise in the number of tube-wells due to which water table is going down in many parts of the country. Therefore, an implementation of strict policy is needed to regulate the number of tube-wells. Furthermore, in the overexploited region, artificial groundwater recharge might help to improve the water table.
- (12) Awareness: In Pakistan, water is free and therefore no attention has been given by the public to its conservation. Both on the print and electronic media, awareness is needed for water conservation. Also, as it is practiced

in many countries, it is feasible to come up with a realistic water pricing mechanism to discourage its enormous waste both at household level as well as commercial level.

In summary, water scarcity and pollution are serious overwhelming threats to the world's sixth populous country, Pakistan. The government needs to pay urgent and serious attention to water conservation and minimizing water pollution to avoid serious consequences in the form of drought, famine, internal migration, and loss of biodiversity.

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