Economic Water Scarcity: The Beginning of the End of Growth Story

Prangya Paramita Gupta

Introduction

When Cape Town is approaching the "Zero Day", with the planets second largest population at 1.3 billion (and expecting to be 1.7 billion by 2050), India is also struggling to ensure this basic tenant of our existence is safe and secure for majority of its population (United Nations, 2013). India possesses only 4% of world's freshwater resources to serve 17.74% of world's population. As population grows and resources shrink this contrast becomes prominent. As per the international norms, countries with per-capita water availability less than 1700 m^3 per year is categorized as water stressed. Following the norms, India, with per capita available water of 1545 m^3 is already a water stressed country (India-WRIS wiki, 2015). Furthermore, it is projected that per capita water availability in India may drop down to 1401 m^3 and 1191 m^3 by 2025 and 2050 respectively, which will eventually turn India to a water scarce country (India-WRIS wiki, 2015; Gangwar, 2013). Booming economics, population growth, and rapid urbanization are some of the major contributors to this issue, especially in urban areas. Urban areas which accounts for only 3% of Earth's total landmass is home to 54% of world's population, and by the end of 21st century it is expected to rise up to 66% and India is no exception. Now the big question is India with so many major and minor rivers and water bodies, rich groundwater resources and blessed by monsoon how is becoming a water scarce country?

Water scarcity: physical and economic

The main long term driver of water scarcity is unprecedented urbanization leading to growing demand and subsequent consumption of fresh-water and/or depletion of freshwater resources predominantly due to climate variability and alike phenomena. According to UN-Water "water scarcity is defined as the point at which the aggregate impact of all users impinges on the supply or quality of water under prevailing institutional arrangements to the extent that the

demand by all sectors, including the environment, cannot be satisfied fully." Water scarcity can be a natural as well as an anthropogenic phenomenon. Often multifunctional and heterogeneous nature of water resources causes scarcity. Water security is also a function of access to water resources. Based on the causes, water scarcity can be of two types: physical (absolute) water scarcity and economic water scarcity.

Physical water scarcity occurs when sufficient water is not available to meet the demand of the region. Arid and water stressed regions are most often suffered by physical water scarcity, though recently new trend of artificial physical water scarcity is observed in other climatic areas due to over allocation and over-development of water resources. Environmental degradation and conflicts over water resources triggers physical scarcity of water. On the contrary, Economical Water Scarcity emerges due to poor management of water resources, lack of good governance, non-investment on sustainable water infrastructure or lack of human capacity to meet the water demand even places with abundant resources. In economic scarcity access to water is not limited by its availability, rather influenced by institutional and financial constraints over distribution of water. Natural hazards like floods and droughts also develop economic scarcity through poor access to water. Human interventions such as reservoirs, dams, and irrigation measures though increase water availability for one region but often push the water scarcity problem downstream.

Where do we stand?

Looking at the global water scarcity scenario, it is evident that almost all the states of India are under some form of water scarcity (Fig. 1). Entire north east India, Bihar, UP, Chhattisgarh, parts of MP, Gujarat, Rajasthan, Chandigarh, Punjab, Haryana and Odisha suffer economic water scarcity. This implies that Centuries of mismanagement of abundant water resources, socio-political and institutional incompetence, severe lack of regulation, over privatization, general neglect and government corruption along with steadily increasing population and sudden emergence of new class of population demanding more water and water intensive protein rich diet are driving the country to economic water scarcity.

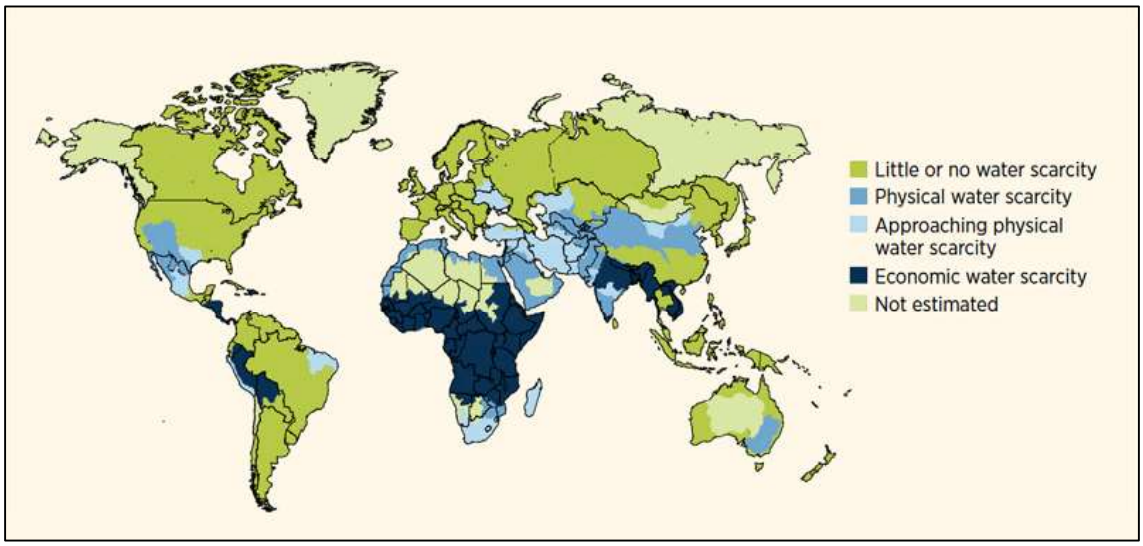

Figure 1 Global physical and economic water scarcity (WWAP, 2012)

The states under the lens are agricultural hot spot in India. Agriculture is a major consumer of both surface and ground water in agri-based countries like India. Indian agriculture accounts for 90% of its water used (Dhawan, 2017). 70% of country's groundwater withdrawn is used for agriculture. Irrigation also has a significant role in boosting Indian agro-production to compensate irregular precipitation and weak monsoon. Thus groundwater resources are over exploited in some states (e.g. in Punjab, Haryana, and Rajasthan) ironically with government interventions in form of subsidies in irrigation, which have developed economic water scarcity in those states.

Table 1: State wise annual groundwater draft and its future availability for irrigation by 2025

State Name	Current groundwater draft for irrigation (bcm)	Available groundwater for irrigation by 2025 (bcm)
Gujarat	10.75	5.87
Haryana	12.35	-3.31
Punjab	34.17	-14.83
Delhi	0.14	0.01
Uttar Pradesh	48.74	19.64
Madhya Pradesh	17.48	13.9
Rajasthan	13.13	0.91
Bihar	10.25	14.1
Chhattisgarh	3.43	7.44
Odisha	3.81	11.64

Source: (Central Ground Water Board, 2014)

Comparative study on the current and projected future (2025) water availability for irrigation in India revealed that all the mentioned states, except Bihar, Odisha, and Chhattisgarh will be highly water deficit with respect to irrigation water demand (Table 1). Though Bihar, Odisha, and Chhattisgarh will have enough storage of groundwater, the apparent economic water scarcity scenario in those state are the result of poor governance. India has a rich cultural heritage of water harvesting and there are ample examples of traditional water management structures such as tanks, wells, and canals across the country but they are either not maintained or poorly maintained. Moreover to meet the quench of ever increasing population number of bore wells/ tube wells has dramatically increased over the years to aggravate the situation (Figure 2). There have also been regular and long term issues of mismanagement in water allocation, e.g. sharing of Cauvery water by Tamil Nadu and Karnataka, which is not because of lack of water but due to reckless overuse. In contrast, China uses a quarter less fresh water than India to support its larger

population. Contamination of fresh water resources due to discharge of untreated wastes from domestic, agriculture as well as industrial sources has sullied the water of major rivers in India. Limited or no initiatives and infrastructure development observed in water recycling, especially in industries and energy sectors.

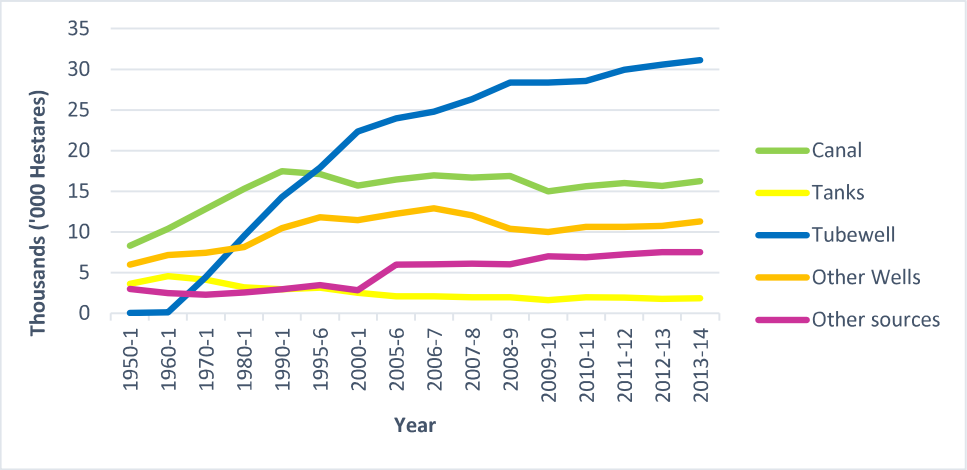

Figure 2 Modes of irrigation in India
(Ministry of Statistics and Programme Implementation, 2017)

Economic implications

Water is used very inefficiently in industry, agriculture and domestic sectors in India and much of it is wasted without properly valuing it and without analysing the economic benefits. Unlike other commodities, scarcity of water cannot be overcome by replenishing it from the water abundant area, because transporting water is expensive both economically and ecologically. Water scarcity has a deep impact on all the economic activities such as food and energy production, manufacturing and infrastructure development. Poor allocation and wasteful use of water impede GDP growth and affect trade balance and industry structure. Computable General Equilibrium Model based on different probable scenario shows that water deficit has pounding impact on different variables of economy i.e. production, consumption, investments, trade flows etc. As different economic sectors are inter-related, negative impact in one sectors can reverberate through the national economy. Water scarcity also gives rise to conflicts over water allocation. A global study by World Bank based on the impact of water scarcity on GDP of countries shows that water scarcity can cost up to 6% of GDP by 2050 if water smart policies are not undertaken (World Bank, 2016). The study also reveals that in business as-usual scenario India can lose 6% of its GDP by 2050 due to water scarcity, but with efficient water, policies can make a gain up to 2% (Fig 3). Both agriculture and industries are water intensive and to some extent interlinked, hence water scarcity in any form will be an obstacle to the growth and development of these sectors, affect livelihood of millions of people and stagnant the millennium Development Goal (MGD 1) of poverty alleviation. It is a matter of concern for India as both of these sectors are significant contributors to the national GDP (17.35% by Agriculture and 28.84% by industry) (World Bank, 2018; Department of Agriculture, Cooperation & Farmers

Welfare, 2015). Around 70% of rural households and 54.6% of total population of India depends on agriculture as their primary mode of livelihood (FAO, 2017). Water scarcity in form of drought is a major factor in deciding the fate of these population since monsoon precipitation has become unpredictable due to climate change. A study by associated Chambers of Commerce and Industry of India found that US$ 100 billion was the cost of drought in Indian economy in 2016 (Govind Katalakute, 2016). Drought itself damage quality and quantity of agri-produces which impacts the economy of agriculture and allied sector. Moreover, a common practice in Indian states is to claim additional economic benefit/ one time grants from the central government during drought events rather than improve water management practices, which pose economic burden to the government.

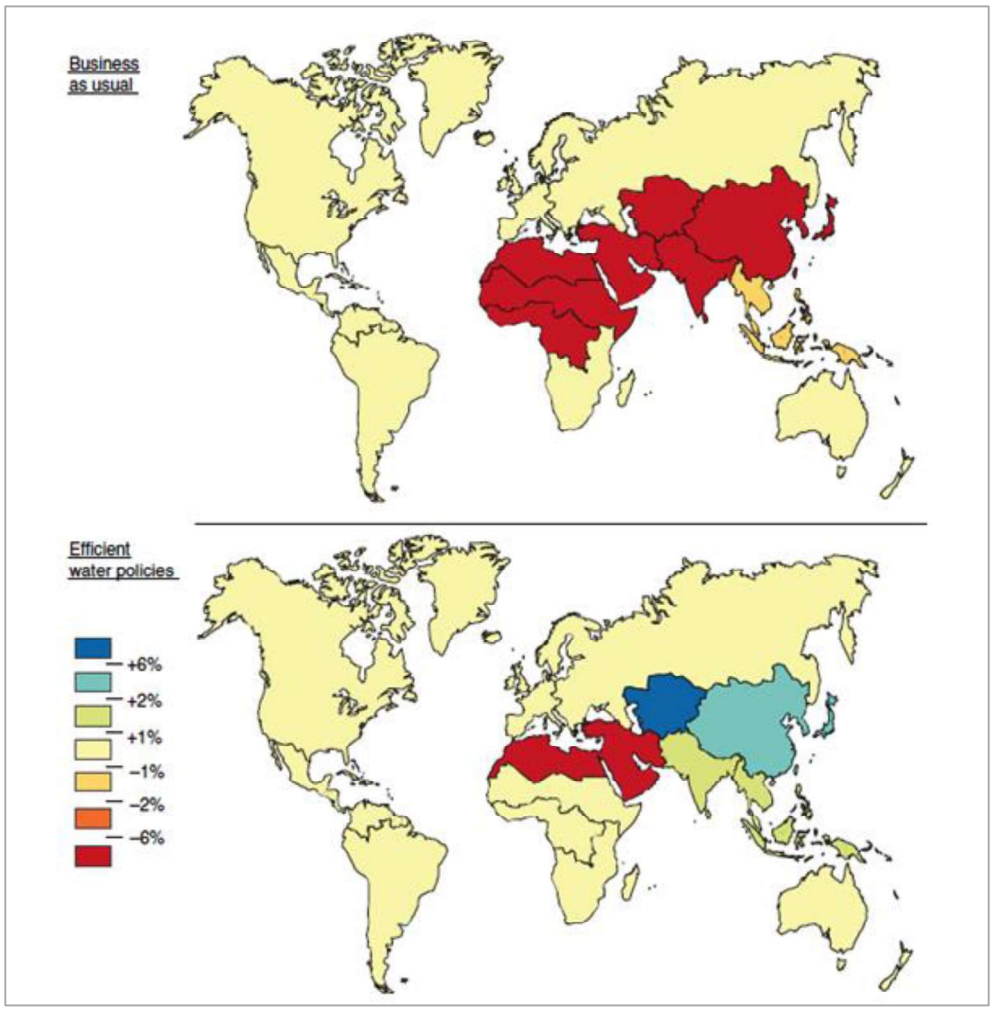

Figure 3 Estimated impact of water scarcity on GDP in 2050 under two policy regime (Source: World Bank, 2016)

Water scarcity affects the access to safe drinking water and sanitation, especially due to water pollution and post-disaster (e.g. flood) infrastructure damage. This has considerable impact on the economy. It has been reported that some developing countries in Africa and Latin America could gain approximately 5% more over their GDP after achieving the Millennium Development Goal (7) to half the

proportion of people without sustainable drinking water and sanitation and universal access could make gain of up to 15% of GDP (HSBC, 2012). In India, the potential gain can be up to 5.2% in terms of GDP if universal access to drinking water and sanitation is provided if India could achieve MGD 7. However, in rural India alone 63.4 million people are still living without access to clean water (WaterAid, 2017). Water pollution also creates economic water scarcity and has high socio-economic cost and subsequent impact on GDP. India lost Rs. 366 billion due to water pollution and poor sanitation through outbreak of water borne diseases in 1995, which is equivalent to 3.95% of GDP (Murty& Kumar, 2011). Investment required to this abates water pollution through formulation of rules and policies and provide better sanitation facility to the population additionally cost 1.7 – 2.2% of GDP. A relatively recent report from World Bank estimated that annual cost of poor water supply and sanitation can cost India as high as Rs. 610 billion per year (World Bank, 2013).

Way forward

A crisis of this magnitude cannot be solved with lip service and short sighted solutions. India needs to be water-smart. The incidence of severe drought in Latur in 2016, when trains carried millions of litres of water there, wasting of thousands of litres of water scrubbing a helipad or watering a cricket ground at the same time are the height of mismanagement of water in India. To avoid economic water scarcity either the supply of water should be increased, or the productivity of water use should be increased or the demand of water should be decreased through changes in water using activities. As there is limited scope of increasing water availability in India, Government should focus on judicious use of water and increase water use efficiency across all sectors. Water conservation needs to be promoted and mandated in daily life. Irrigation water management and adaptation of water smart technology needs to be given priority. Massive investments in alternative energy should also be vigorously pursued. Wastewater treatment needs serious attention. Nonetheless, economic water scarcity can be addressed quickly and efficiently with good governance and effective policy interventions.

References:

1. Central Ground Water Board. (2014). Dynamic Ground Water Resources of India. Faridabad: Government of India.
2. Department of Agriculture, Cooperation & Farmers Welfare. (2015). All India Report on Agriculture Census 2010-11. New Delhi: Ministry of Agriculture & Farmers Welfare, GoI.
3. Dhawan, V. (2017). Water and agriculture in India.
4. FAO. (2017). India at A Glance. Retrieved 01 05, 2018, from http://www.fao.org/india/fao-in-india/india-at-a-glance/en/
5. Gangwar, S. (2013). Water Resource of India: From Distribution to Management. International Journal of Information and Computation Technology, 3(8), 845-850.
6. Govind Katalakute, V. W. (2016). Impact of Drought on Environmental, Agricultural and socio-economic Status in Maharashtra State, India. Natural Resources and Conservation, 3(4), 35-41.
7. HSBC. (2012). Exploring the links between water and economic growth: A report prepared for HSBC by Frontier Economics: Executive Summary. Retrieved 04 18, 2018, from www.hsbc.com/-/media/hsbc-com/citizenship/.../120723-hsbc-executive-summary.pdf

8. India-WRIS wiki. (2015). Water Resources Information System for India. Retrieved 12 5, 2017, from http://www.india-wris.nrsc.gov.in/wrpinfo/index.php?title=India%27s_Water_Wealth
9. Ministry of Statistics and Programme Implementation. (2017). Statistical Year Book India. New Delhi: Government of India.
10. Murty, M., & Kumar, S. (2011). Water Pollution in India: An Economic Appraisal. In I. D. Company, India Infrastructure Report 2011, Water: Policy and Performance for Sustainable Development (pp. 285-298). New Delhi: Oxford University Press.
11. United Nations. (2013, June 7). World Population Prospects, the 2012 Revision. Retrieved April 14, 2018, from http://www.un.org/en/development/desa/publications/world-population-prospects-the-2012-revision.html
12. Vervoort, C. J. (2015). Rainwater Harvesting—A Supply-Side Management Tool for Sustaining Groundwater in India. In V. S. Walter Leal Filho, Sustainable Water Use and Management: Examples of New Approaches and Perspectives (pp. 313 - 338). Switzerland: Springer International Publishing.
13. Water Aid (2017). Wild Water, The State of the World's Water 2017. Water Aid.
14. World Bank. (2013). Diagnostic Assessment of Select Environmental Challenges, an Analysis of Physical and Monetary Losses of Environmental Health and Natural Resources. World Bank. Retrieved 04 30, 2018, from http://documents.worldbank.org/curated/en/220721468268504319/An-analysis-of-physical-and-monetary-losses-of-environmental-health-and-natural-resources
15. World Bank. (2016). High and Dry: Climate Change, Water and the Economy. Washington D.C.: World Bank.
16. World Bank. (2018).The World Bank Data: India. Retrieved 04 27, 2018, from https://data.worldbank.org/country/india
17. WWAP (2012). The United Nations World Water Development Report 4: Managing Water under Uncertainty and Risk. Paris: UNESCO.

Prangya Paramita Gupta is an Environmental Specialist with expertise in Natural Resources Management using Earth Observation and Geo-informatics tool. She is presently working as an ENVIS resource partner Information Officer at Centre for Environment, Energy and Climate Change, ADRI.