7. Water Management in India:
Emerging issues and challenges

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Abstract:

Water is a foundation of life and livelihoods and is a key to sustainable development. Successful water management will serve as a foundation for the achievement of many of the 17 Sustainable Development Goals (SDGs), as well as for SDG 6—which is to 'ensure availability and sustainable management of water and sanitation for all'. India with 2.4% of the world's total area has 16% of the world's population but has only 4% of the total available fresh water. The total water available from precipitation in the country in a year is about 4,000 cubic km. The availability of surface water and replenishable groundwater is 1,869 cubic km. Out of this only 60 per cent can be put to beneficial uses. Thus, the total utilisable water resource in the country is only 1,122 cubic km. This clearly indicates the need for water resource development, conservation, and optimum use.

While the total water resource availability in the country remains constant, the per capita availability of water has been steadily declining since the year 1951 due to population growth. The twin indicators of water scarcity are per capita availability and storage. A per capita availability of less than 1700 cubic metres (m3) is termed as a water-stressed condition while if per capita availability falls below 1000 m3, it is termed as a water scarcity condition. Safe and clean drinking water is one of the biggest problems in India. There is a shortage of water for agriculture and industrial sectors also. The main issue is how to make better water management in India. Unplanned development and management of water are leading to water scarcity, an economic and environmental strain which may increase manifold in the coming decades. The main issues and challenges for water management in India are (i) Deterioration of Water Quality (ii) Water Conservation (iii) Lack of Safe and clean drinking water (iv) Insufficient water for irrigation.

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The Ministry of Water Resource, River Development & Ganga Rejuvenation has been allocated the subject of regulation and development of inter-State rivers, implementation of awards of Tribunals, water quality assessment, bilateral and external assistance and co-operation programmes in the field of water resources and matters relating to rivers. In the 21st century India, there is a declining availability of fresh water and increasing demand, the need has arisen to conserve and effectively manage this precious life-giving a resource for sustainable development. There is need to take quick steps and make effective policies and laws (no doubt, there is water policy 2002, but that is not dealing effectively with these issues), and adopt effective measures for its conservation. There is a need to encourage watershed development, rainwater harvesting, water recycling and reuse, and conjunctive use of water for sustainable water supply in the long run.

Keywords:

Water, Water Management, India, Ministry of Water Resources, Issues, Challenges

Water Management in India:
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Introduction

Water is a foundation of life and livelihoods and is a key to sustainable development. Successful water management will serve as a foundation for the achievement of many of the 17 Sustainable Development Goals (SDGs), as well as for SDG 6—which is to 'ensure availability and sustainable management of water and sanitation for all'. Despite this, water is becoming a pressing societal and geopolitical issue–in some regions, it is already of critical national concern. 'Business as usual' will mean the world will miss water-related SDGs by a wide margin; up to 40% of the world's population will be living in seriously water-stressed areas by 2035; and the ability of ecosystems to provide fresh water supplies will become increasingly compromised. 60% of fresh water comes from river basins that cross national borders. Trans-boundary water agreements need to be robust enough to deal with increasingly uncertain environmental and climatic conditions, and the social and demographic changes that will raise global population to 9.7 billion by 2050 and double the number of people who live in urban areas (Guppy, L. & Anderson, K., 2017).

The notion that water is plentiful–it covers 70% of the planet–is false, as only 2.5% of all water is freshwater. This limited resource will need to support a projected population of 9.7 billion in 2050 (Guppy, L. & Anderson, K., 2017); and by that date, an estimated 3.9 billion–or over 40% of the world's population - will live in severely water-stressed river basins (OECD, 2012). It is not just population that is pressuring water resources. Excessive use is also evident: the global population tripled in the 20th century, but the use of water increased six-fold (2050 high-level experts forum: expert papers, 2009). Between now and 2050, water demands are expected to increase by 400% from manufacturing, and by 130% from household use (OECD, 2012). Water insecurity can be exacerbated by drought. More people are affected by drought than any other disaster type. In 2016, 411 million people in total were affected by disasters and 94% of those were drought affected (CRED, 2016).

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The Report of Global Water Crisis: The Facts, published by the United Nations University, highlights the following facts for water (Guppy, L. & Anderson, K., 2017):

1. 30% of global water abstraction is lost through leakage
2. 80% or more wastewater returns to the environment without treatment
3. 1.8 billion people now use a source of drinking water contaminated by faeces
4. 112 million people were affected by floods during the years 2005 to 2015
5. There is 40% gap between water demand and water available by 2030
6. Amount of US $114 billion per year or more than 3 times the current level of capital investment is needed to achieve the Sustainable Development Goal 6 targets on water supply, sanitation and hygiene (6.1 and 6.2). The amount of money needed to meet the other targets of the "water goal" is currently unknown.

Status of Water in India

The water resources potential of the country, which occurs as a natural runoff in the rivers is about 1869 Billion Cubic Meters (BCM). It constitutes a little over 4% of the total river flows of the world. However, due to various constraints of topography and uneven distribution over space and time, only about 1123 BCM of the total annual water potential can be put to beneficial use. This can be achieved through 690 BCM of utilizable surface water and 433 BCM through ground water (Government of India, 2012, pp.15)

Irrigation is typically planned in isolation as the sole or standalone means to secure crop production. Use of fresh rainwater or green water thus receives no attention while planning and designing irrigation projects. Though 'full' and widespread irrigation is not possible in rain-fed areas, opportunities do exist for small scale and supplemental irrigation. An alternative formulation is therefore required for the development of rain-fed areas whereby blue water or irrigation is seen in conjunction with green water to maximize productivity of all water (GoI, p.8).

Central Water Commission (CWC) of India is directly and indirectly contributing in achieving the objectives of these thrust/priority areas. Our country is endowed with a rich and vast diversity of natural resources, water being the most precious of them. Water security, water management and its development is of immense importance in all walks of human life and also for all living beings. Integrated water management is essential for environmental sustenance, sustainable economic development of the country and for bettering human life through poverty reduction (Government of India, 2012). The Ministry of Water Resources, River Development and Ganga Rejuvenation,

Government of India, is responsible for conservation, management and development of water as a national resource; overall national perspective of water planning and coordination in relation to diverse uses of water; general policy, technical assistance, research and development, training and matters relating to irrigation and multipurpose projects, ground water management; conjunctive use of surface and ground water, the work relating to rejuvenation of river Ganga, command area development, flood management including drainage, flood-proofing, water logging, sea erosion and dam safety (Government of India, 2012, pp.1)

The Ministry of Water Resource has been allocated the subject of regulation and development of inter-State rivers, implementation of awards of Tribunals, water quality assessment, bilateral and external assistance and co-operation programmes in the field of water resources and matters relating to rivers common to India and neighbouring countries. The functions of the Ministry are performed through its two attached offices (Central Water Commission and Central Soil and Materials Research Station), seven sub-ordinate offices (Central Ground Water Board, Central Water and Power Research Station, Ganga Flood Control Commission, Farakka Barrage Project, Sardar Sarovar Construction Advisory Committee, Bansagar Control Board and Upper Yamuna River Board), six statutory bodies (Brahmaputra Board, Narmada Control Authority, Betwa River Board, Tungabhadra Board, Godavari River Management Board and Krishna River Management Board), four autonomous societies/body (National Water Development Agency, National Institute of Hydrology, North-Eastern Regional Institute of Water & Land Management) and National Mission for Clean Ganga (NMCG); and two public sector enterprises (WAPCOS Limited and National Projects Construction Corporation Limited).

Constitutional Provisions for Water in India

Entry 17 under List II of Seventh Schedule provides that "Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of Entry 56 of List I". As such, the Central Government is conferred with powers to regulate and develop inter-State rivers under Entry 56 of List I of Seventh Schedule to the extent declared by the Parliament by law to be expedient in the public interest. It also has the power to make laws for the adjudication of any dispute relating to waters of Inter-State River or river valley under Article 262 of the Constitution.

Entry 56 of List I of Seventh Schedule provides that "Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest".

Article 246, Constitution of India, prescribes that—

- Notwithstanding anything in clauses (2) and (3), Parliament has exclusive power to make laws with respect to any of the matters enumerated in List I in the seventh Schedule (in this Constitution referred to as the "Union List").

- Notwithstanding anything in clause (3), Parliament, and, subject to clause (1), the legislature of any State also, have power to make laws with respect to any of the matters enumerated in List III in the Seventh Schedule (in this Constitution referred to as the "Concurrent List").

- Subject to clauses (1) and (2), the Legislature of any State has exclusive power to make laws for such State or any part thereof with respect to any of the matters enumerated in List II in the Seventh Schedule (in this Constitution referred to as the "State List").

- Parliament has power to make laws with respect to any matter for any part of the territory of India not included in a State notwithstanding that such matter is a matter enumerated in the State List.

Article 262, in case of disputes relating to water provides:

- Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-State river or river valley.

- Notwithstanding anything in this Constitution, Parliament may, by law provide that neither the Supreme Court nor any other court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in Clause (1).

National Water Policy, 2002

The National Water Policy 2002 stipulates water allocation priorities broadly in the following order:

- Drinking water; irrigation, hydro-power, navigation, industrial and other uses. The policy stipulates progressive new approaches to water management. Key features include:
- Irrigation and multi-purpose projects should invariably include drinking water component, wherever there is no alternative source of drinking water.
- Providing drinking water to all human beings and animals should be the first priority.
- Measures should be taken to limit and regulate the exploitation of groundwater.
- Both surface and groundwater should be regularly monitored for quality. A phased programme should be undertaken for improving water quality.
- The efficiency of utilisation in all the diverse uses of water should be improved.
- Awareness of water as a scarce resource should be fostered.
- Conservation consciousness should be promoted through education, regulation, incentives and disincentives.

Water Availability in India

India with 2.4% of the world's total area has 16% of the world's population; but has only 4% of the total available fresh water. This clearly indicates the need for water resource development, conservation, and optimum use. Fortunately, at a macro level India is not short of water. The problems that seem to loom large over the sector are manageable and the challenges facing it are not insurmountable. Within the limitations of physiographic conditions, socio-political environment, legal and constitutional constraints, and the technology available at hand, the utilizable water resources of the country have been assessed at 1123 bcm, of which 690 bcm is from surface water and 433 bcm from groundwater sources . Harnessing of 690 bcm of utilizable surface water is possible only if matching storages are built. Trans-basin transfer of water, if taken up to the full extent as proposed under the National Perspective Plan, would further increase the utilizable quantity by approximately 220 bcm. The irrigation potential of the country has been estimated to be 139.9 MH without inter-basin sharing of water and 175 MH with interbas in sharing.

While the total water resource availability in the country remains constant, the per capita availability of water has been steadily declining since the year 1951 due to population growth. The twin indicators of water scarcity are per capita availability and storage. A per capita availability of less than 1700 cubic metres (m3) is termed as a water-stressed condition while if per capita availability falls below 1000 m3, it is termed as a water scarcity condition. While on an average it may be nearing the water-stressed condition, on an individual river basin-wise situation, nine out of 20 river basins

with 200 million populations are already facing a water-scarcity condition. Even after constructing 4525 large and small dams, the per capita storage in the country is 213 m3 as against 6103 m3 in Russia, 4733 m3 in Australia, 1964 m3 in the United States (US), and 1111 m3 of China. It may touch 400 m3 in India only after the completion of all the ongoing and proposed dams.

The population of the country has increased from 361 million in 1951 to 1130 million in July 2007. Accordingly, the per capita availability of water for the country as a whole has decreased from 5177 m^3/year in 1951 to 1654 m^3/year in the year 2007. Due to spatial variation of rainfall, the per capita water availability also varies from basin to basin[1]. The distribution of water resources potential in the country shows that the average per capita water availability in Brahmaputra & Barak basin was about 14057 m3/year whereas it was 308 m3/year in Sabarmati basin in year 2000.

Table 1: Water Demand in India

Sl. No.	In Year	In billion cubic meter
1	2010	710
2	2025	843
3	2050	1180

Source: National Commission for Integrated Water Resource Development Plan

Water Resources of India

India accounts for about 2.45 per cent of world's surface area, 4 per cent of the world's water resources and about 16 per cent of world's population. The total water available from precipitation in the country in a year is about 4,000 cubic km. The availability from surface water and replenishable groundwater is 1,869 cubic km. Out of this only 60 per cent can be put to beneficial uses. Thus, the total utilisable water resource in the country is only 1,122 cubic km.

Basically, there are three water resources in India:

1. Surface Water Resources
2. Ground Water Resources
3. Lagoons and Backwater

[1] Surface water resources -
Retrieved from: http://india-wris.nrsc.gov.in/wrpinfo/index.php?title=Surface_water_resources

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Surface Water Resources

There are four major sources of surface water. These are rivers, lakes, ponds, canals and tanks. However, rivers comprise the most important source of surface water. India is blessed with a large number of major, medium and small size rivers. In the country, there are about 10,360 rivers and their tributaries longer than 1.6 km each. The mean annual flow in all the river basins in India is estimated to be 1,869 cubic km. However, due to topographical, hydrological and other constraints, only about 690 cubic km (32 per cent) of the available surface water can be utilised. Water flow in a river depends on size of its catchment area or river basin and rainfall within its catchment area. Some of the rivers in the country like the Ganga, the Brahmaputra, and the Indus have huge catchment areas. Given that precipitation is relatively high in the catchment areas of the Ganga, the Brahmaputra and the Barak rivers, these rivers, although account for only about one-third of the total area in the country, have 60 per cent of the total surface water resources. Much of the annual water flow in south Indian rivers like the Godavari, the Krishna, and the Kaveri has been harnessed, but it is yet to be done in the Brahmaputra and the Ganga basins.

Due to various constraints of topography, uneven distribution of resource over space and time, it has been estimated that only about 1123km^3 including 690km^3 from surface water and 433km^3 from groundwater resources can be put to beneficial use.Table-2 shows the water resources of the country at a glance. Many Indian rivers are perennial, though few are seasonal. This is because precipitation over a large part of India is concentrated in the monsoon season during June to September/October. Precipitation varies from 100mm in the western parts of Rajasthan to over 11,000mm at Cherrapunji in Meghalaya. Rivers do not, however, remain at a high stage throughout the monsoon season. It is only a spell of heavy rains, which may last for a period of several hours to few days that generates large run-off in the catchments[2].

Table 2: Water Resources of India

S.No.	Water source	Area (in Km^3)
1	Estimated annual precipitation (including snowfall)	4000
2	Average annual potential in rivers	1869
3	Estimated utilisable water	1123
4	Water demand utilization (for year 2000)	634

Source: Ministry of Water Resources

[2] Ibid

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As many as 13 are classified as major rivers whose total catchment area is 252.8 million hectares (m. ha). This is about 83 per cent of the total area of all drainage basins. Of the major rivers, the Ganga-Brahmaputra-Meghna system is the biggest with catchment area of about 110 million hectares (m. ha) which is more than 43 per cent of the catchment area of all major rivers in the country. The other major rivers with catchment area more than 10 m. ha are those of the Indus (32.1 m. ha), Godavari (31.3 m. ha), Krishna (25.9 m. ha), and Mahanadi (14.2 m. ha).

While water for drinking purpose has been accorded top most priority in water use, irrigation is the major consumer of water. Ultimate Irrigation Potential which can be created through major and medium irrigation projects is assessed as 58.47 Mha. Irrigation potential created in the country from major and medium irrigation projects, which stood at 9.7 Mha. in 1951, has risen to 47.97 Mha by the end of XI Plan. Besides this, an additional irrigation potential of about 35 Mha can be created by taking up long distance inter basin transfer of water from surplus to deficit basins (Government of India, 2012, pp. 16)

As per latest information furnished by the State Governments, total storage capacity of 218.90km^3 has been created in India by the Projects having a live storage capacity of 10 hm^3 and more. The projects under construction will add up another 63.90 km^3 as given in the Table-3. An additional live storage capacity of 6.24 km3 is estimated to be created through medium projects each having a capacity of less than 10 hm^3 thus making a total live storage capacity of 225.14 km3 in completed Projects. Therefore expected storage capacity through completed, on-going and contemplated Projects would be 390.34 km^3 against total utilisable surface water resources availability of 690.31 km^3 in the river basins of the country. The Krishna basin leads in term of storage capacity (41.80 km^3) followed by Godavari basin (25.12 km^3) and Narmada basin (16.98 km^3). Pennar basin leads (76.32%) in terms of storage capacity created, under construction and under consideration as percentage of average annual flow followed by Tapi basin (70.86%) which even otherwise has requirement for higher storage capacity as it covers the semi desert areas of Madhya Pradesh, Maharashtra and Gujarat.

The West Flowing Rivers of Kutch, Shaurashtra including Luni, Krishna, Narmada and Brahmani and Baitarni basins exceed 50% capacity of their respective average annual potential[3]. The storage percentage is, however, less than 25% in few basins and in some big basins like Brahmaputra, Barak and others the percentage is as low as 9.04%.
It may be seen from above figures that there is rapid development planned in the Brahmaputra,

[3] Ibid

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Barak and others basin followed by Brahmani and Baitarni and West flowing rivers of Kutch and Saurashtra including Luni basins. The storage development envisaged in the Brahmaputra, Barak and others and West flowing rivers from Tapi to Tadri basins is more than the assessed utilisable surface water resources in those basins whereas in Mahi basin the created storage is already more than the assessed utilizable surface water resources[4].

Groundwater Resources

The total replenishable groundwater resources in the country are about 432 cubic km. The Ganga and the Brahamaputra basins, have about 46 per cent of the total replenishable groundwater resources. The level of groundwater utilisation is relatively high in the river basins lying in north-western region and parts of south India. The groundwater utilisation is very high in the states of Punjab, Haryana, Rajasthan, and Tamil Nadu. However, there are States like Chhattisgarh, Odisha, Kerala, etc., which utilise only a small proportion of their groundwater potentials. States like Gujarat, Uttar Pradesh, Bihar, Tripura and Maharashtra are utilising their ground water resources at a moderate rate. If the present trend continues, the demands for water would need the supplies. And such situation, will be detrimental to development, and can cause social upheaval and disruptions.

Lagoons and Backwaters

India has a vast coastline and the coast is very indented in some states. Due to this, a number of lagoons and lakes have formed. The States like Kerala, Odisha and West Bengal have vast surface water resources in these lagoons and lakes. Although, water is generally brackish in these water-bodies, it is used for fishing and irrigating certain varieties of paddy crops, coconut, etc.

Government Initiatives for Water Management

Since independence, the Government of India has initiated a number of acts, polices, plans, programmes and projects for water management in India. The main government agency for water management in India is: Ministry of Water Resources, River Development & Ganga Rejuvenation.

On 31.7.2014, the Ministry of Water Resources has been renamed as "Ministry of Water Resources, River Development & Ganga Rejuvenation". The Ministry has two attached offices: (i). Central Water Commission; (ii). Central Soil and Materials Research Station, seven Subordinate Offices: (i). Central

[4] Ibid

Ground Water Board (ii). Central Power & Research Stations (iii). Bansagar Control Board (iv). Sardar Sarovar Construction Advisory Committee (v). Ganga Flood Control Commission (vi). Farakka Barrage Project (vii). Upper River Yamuna Board, six Statutory Bodies: (i) Narmada Control Authority (ii) Tungabhadra Board (iii) Betwa River Board (iv) Brahmaputra River Board (v) Godavari River Management Board (vi) Krishna River Management Board, four Autonomous Bodies: (i) National Mission for Clean Ganga (ii) National Water Development Agency (NWDA) (iii) National Institute of Hydrology (iv) North-Easter Regional Institute of Water and Land Management (NERIWALM) and two public sector enterprises: (i) WAPCOS Limited (ii) National Projects Construction Corporation Limited. These all agencies/bodies/organizations are working for water management in India.

Few important efforts for water management which have been launched recently are:

1. National Water Policy Revamped: National Water Policy was revamped in the year 2002. Earlier, there was Water Policy framed in the year 1987. This new Policy focus shift to treating water as an economic good for efficient use.
2. Right to Water recognized: Supreme Court recognizes '*Right to Water*' as a part of right to life.
3. National Water Mission (NWM): The National Water Mission under the National Action Plan for Climate Change (NAPCC), launched on 30th June, 2008, envisages the following five goals: Goal 1: Comprehensive water data base in public domain and assessment of the impact of climate change on water resource; Goal 2: Promotion of citizen and state actions for water conservation, augmentation and preservation; Goal 3: Focused attention to vulnerable areas including over-exploited areas; Goal 4: Increasing water use efficiency by 20%; Goal 5: Promotion of basin level integrated water resources management.
4. PMKSY: Government expands efforts to make irrigation more efficient, with a focus on micro-irrigation.
5. National River-Linking revitalized: Government allocates funds to prepare detailed project reports on river linking project.
6. Model Groundwater Bill framed: Government publishes initial Bill asserting state control over groundwater extraction.
7. India-Israel Water Partnership: Government signs MoU to leverage Israel's expertise for a National campaign for Water Conservation in India
8. Basin Level Governance: The consolidation of several river authorities into the central Ministry of Water Resources, to enable better decision-making for surface water projects and allocation.

Emerging Issues and Challenges

Safe and clean drinking water is one of the biggest problems in India. There is shortage of water for agriculture and industrial sectors also. The main issue is how to make better water management in India. Unplanned development and management of water is leading to water scarcity, economic and environmental strain which may increase manifold in the coming decades. Studies indicate that integrated management of all water resources can avert the impending water crisis. The main issues and challenges for water management in India are: (i) Deterioration of Water Quality (ii) Water Conservation (iii) Lack of Safe and clean drinking water (iv) Insufficient water for irrigation.

India is one of the world's largest groundwater, accounting for more than a quarter of the global total. According to India's Central Ground Water Board (CGWB), Groundwater accounts for over 60% of the total area irrigated in the country. About 85% of the rural drinking water supply is also met from groundwater resources. The Board states that the most significant change is that the share of bore well irrigation went up from just 1% (1960-1961) to 60% (2006-2007). There is therefore a major focus on efficient groundwater management and technologies for this.

In India, the emerging trends of population growth, increasing urbanization, expanding industrialization and climate variability—often combined with pollution—severely affect water availability and lead to chronic water shortages in a growing number of regions, mainly Tamil Nadu, Rajasthan, etc. Water management in India has scores of challenges like bridging the gap between demand and supply, providing enough water for food production and balancing the uses between competing demands, meeting the growing demands of metros and other big cities, treatment of wastewater, sharing of water with the neighbouring countries and amongst the co-basin states etc.

The draft National Water Policy of the government of India raises the following important points: (i) Growing pollution of water sources, especially through industrial effluents, thereby affecting the availability of safe water besides causing environmental and health hazards; (ii) Large parts of India already becoming water-stressed with a potential of causing societal challenges; (iii) Wide temporal and spatial variation in availability of water, which may increase substantially due to a combination of climate change and incidences like floods, increased erosion and increased frequency of droughts; (iv) Inequitable exploitation of ground water without any consideration to its sustainability; (v) Mismanagement of water resources; (vi) Low consciousness about overall scarcity and economic value of water resulting in its wastage and inefficient use; and (vii) Lack of adequate trained personnel for scientific planning, utilizing modern techniques and analytical capabilities and lack of a holistic and inter-disciplinary approach to water related problems.

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The per capita availability of water is dwindling day by day due to increase in population and industrialization. The available water resources are also getting polluted with industrial, agricultural and domestic effluents, and this, in turn, is further limiting the availability of usable water resources. Water quality refers to purity of water, or water without unwanted foreign substances. Water gets polluted by foreign matters such as microorganisms, chemicals, industrial and other wastes. Such matters deteriorate the quality of water and render it unfit for human use. When toxic substances enter lakes, streams, rivers, ocean and other water bodies, they get dissolved or lie suspended in water. This results in pollution of water whereby quality of water deteriorates affecting aquatic systems. Sometimes, these pollutants also seep down and pollute groundwater. The Ganga and the Yamuna are the two highly polluted rivers in the country.

In order to appropriately address the present and future water demand requirements of the citizens, the following priority areas for water resources related issues are important:

- Revival and restoration of existing water bodies;
- Drinking water supply both in rural and urban areas;
- Focusing on clean and safe drinking water;
- Improving water utilization efficiency;
- Appropriate regulation and management of ground water;
- Ground water recharge;
- Inter-linking of rivers;
- Command area development and participatory irrigation management;
- Flood management and erosion control;
- Protection from coastal erosion;
- Dam safety and rehabilitation

Concluding Remark

Effective water management will mean tackling neglected issues such as water wastage in current systems, which has been estimated to be up to 30%; common institutional dysfunction, unethical practices, poor accountability, and corruption in the water sectors of many countries. The report highlights looming water crises from 6 inter-related contexts: water scarcity and insecurity, water related disasters, water, sanitation and health (WASH) crisis, water infrastructure deterioration and destruction, unsustainable development, and ecosystem degradation (GUPPY, L. & ANDERSON, K.,

2017). Several steps for augmentation, conservation and efficient management of water resources are undertaken by the central and state government(s), whereas the central government provides technical and financial assistance in order to supplement their efforts.

Building on this policy push, NITI Aayog has sought to establish a 'Composite Water Management Index' for the country. This Index is expected to establish a public, national platform providing information on key water indicators across states. This platform will help in monitoring performance, improving transparency, and encouraging competition, thereby boosting the country's water achievements by fostering the spirit of 'competitive and cooperative federalism' among the states. Further, the data can also be used by researchers, entrepreneurs, and policymakers to enable broader ecosystem innovation for water in India.

The average annual water availability for the country has been assessed by the Central Water Commission to be at 1,869-billion cubic metres (BCM), but due to topographical, hydrological and other constraints, the utilisable water has been estimated to be about 1,123 BCM. The National Commission for Integrated Water Resources Development, in a 1999 report, had said that the annual water requirement by 2025 and 2050 will be about 843 BCM and 1,180 BCM, respectively. India's demand for water is expected to exceed all current sources of supply and the country is set to become water scarce by the year 2025.

In 21st century India, there is a declining availability of fresh water and increasing demand, the need has arisen to conserve and effectively manage this precious life giving resource for sustainable development. Given that water availability from sea/ocean, due to high cost of desalinisation, is considered negligible. There is need to take quick steps and make effective policies and laws (no doubt, there is water policy 2002 but that is not dealing effectively with these issues), and adopt effective measures for its conservation. Besides developing water saving technologies and methods, attempts are also to be made to prevent the pollution. There is need to encourage watershed development, rainwater harvesting, water recycling and reuse, and conjunctive use of water for sustaining water supply in long run.

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