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A Review of India's Water Resources Utilisation, Pollution and Conservation

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Abstract: *Water is one of the vital natural resource for the existence of life. It makes up to 60-95% of the total weight of any functioning living cell. Only 2.5% of water on the Earth is fresh water, and over two thirds of this is frozen in glaciers and polar ice caps. It is estimated that 70% of world-wide water use is for irrigation in agriculture. Almost 69 percent of freshwater resources are tied up in glaciers and ice caps; about 30 percent is groundwater, and a mere 0.27 percent is surface water. India is a country of vast biological, geographic, and climatic diversity. It has total geographic area of 329 Mha, excluding bodies of water. India's total land area is estimated at 297 Mha. India receives average annual precipitation of 4000 km^3, out of which 700 km^3 is immediately lost of the atmosphere, 2150 km soaks into the ground, and 1150 km^3 flows as surface run-off. Average annual water resources in various river basins are estimated to be 1869 BCM, of which the utilisable volume of water has been estimated to be 1086 BCM including 690 BCM of surface water and 396 BCM of ground water. Rainfall is the only sources for water, which is available mainly during the monsoon season lasting for less than 3 months. About one- third of the country's area is drought prone. India receives about 3 trillion M^3 of water from rainfall. This is a huge resource and largest in the world.*
Key words: *Water pollution, infiltration, aquifers, surface runoff. Recharge pits*

I. Introduction

India is one of the fastest developing countries . The geographical area of India covers 3,287,590 sq.km. with the coastline length of 7,500 km. India's human population of 1.3billion covered about 17% of the earth's total population. India has the largest rural drinking water supply program in the world serving almost more than 740 million people..Every year over 38 million Indians are infect with waterborne diseases. India is located in southern Asia and has a total area of almost 3.3 million km^2 making it the largest peninsula in the world and the seventh largest country. It is bordered in the northwest by Pakistan, in the north by China, Nepal and Bhutan, and in the northeast by Myanmar and Bangladesh. In the south, some 7 600 km of coastline is on the Arabian Sea, Indian Ocean and Bay of Bengal. The peninsula can be divided into three main regions. In addition the Lakshadweep Islands in the Arabian Sea and the Andaman Islands and Nicobar Islands in the Bay of Bengal are part of the territory of India. The total cultivable area is approximately 183 million ha, or over 55 percent of the total area of the country. Between the early 1960s and the late 1980s the cultivated area increased by 5 percent. For most parts of India the rainfall occurs under the influence of the southwest monsoon between June and September. In the southern coastal areas near the east coast much of the rainfall is influenced by the northeast monsoon during October and November. Human use of natural waters, particularly of freshwater resources, has increased steadily over the centuries. It is unlikely that this trend will change given the continued growth of population and the ever-widening utilization of water for agricultural, industrial, and recreational purposes. This situation has given rise to growing concern over the availability of adequate water supplies to accommodate the future needs of society. Surface-water resources are already being used to their maximum capacity in various regions of the world.

Water Resources and utilisation

India has an annual average precipitation of 1 170 mm and about 80 percent of the total area of the country experiences annual rainfall of 750 mm or more. 80 percent of the river flow occurs during the four to five months of the southwest monsoon season. Several important river systems originate in upstream countries and then flow to other countries: the Indus river originates in China and flows to Pakistan; the Ganges-Brahmaputra river system originates partly in China, Nepal and Bhutan, and flows to Bangladesh; some minor rivers drain into Myanmar and Bangladesh. However, no official records are available regarding the annual flows into or our of the country. The rivers of India can be classified as 1. The Himalayan rivers like Ganges, Brahmaputra, Indus. They are formed by melting snow and glaciers as well as rainfall have a continuous flow throughout the year. 2 The rivers of the Deccan plateau such as Mahanadi, Godavari, Krishna, Pennar and

Cauvery draining into the bay of Bengal in the east, where as Narmada and Tapti draining into the Arabian sea in the west. The Ganges-Brahmaputra and the Indus systems are the largest as they drain almost half of the country carrying more than 40% of the utilizable surface water from the Himalayan watershed to the ocean. Over 70% of India's rivers drain into the Bay of Bengal, mostly as part of the Ganges-Brahmaputra system. The Arabian Sea receives 20% of the total drainage from the Indus and other rivers. The remaining 10% drains into interior basins and natural lakes. India has about 4% of world's freshwater resources ranking it among the top ten water rich countries. Despite this, according to the Working Group II report of the Fourth Assessment of the Intergovernmental Panel on Climate Change, India is designated a 'water stressed region' with current utilizable freshwater standing at 1122 cubic meter (cu m) per year and per capita compared to international limiting standards of 1700 cu m. In future, at the current rate it is expected that India with high demands will be termed a 'water scarce region' as utilizable freshwater falls below the international standard of 1000 cu m per year and per capita. Water demand is on a high due to rapid urbanization and industrialization along with the traditional demand for agriculture. Overall, every year, precipitation in the form of rain and snowfall provide over 4000 cu km of freshwater to India, of which 2047 cu km return to oceans or is precipitated. A small percentage is stored in inland water bodies and groundwater aquifers. Topographic constraints, distribution pattern, technical limitation, and poor management do not allow India to harness its water resources efficiently.

The rapid increase in population, urbanization and industrialization has led to a significant increase in water requirement. In the next decade the demand in water is expected to grow by 20 percent, fueled primarily by the industrial requirements which are projected to double from 23.2 trillion liters at present to 47 trillion liters. Domestic demand is expected to grow by 40 percent from 41 to 55 trillion liters while irrigation will require only 14 percent more ten years hence, 592 trillion liters up from 517 trillion liters currently. The per capita availability of water has significantly come down and is likely to come down further with the growing population and demand. As per the Ministry of Water Resources per capita water availability in 2025 and 2050 is estimated to come down by almost 36 percent and 60 percent respectively of the 2001 levels.

Ground water usage

Groundwater depletion and contamination Irrational use has led to higher groundwater consumption than recharge. Groundwater levels have reduced drastically in the last 60 years. Of all the 5723 blocks assessed across India by the Central Ground Water Authority, 839 have been found to be over-exploited, 226 are classified as critical, while 550 are under the semi critical stage. Thus, around about 29 percent of India's ground water blocks are considered to be in need of very careful usage

Water and agriculture

India has about 140 million ha of cultivable land (BMEL, India country report, 2016). 42% of the country's cultivable land lies in drought-prone areas. Moreover, 54% of India's net sown areas dependent on rain, rain fed agriculture plays an important role in the country's economy. An achievement of food security, at the current nutritional levels, requires an additional 100 million tons (MT) of food grain to be produced or imported by 2020.The total contribution of irrigation agriculture to food grain production from both area expansion and yield improvement would contribute a maximum of 64 MT by 2020. According to estimates, 40% of the additional supply of food grain requirement as to meet the rice demand has to come from these areas. Earlier food shortages were mainly due to the shortage in food grains and not water but, today ground water depletion is serious cause of concern. . As per figures released by the Union Government in 1999, India had an irrigation efficiency of ~36 percent in 1993-1994 and projected that efficiency would have to increase to 60 percent by 2050 to bring a balance in the demand and supply of water. A model of water demand and supply for 118 countries accounting for 93 percent of the world's population developed by the International Water Management Institute (IWMI), shows that a 50 percent increase in demand of water by 2025 can be met by increasing the effectiveness of irrigation.

Drinking water

Nearly 76 million people in India do not have access to safe drinking water, as polluted rivers and poor storage infrastructure over the years has created a water deficit which may become unmanageable in the future. A Water Aid report in 2016 ranked India among the worst countries in the world for the number of people without safe water. By 2050, India's total water demand will increase 32 per cent from now. Industrial and domestic sectors will account for 85 per cent of the additional demand. Over-exploitation of groundwater, failure to recharge aquifers and reduction in catchment capacities due to uncontrolled urbanisation are the causes for the un balanced water table. By 2050 almost 50 per cent of the world's population will be living under extreme water stress. While this may be true if the current usage continues, people should be enriched with technologies so that risks of water stress levels are minimised. Ministry of Drinking Water and Sanitation states that 45,053 villages had access to piped water and hand pumps by the end of 2016-17, accounting for 64.19 per

cent of India. Almost 19,000 villages across the country still do not receive regular water supply. According to the United Nations Water Development Report 2016, one of the most serious problems the humanity is facing today is the scarcity of potable water for drinking and domestic use.

Water pollution

Water pollution can be defined in many ways. Usually, it means one or more substances have built up in water to such an extent that they cause problems for animals or people. Oceans, lakes, rivers, and other inland waters can naturally clean up a certain amount of pollution by dispersing it harmlessly. With billions of people on the planet, disposing of sewage waste is a major problem. According to 2015 and 2016 figures from the World Health Organization 663 million people don't have access to safe drinking water, while 2.4 billion don't have proper sanitation, although there have been great improvements in securing access to clean water, relatively little progress has been made on improving sanitation in the last decade. Sewage disposal affects people's immediate environments and leads to water-related illnesses such as diarrhoea that kills 525,000 children under five each year. The World Health Organization estimates that water-related diseases could kill as many as 135 million people by 2020. India has two principal sources, namely water from rivers and groundwater. However, the rivers are shrinking because of pollution and industrialization, while the population keeps growing, pushing us towards an enormous water deficit.

Polluted groundwater, unfortunately, is very difficult to purify. whenever pollutants enter a groundwater aquifer, the environmental damage can be severe and long lasting, partly because of the very long time needed to flush pollutants out of the aquifer. Groundwater pollution is insidious, in that it takes many years to show up in water withdrawn from wells and boreholes. By that time it may be too late to prevent serious contamination. It is also expensive. One major urban pollutant is sewage, being particularly serious in developing countries with inadequate sanitation systems. Large volumes of solid wastes are produced and disposed of in urban areas, and are potentially serious groundwater pollution sources, particularly where uncontrolled dumps are plentiful, and where industrial hazardous wastes are disposed of at inappropriate sites located on the basis of their proximity to the source of the waste. Chemicals can be picked up from such sources as rainfall seeps through them. Industry produces waste materials that can be released into the ground or into surface water courses. Mining activities can produce pollutants from groundwater that leaches chemicals and related materials.

II. Conclusion

Water resources provide a diversity of services which is vital for human well-being and poverty alleviation. On the other hand, water pollution weakens and deteriorate natural eco-system that supports human health, food production, bio-diversity and industrial growth. To utilise the surface water in the country by creating an ample storage by building new dams. Reservoirs should be constructed in river plains at high topographical altitudes where the untapped potential of the pure, clean water exists. As 90% of the water is used in the agricultural sector, it would be very efficient if higher yielding crop varieties are developed which can make away with less water per unit of food grain produced. . Rainwater harvesting and subsequent recharge of groundwater can help lower the concentration of minerals in aquifers and therefore rain water harvest should be implemented in both central and state governments Use infiltration basins also called recharge pits, which capture rainwater and recharge groundwater supplies in agriculture. Government and local organisations have to emphasise for the recharge of rainwater by constructing recharge pits at the open places including every household.

Common effluent treatment plants and the largest sewage treatment plants needed to construct in big cities and industrial zone along with an activated sludge process where as trickling filters considered for the appropriate plants. As good quality fresh water resources are becoming increasingly scarce, they need to be managed carefully and in an integrated way. Many countries have a history of managing water as a commodity rather than as a resource. Integrated water resource management is necessary to safeguard the sustainable use of water resources.

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