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Is India ready for water scarcity and its catastrophic impact in the era of Global Climate Change?

Pardeep Singh and Anwesha Borthakur

Is India ready for water scarcity and its catastrophic impact in the era of Global Climate Change?

Pardeep Singh¹, Anwasha Borthakur²

¹Department of Environmental Studies, PGDAV College, University of Delhi, New Delhi 110054

²Centre for Studies in Science Policy, Jawaharlal Nehru University (JNU), New Delhi-110067, India

1. Introduction

During the month of June 2018, prominent international news agencies, including the BBC, the Independent, Time and Al Jazeera among others, published reports on India's 'worst-ever' water crisis in the history of the country. A vast majority of them referred to the report by the National Institution for Transforming India, popularly known as the Niti Aayog. It is "the premier policy 'Think Tank' of the Government of India, providing both directional and policy inputs" (See: <http://niti.gov.in/content/overview>) and works on the implementation of the sustainable development goals (SDGs). Drawing data from 24 of the 29 Indian states, the Niti Aayog report states that the water crisis in the country will be at its worst in the coming years with 21 cities in the country, including Delhi, Hyderabad, Chennai and Bengaluru, will probably have no ground water resources. Approximately 600 million citizens of India are already subjected to 'high to extreme stress' over water with the loss of life of about 2,00,000 individuals every year owing to insufficient access to safe water. It has been anticipated that, the country will have a global ranking of 40th in relation to water scarcity by the year 2040 (Manju and Sagar 2017). The management of the water scarcity has developed as an emerging challenge globally in general and for the rural

livelihood dependent on rainfed agriculture in particular (Singh, Osbahr et al. 2018). The decisions related to water management will certainly decide the political stability of a country, health of regional economies and the future of the major ecosystems (Tiwari, Singh et al. 2017). The current situation is already grim and worrisome with the potential for further disastrous repercussions in the near future. The BRICS nations are the emerging economies in the world. It comprises 41% of the world population and 27% of world land share. Increasing population, urbanization, industrialization and uses of chemical fertilizer and pesticide in agriculture for more production of food (especially in India and China to support their large population) have adverse effects on natural environment including water resources. The Rio Conference gave recognition that water is at the core of sustainable development and therefore, reiterated the importance of integrating water in sustainable development. The Conference committed to the progressive realisation of access to safe and affordable drinking water and basic sanitation for all as necessary for poverty eradication, the improvement of women and to protect human health and to significantly improve the implementation of integrated water resource management at all levels as appropriate. But in India the unorganized urbanization, expansion in the industries,

population explosion, Change in life style and increasing in the pollution did not fulfill the sustainable development goals. The sources of water pollution in Indian cities are diverse industries, waste dumping in open, sewages, small industries, exploitations of ground water resources, land use patterns, agricultural activity, agrochemicals, excesses use of chemical fertilizers, and main cause is degraded natural ecosystem by encroachment and unorganized big projects.

2. The Current State of Affair

Approximately 70% of the Earth's surface is covered by water, nonetheless, only 3% consists of the usable freshwater. The constant depletion of freshwater reserves of India, in terms of both groundwater and surface water, has been a major concern in the recent past. For instance, since the historical past, groundwater has been a substantial resource towards agricultural and other economic development of the country. As argued by Bhanja, Mukherjee et al. (2017), "the country comprises <3% of the terrestrial area and hosts about 19% of the global population. It also covers more than 30% of the global irrigated land and consumes the largest volume of global groundwater resource (higher than the sum of the total groundwater abstraction of United States and China, the second and third countries, respectively, in the country-wise groundwater utilization list)". India is primarily a groundwater civilization with nearly 85% of the country's domestic water sectors and 90% of agriculture are reliant on groundwater (Biswas 2019). The 'groundwater drought', as the authors have put it, is an alarming scenario in need of immediate attention both from the research and policy community in India.

With respect to the surface water, the scenario is no better than the ground water.

The destruction of fresh waters in India, primarily in terms of pollution creation, encroachment etc., is shattering. As put forth by Borthakur, Singh et al. (2016),

- "The tales of India's lost rivers and rivulets are indeed distressing. Many of these rivers and rivulets flow through some of the major cities in the country. The river and rivulet ecosystems, which once provided the dwellers with water and food besides contributing significantly to sectors such as agriculture, pisciculture and transportation, are now at the verge of extinction at several places. The rapid and haphazard urbanization and industrial development are significant factors responsible for such depletion [...] Encroachment of river banks is a major challenge for the local authorities of most Indian cities. Besides creating significant pollution, the river bed is destroyed in the process and it could not perform its intended function. In addition to significant urban and industrial pollution, encroachment activities could be attributed as the single largest threat for sustaining a healthy and sound river system in Indian cities."

With depleting freshwater resources in the country, the sustenance of the economy in this agrarian country faces a major challenge. During the recent decades, climate change has been considered as a key phenomenon responsible for the water scarcity in the both global and Indian context. As argued by Singh, Osbahr et al. (2018), with growing demand from urbanization, population burdens, effects of climate inconsistency and change, agricultural intensification, farming of novel water-intensive crops, over extraction/misuse, water scarcity is a critical

restrictive factor enhancing farmer susceptibility. Although current climate change projections display an upsurge in the CO₂ content and subsequent global temperature having indirect effects on the flow of surface water, nevertheless, the impact of rainfall, for instance, is more direct on groundwater storage system and surface run-off (Hussain, Das et al. 2018). The globalized dimensions of the depletion of groundwater is often an inadequately understood topic due to the dearth of research assimilating 'crop water use, groundwater depletion and international food trade' (Dalin, Wada et al. 2017). It is imperative to realize that the exhaustion of groundwater threatens the water and food security and sustainability of food production not only at a local scale but also in a larger global context through the international food trade (Dalin, Wada et al. 2017).

Ground Water pollution: According to CGWB (<http://cgwb.gov.in>) arsenic contaminations has been reported from 10 states- West Bengal, Bihar, Uttar Pradesh, Assam, Manipur, Jharkhand, Punjab, Haryana, Chhattisgarh and Karnataka. Fluoride contamination (more than 1.5 mg/l) in ground water is widely prevalent in different parts of India mostly in the states of Telangana, Andhra Pradesh, Rajasthan, Maharashtra, Madhya Pradesh, West Bengal, Bihar, Odisha, Punjab, Haryana, Tamil Nadu, Uttar Pradesh, Karnataka and Gujarat. Some parts of Chhattisgarh, Delhi and Kerala are also affected by fluoride contamination. Salinity in ground water is found mainly in western, north western and southern parts of India. Salinity has been observed in all major aquifer systems. Surface water: In India almost all the big rivers are polluted and a few of them are near to die. The pollution issue in Ganga River due to the various sources such as domestic sewage and industrial effluents

have polluted the rivers. According to NGT various authorities had spent a sum of Rs. 7304.64 crores up to March 2017 without any significant improvement in the water quality of River Ganga or its tributaries. The level of pollution in Yamuna is at an alarming rate. These are not only the condition of these two rivers, almost all Indian rivers are polluted.

Floods and drought affected vast areas of the country, transcending state boundaries. A third of the country is drought prone. Floods affect an average area of around 9 million hectares per year. According to the National Commission on floods, the area susceptible to floods in India is around 40 million hectares.

The recent IPCC report on increasing global-mean temperature to 1.5°C is an alarming concern to the whole society. Global climate changes are affecting the water and food resources worldwide. Nevertheless, its effects are more intense in African and Indian sub-continent. According to the Germanwatch, India ranks sixth in the 2016 in CRI (Climate risk Index). Asian Development Bank highlights that climate change are likely to result in huge economic, social, and environmental damage to South Asian countries, including India, it also estimates a temperature increase of 4–5 degrees Celcius by 2100. The countries in the greater Himalayas region, including Northern India, will face extreme weather events resulting in flooding, landslides, and damage to infrastructure, agricultural crops, and adverse impacts on human health (Sharma et al 2016).

In the context of Africa, water scarcity is already at its peak with the South African city of Cape Town in the global limelight because of its acute water crisis earlier this year. India and China have polluted almost all its major rivers, which support the large population of these two

countries for various purposes ranging from drinking to irrigation. Surface and sub-surface water are also contaminated in Brazil, India and China due to heavy metals from industrial pollutions. Accordingly, water scarcity is already a big issue in the BRICS nations. And it is the need of the hour to work out some acceptable policies and strategies for abatement of water-related problems. The 'National Water Policy (2012) adopted by the Government of India regards water as a scarce natural resource, fundamental to life, livelihood, food security and sustainable development. It emphasizes that the efforts to develop, conserve, utilize and manage this resource have to be guided by national perspective. The concerns related to water are generally the skewed accessibility to safe water for drinking and other domestic needs, general perception that ground water is an individual's property rather than community resource, encroachment of river channels, blockage of recharge zones and inter regional disputes in sharing water etc.

2. Possible Solutions

At present, the human population are undergoing its worst ever water shortage apprehensions due to the climate change, industrialization and urbanization, poor water management, population and economic growth, water pollution etc. and all these activities are responsible for deteriorating both the quality and quantity of water resources from local up to the global scales (Long and Pijanowski 2017). On a positive note, India's water scarcity could be addressed adequately if the present water resources in the country are sustainably explored and utilized. There are needs for innovative approaches. For instance, the country is blessed with an extensive coastline of more than 7500 km. in order to realize the increasing freshwater demands, 'desalination' could be a sustainable and

smart option in the country (Manju and Sagar 2017).

Watershed management practices is an effective tool for water and soil management in many parts of the world (Zimale, Tilahun et al. 2017). Watershed development "refers to the conservation; regeneration and the judicious use of all the natural resources particularly land, water, vegetation and animals and human development within the watershed. All land-based productive activities are dependent on the topography of the area, soil type, available biomass and water and call for adopting an integrated management approach, which can be better evolved within a natural domain such as the watershed" (See:

<http://www.teriin.org/blog/watershed-management-and-development>). India has already established some remarkable cases of excellent watershed management. The Maharashtrian village of Hiware Bazaar, situated in the Ahmednagar district, is one such example. As illustrated by Sushma, Shashikant et al. (2019), the village of Hiware Bazaar is recognized for its livelihood status that could be particularly characterized into two distant phases of the periods before 1991 and after 1991. While the first phase was distinguished by severe livelihood crisis because of the serious water scarcity, the second phase is known marked for livelihood enhancements achieved via 'community engagement and planned investment initiatives for watershed development and organic farming. All the above development regarding the water management in India is nor sufficient. it is a diverse country with different geographical location and land use patterns. There is a need of hours to adopted the sustainable water management techniques both in the rural as well as urban India. There is also need to change the irrigations pattern in context to rural agriculture system.

Concluding remarks:

A holistic and inter-disciplinary approach at water related problems are missing. Need to explore the indigenous technical knowledge for the conservation of water resources in the era of global climate change. It is a challenge for the scientists, policymakers and water program managers to sustainably manage the global water resources. There is a need of specific research attention for addressing diverse issues of water resources, including combined sewer system overflows, assessing effects on water quality standards, and protecting surface and sub-surface potable water from the intrusion of saline water due to sea level rise. Realizing the significance of these imperative concerns, various international organization including the BRICS nations have recently started taking various initiatives to tackle the problem of environmental pollution and water resource management through science diplomacy by organizing various interactions and programs such as the BRICS young scientist conclave (water theme), young entrepreneur and several start up initiatives. The main agenda of all these conferences and events is to develop some common strategies for conservation of water resources and resolve environmental issues through science diplomacy among the BRICS nations. Thus, knowledge has been created and disseminated through these initiatives and mechanisms. The knowledge generated through these initiatives has a global reach and will definitely shape the global environmental agendas in the near future. As the BRICS nations comprises of some global giants who have substantial say in the global environmental politics, it is expected that the overall environmental concerns and the focuses will be impacted and directed based on their primary focal points. For instance, impacts of the global climate change on aquatic ecosystems, and ecosystem services could be a major area of global environmental knowledge and

politics in the coming days due to the attention by the majority of the BRICS countries towards their aquatic biodiversity. Thus, it is certain that the decisions and knowledge creation through the interactions among the BRICS nations not only impacts these five countries alone, but also directs the research, policy and politics at a global scale.

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About the Author

Dr Pardeep Singh is an Assistant Professor at the Department of Environmental Studies, PGDAV College, University of Delhi and Anwasha, his co-author is, from the Centre for Studies in Science Policy, Jawaharlal Nehru University (JNU). Dr Pardeep Singh is an alumnus of the Durban Conclave in 2018, representing India in the water forum.

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