

YOJANA SUMMARY

OUR ECOSYSTEM

OCTOBER 2022

ZOOLOGICAL DIVERSITY

India's Bio-diversity

- India is one of the mega-biodiversity countries in the world with unique biogeographical locations, diversified climatic conditions and wide array of ecosystems from deep sea to high mountain ranges at Himalayas.
- According to **world biogeographic classification**, India represents two of the major realms, the Palearctic and Indo-Malayan, and three biomes viz. Tropical Humid Forests, Tropical Dry Deciduous Forests, and Warm Deserts/Semi-Deserts.
- Indian landmass has been classified into 10 Biogeographic Zones and Zoological Survey of India (ZSI) documented the faunal resources in all biogeographic zones.
- **Coastal and Marine Biodiversity**
 - India is endowed with a long coastline of 7516.6 km.
 - The country has the **18th largest Exclusive Economic Zone (EEZ)** with a total area of 2.37 million square kilometres.
 - In the Indian Ocean region, India is one of the highest marine biodiversity countries.
 - Among the Indian fauna, 5,632 species have been included in various categories on IUCN Red List.

Conservation Efforts

- In order to protect biodiversity, 990 Protected Areas sprawling over 5.27% of the country's geographical areas have been designated.
- The ZSI under the Ministry of Environment, Forest and Climate Change (MoEF&CC) was established in 1916 for inventorying the faunal resources of the country.
 - It has contributed to the revision of the Wildlife (Protection) Act, 1972.
- Headquarters in Kolkata, ZSI is studying the Indian fauna of all the States, UTS, and Protected Areas present in different ecosystems.

Works of ZSI

- **State Fauna**
 - ZSI has made notable progress in its mandatory scientific function of faunistic survey/exploration of India towards documenting its faunal wealth.
 - The faunal diversity of 28 States and Union Territories has been published.
- **New Discovery**
 - Scientists of ZSI are describing new species at the rate of 125 to 175 per year. Till December 2021, a total of 5,300 species have been described as new to science.
- **Status Survey**
 - Significant progress made in the monitoring of the status of the endangered rare species of animals was undertaken.
 - Recently, ZSI has taken an initiative of a **massive tagging programme of Olive Ridley Sea turtles** along the Odisha coast and **Leatherback turtles in Great Nicobar Island** for tracking their migration and movement between feeding and breeding areas in the Bay of Bengal and the Indian Ocean.
 - ZSI has also initiated several innovative programmes from the molecular level to the monitoring of fauna. The population genetics of *Arunachal Macaque* and population genetics of *Barking Deer*, as well as *Chinese Pangolin*, have been carried out by scientists of ZSI.

- **Long Term Monitoring of Fauna**
 - **Long Term Ecological Observatories (LTEO)** - Monitoring Arthropods in LTEO sites funded by MoEF&CC, is also being implemented through ZSI.
 - In order to understand the impact of climate change, long-term monitoring plots have been established in Andaman and Nicobar Islands and Lakshadweep.
- **Forensic Study**
 - **ZSI is designated as a Forensic Laboratory** by the Ministry of Home Affairs for solving wildlife case materials and supporting the MoEF&CC.
- **Mapping of Fauna**
 - Mobile Application and Web GIS have been developed in collaboration with National Remote Sensing Centre, ISRO to provide specific information on different animals in Protected Areas.
 - A **geospatial database** has been created for the threatened vertebrates of the Indian Himalayan Region.
 - ZSI is currently working on developing the **geospatial repository of the fauna** of India based on the National Zoological Collections.
- **Reef Restoration**
 - Approximately, 1050 sq metre area of degraded reefs has been restored in collaboration with the Government of Gujarat through World Bank-ICZM.
 - Presently, the translocation of corals in the Gulf of Kutch is being carried out for Indian Oil Corporation.
 - An attempt has also been made to understand the impact of forest fire in Northeast India and also to predict the fire-prone area.

GEOSCIENTIFIC EXPLORATIONS

- The **Geological Survey of India (GSI)** is the premier geoscience organisation involved in mineral exploration in the country since its inception in 1851.
- The baseline geoscience data collected by GSI is the core for generating more mineral exploration work which leads to mineral discoveries.

Works of GSI

- During the inception of GSI, the prime mandate was to carry out:
 - geological survey of the country, and
 - exploration in specific parts of the country with special objectives to locate mineral resources.
- **Recent Thrust Areas**
 - **Mission-I Baseline Geoscience Data Generation:**
 - The National Mineral Exploration Policy (NMEP), 2016, emphasises on the acquisition and dissemination of pre-competitive baseline geoscience data of the highest standards.
 - Probing deep-seated/concealed mineral deposits are primary requisites to promote mineral exploration in the country.
 - Accordingly, GSI has geologically mapped 99.15% of the mappable part of the country.
 - Presently, GSI is carrying out pan-India mapping projects with a primary aim to identify new target areas for prognostication of natural resources, and to address fundamental geological problems as well as geo-societal issues.

- **In the field of Marine Geology**, GSI has been contributing immensely with its state-of-the-art research vessel, R V Samudra Ratnakar and other coastal vessels in **seabed mapping** over an area of 20.5 lakh sq km and reconnaissance of mineral resource estimation.
- **Mission-II Natural Resource Assessment:**
 - GSI is **augmenting natural mineral and coal resources** for enhancing the Mining Sector's contribution in the GDP of India.
 - In this context, thrust has been given on **exploration for strategic and critical minerals** like tungsten, molybdenum, nickel, lithium, cobalt, rock phosphate, potash, etc., and to probe deep-seated and concealed deposits under ***Project "Uncover India"***, in collaboration with Geoscience Australia.
- **Mission-III Geoinformatics**
 - GSI has implemented **Online Core Business Integrated System (OCBIS) portal** to fulfill the responsibility to disseminate multi-thematic geoscientific information freely for the use of all.
 - It does so through **"Bhukosh,"** the flagship Geospatial portal of GSI. This data can be utilised by anyone for mineral prognostication as well as to generate new knowledge through research.
 - GSI is also taking up the lead role in setting up of **National Geoscience Data Repository (NGDR)** for hosting exploration-related geoscientific data collected by all stakeholders.
 - An MoU has been signed between GSI and Bhaskaracharya National Institute for Space Applications and Geo-Informatics (BISAG-N), for the implementation of NGDR.
- **Mission-IV Fundamental & Multidisciplinary Geosciences and Special Studies:**
 - Fundamental geoscience research help comprehend the earth surface processes and GSI is involved in these researches for decades.
 - **GSI is the nodal agency** for landslide hazard studies in the country since 2004.
 - In collaboration with the British Geological Survey (BGS) under **LANDSLIP project**, GSI is engaged in developing an experimental regional **Landslide Early Warning System (LEWS)** based on rainfall thresholds since 2017.
 - Since the 2020 monsoon, GSI has started issuing daily landslide forecast bulletins during monsoon to the district administrations in two pilot areas (Darjeeling district, West Bengal and the Nilgiris district, Tamil Nadu).
 - GSI has also been carrying out several seismic/ earthquake studies, seismic hazard micro-zonation, active fault mapping. and neo-tectonic studies over the years.
 - With an aim to build a **permanent Global Navigation Satellite Systems (GNSS) network** in India which can be used as the Crustal Movement Monitoring Network, GSI has established 35 permanent GNSS stations.
- **Other Activities**
 - Since 1974, GSI has been closely monitoring several glaciers in the Himalayan states of Himachal Pradesh, Uttarakhand, Sikkim and UTs of Jammu & Kashmir and Ladakh.
 - Studies are being conducted regularly in the Himalayan glaciers to decipher the effect of climate change on the cryogenic environment and its impact on the water balance of Himalayan River systems feeding the fertile Indo Gangetic Plain.
 - For a better understanding of the global ecosystem, GSI has also been conducting **studies in the Polar Region of Antarctica and Arctic** to decipher the climate change pattern in the frozen continent and its impact on the global climate.
 - Appraisal of geogenic and anthropogenic contamination of soil and groundwater in several parts of the country, impacts of conspicuous bank erosion and urban flooding, change in coastal land use and

land cover are some of the other vital geo-societal studies which figure prominently in the annual programme of GSI every year.

SAFEGUARDING OCEANS

About two-thirds of our Earth's surface is covered by water, and the oceans hold about 96.5 per cent of the entire Earth's water. Different organisms are found in different ocean depths.

Different Zones In The Ocean

- Sunlight permeates about 200 metres below the sea surface called the **sunlight or Epipelagic Zone**.
- In the zone, from 200 metres to 1000 metres, the faint light of the sun percolates, hence it is called **twilight or midwater zone or Mesopelagic Zone**. Darkness prevails here and to overcome it, the creatures use bioluminescence similar to fireflies found on the land.
- Below the midwater zone comes the bottom depth of the sea, i.e., the depth from 1000 to 4000 metres, it is called the **midnight or Bathypelagic Zone**. The organisms found here are illuminated by bioluminescence. The water pressure in this zone is very high. But surprisingly, despite such adversities, innumerable creatures are found here.
- The **Abysal Zone or ocean womb** is the part of the sea with a depth of 4000 to 6000 metres. Here, it is stark dark and the temperature is very low (almost equal to the freezing point). Only a few creatures are found in this depth, mostly invertebrates like squids.

Organisms In Mariana Trench

- The deepest point in the world is located in the Mariana Trench in Japan, about 11,000 metres deep from sea level. The water temperature here is always above freezing point and the pressure is beyond imagination.
- Even in these harsh and adverse conditions, invertebrates like telescope octopus, snailfish and amphipods inhabit here.

Innovative Scientific Research Initiatives in Ocean

- **RV Sindhu Sadhana: Scientific Research Focused on the Indian Ocean**
 - The National Institute of Oceanography (NIO) headquartered in Goa, is the laboratory of Council of Scientific and Industrial Research (CSIR).
 - It has been conducting research in the field of oceanography since 1966. In 2021, a vital project in this laboratory completed research work in the Indian Ocean named 'R V Sindhu Sadhana'.
 - **Scientific Objectives of RV Sindhu Sadhana Abhiyan** - This sea expedition had two main objectives:

A. Gene Mapping of Marine Microorganisms

- The expedition team conducted **scientific analysis of proteins and genes in marine organisms** to understand the processes occurring at the cellular level of marine microorganisms.
- This study, a branch of biology, is called **proteomics**. In this, all these cellular biochemical changes occurring in the body of organisms and their responses to climate change, increasing pollution and stress of trace metals and nutrients are studied.
- The study made it possible to understand how climate change, pollution and stress from trace metals and nutrients affect ocean organisms, as well as how the cellular biochemistry of organisms responds to these external interferences.
- Scientists also studied if there is any adaptive behaviour in the genes of marine organisms in response to climate change and pollution which would help in the conservation efforts of marine species.

B. Study of Trace Metals

- Trace metals (manganese, cobalt, iron, nickel, copper, zinc) found in the oceans help in the growth of organisms. These trace metals present in small amounts in the tissues of living beings mainly act as catalysts in the enzyme system and energy metabolism.
- **To fully understand the cycling and productivity of nutrients found in the oceans**, it is essential to know the relationship between marine organisms and trace metals.
- The second main objective of the RV Sindhu Sadhana Abhiyan was to unearth new information related to trace metals present in regions of the Indian Ocean.
- **Deep Ocean Mission**
 - About 30 per cent of India's human population inhabits the coastal areas. Hence, the sea is the primary source of livelihood for this population.
 - Keeping in mind the significance of the ocean, the United Nations has declared the decade **2021-2030 as the Decade of Ocean Science for Sustainable Development**.
 - India has a unique maritime position. Its 7517 km long coastline is home to nine coastal states and 1382 islands.
 - Given the Government of India's Vision of **New India by 2030** framework, Blue Economy has been constituted. It is in this context; the Cabinet Committee on Economic Affairs has approved **the 'Deep Ocean Mission' of the Ministry of Earth Sciences**.
 - The Deep Ocean Mission consists of the **following six major components**:
 - Development of Technologies for Deep Sea Mining and Manned Submersible
 - Development of Ocean Climate Change Advisory Services
 - Technological Exploration and Conservation of Deep-Sea Biodiversity
 - Deep Ocean Survey and Exploration
 - Energy and fresh water from the ocean State-of-the-art Marine Centre for Ocean Biology.
- **Samudrayan: India's First Manned Submersible for Deep Ocean Exploration**
 - India has launched an **ocean expedition named Samudrayan** to explore deep sea organisms, minerals and other natural resources.
 - In October, 2021 Samudrayan mission comprises an automatic manned submersible vehicle designed to carry three persons to a depth of 6000 metres under the sea.

Conclusion

- The increasing human population, tourism, release of industrial chemicals and pollution in the coastal areas are primary causes of creating dead zones.
- It is essential to curb these human activities to save the ocean and its ecosystem. We must make every possible effort to conserve the ocean and its ecosystem.

A BIOLOGICAL PARADISE

- The Andaman and Nicobar archipelago consists of 836 islands, islets, and rocky outcrops, extending over 800 km. These Islands were once a part of the Asian landmass but then got disconnected some 100 million years ago during the Upper Mesozoic Period due to geological upheaval.
- The chains of these islands are in fact the camel backs of the submerged mountain ranges projecting above the sea level running north to south between 6° 45' and 13° 30' N latitudes and 90° 20' and 93° 56' E longitudes with an extent of 8,249 km².

- The Andamans and the Nicobars are **separated by the ten-degree channel**. The highest elevation is **Saddle Peak** in North Andaman, **Mount Thullier** in Great Nicobar Island.

Representative Fauna of A&N Island

- **Coconut Crab *Birgus latro***: The coconut crab is the largest terrestrial arthropod in the world which is related to hermit crabs and lobsters.
- **Long-tailed Macaque**: It inhabits Great Nicobar Island, Katchal island and Little Nicobar Island in Nicobar Islands. Their preferred habitats are mangroves and coastal forests. The long-tailed Macaque is an **endangered primate in India** and it has been listed in Schedule-I of the Wildlife (Protection) Act, 1972.
- **Narcondam Hornbill**: There are 9 species of Indian hornbills, of which 4 species are endemic in India, and among them one species is present in Narcondam Island. This species is considered as **endangered**.
- **Nicobar Megapode**: The Nicobar Megapode belongs to the family of megapodes, Megapodiidae. IUCN has categorised these species as **vulnerable**. These species are found only in the Nicobar Islands.

Conservation Efforts

- The Andaman and Nicobar Islands are located in the equatorial belt and have been endowed with an abundance of flora and fauna. In order to conserve the ecosystem, 87% of the areas are declared as protected areas.
 - There are 105 protected areas (nine National Parks and 96 Wildlife Sanctuaries) that have been established.
- Apart from this, the Great Nicobar is declared as Biosphere Reserve to protect the endemic fauna of these islands.

WONDER IN THE WEST

- The region in and around Gujarat is blessed with a plethora of varied ecosystems that accommodate numerous species of wildlife.
- Gujarat State has many biodiversity hotspots like Little Rann of Kutch, Greater Rann of Kutch, Marine National Park, Jamnagar, wetlands and forests of Barda Sanctuary, Porbandar, Grasslands of Velavadar, Thol Lake and Nalsarovar, Northern part of Western Ghat in South Gujarat, etc.
- The **Gir National Forest** supports the **last surviving population of Asiatic lions** in the world.
- Gujarat has four Ramsar sites:
 - The notable Ramsar sites of the State are Nalsarovar and Thol Bird Sanctuaries near Ahmedabad, Khijadia Sanctuary near Jamnagar and Wadhvana wetland near Vadodara.

Gujarat Ecological Education and Research (GEER)

- In 1977, a **Natural History Museum** was established in Gandhinagar. Later, this was subsumed into Gujarat Ecological Education and Research (GEER) Foundation which was founded in June 1982.
- Considering the expertise of GEER Foundation, MoEF&CC has assigned the work of **Long Term Ecological Observatories (LTEO) Project** under Climate Change Action Programme.
- This project of LTEO was launched during 21st Conference of the Parties (COP) of the UNFCCC at Paris in December 2015.
- The main aim of this project is to know the biophysical and anthropogenic drivers of ecosystem in selected biomes as well as their effect on social-ecological responses.
- GEER Foundation is also involved in the creation of "**Cactus Garden**" at "Statue of Unity" in Kevadia.

- It is said to be a "Grand Architectural Greenhouse" consisting of 450 species of cactus and succulents from India and 17 other countries.

GREEN TELECOM

Telecom Service And Contribution To Global Warming

- Telecom services are an integral part of our lives, connecting people and things by the means of calls, messages, and the Internet. The operations of these towers of telecommunication networks require electricity on a continuous basis for interruption-free telecom services.
- The electricity comes mainly from the power grid. However, when there are power cuts, these towers' electronics run on fossil fuels like Diesel Generator sets and battery backup.
- Both the grid energy and DG sets contribute to the emission of Green House Gases, thus increasing the carbon footprints.
- With the advent of 5G technology, it is expected that there will be a significant rise in the towers, small cells, resulting in an acceleration in GHG and carbon emissions, and the resultant contribution to the overall global warming.

Telecom Market in India

- India's telecom market is the second largest in the world in terms of subscriptions. This market is characterised by **one of the lowest broadband rates** in the world.
- As per the latest TRAI report, as on 31 May 2022, **India had 1.15 billion mobile subscriptions** and about 800 million broadband connections, most of which were on mobile devices and connected through telecom towers and small cells.
- Due to the pandemic, there has been a rapid growth in mobile broadband as people are using broadband for connecting through video-conferencing and using payment through applications like Unified Payment Interface (UPI).

Steps Necessary To Control The Emission Of GHG From Telecom Services

To reduce the adverse effect on the overall ecosystem by the telecom sector, steps must be taken now on the two main fronts:

1. Reducing The Energy Consumption:

- **Use of 5G Technology:**
 - In the 5G technology, the energy issues are handled right from the design stage itself. The energy efficiency of future network like 5G is expected to be improved by a factor of twenty as compared to LTE/4G technology. 5G technology.
 - It will help in **power management at the equipment level itself**, thus reducing not only power requirement but also the need for air conditioning.
 - Further, 5G technology will allow flexible use of spectrum which is an essential element for wireless communication, which in turn will have a direct impact on energy consumption.
- **Efficient Use of Network Operations:**
 - Traditional (4G and earlier) mobile networks spend only about 15% to 20% of overall power consumption on actual data transfer. The rest is wasted because of heat loss.
 - New approaches are needed to eliminate the energy wastage or harness that wasted power for other purposes by:
 - **Cell switch-off techniques**, i.e., by turning Radio Frequency (RF) chains off when not in use.
 - **Introducing smart shutdown** techniques using Artificial Intelligence (AI)

- **Use of single Radio Access Network (RAN)** platforms, in which a single base station supports 2G, 3G, 4G, and 5G technologies.
- **Use of Dynamic Spectrum Sharing (DSS)**, which allows new mobile technologies to make use of older networks' spectrum, sharing it on a dynamic basis.

2. Migrate Towards Renewable Sources of Energy

- Telecom towers consume 65-70% of energy from the operations of telecom networks. There is an urgent need to move to renewable sources of energy for telecom towers, i.e., **Green telecom towers** for energy saving.
 - India was ranked fourth in wind power, fifth in solar power, and fourth in renewable power installed capacity, as of 2020.
 - For providing energy to the telecom towers, some of the following renewable sources can be used:
 - **Solar Power:** Generation has increased by more than 18 times from 2.63 GW in March 2014 to 49.3 GW at the end of 2021.
 - Wind Power; Geothermal Power
 - **Fuel cell** - Fuel cells are a promising technology for use as a source of heat and electricity. A fuel cell combines hydrogen and oxygen to produce electricity, heat and water.
 - **Other innovative solutions:** Wave power, tidal power, and ocean currents can also be used to drive turbines to generate electricity.

Barriers to Renewable Energy Implementation

- Many renewable energy technologies remain expensive on account of higher capital costs.
- Implementation of renewable energy technologies needs significant initial investment.
- There is still a lot to be done for consumer awareness.
- Financial, legal, regulatory, and organisational barriers need to be overcome.

Conclusion:

- With the proliferation of broadband and mobile devices, there has been significant growth in the number of telecom towers and associated electronics at the Base-Stations of these towers.
- Hence, it is high time that we adopt the latest technologies to reduce the power requirements and move towards alternate renewable sources.

OUR WATER HEROES

Our ancestors had a rich knowledge of water conservation and management. For example, canal irrigation was not new to India as mentioned by Greek travellers and also mentioned in Arthashastra and not surprisingly, the Ahar-Pyne system of that period is still in use in the South Bihar region.

Jal Satyagrahs

- Many protests were organised to demand the access of water for all sections of the society.
- Unreasonable taxes imposed on the use of water also caused many irritants. Since lands and forests are intrinsically linked to water, many protests were carried out on the theme of Jal-Jungle-Jameen, especially in the tribal areas.
 - The **Koya Revolt** (1862) started against the 'Muttadars' (zamindars).
 - The tribals attacked the authorities under the leadership of **Tammanna Dora** in 1879.
 - In 1922-24, this movement synchronised with the Non-Cooperation and Civil Disobedience Movement under the leadership of **Alluri Sitharama** Raju in West Godavari district.

- **Komaram Bheem** (1901-40), a revolutionary leader in Hyderabad State from the Gond tribes, is credited for coining the slogan **Jal, Jangal, Jameen** which symbolised a sentiment against encroachment and exploitation.

Water Services

- Besides water related protests and building water structures, another category of efforts included activities like exploring virgin areas to identify water sources, carrying out surveys and investigations for planning of water schemes, established institutions, etc.
- Akin to the present-day water-supply missions, various piped-water supply schemes were implemented by *Sood community* during 1860 to 1920 in Muhin, Garli, and Garh villages of Kangra Region and adjoining areas of undivided Punjab.
- **Maharaja Ranjit Singh** was the first ruler in Punjab who thought of large-scale utilisation of canal water for irrigation of crops.
- Both the perennial and inundation canals were excavated and expanded in the early nineteenth century.
- **Nain Singh Rawat** (1830-82) was one of the first 19th century Indian explorers who explored the Himalayan region. His accolades consist of putting **Lhasa on the map and accurately locating the source of the Brahmaputra River.**
- After the catastrophic floods of 1908 from rivers Musi and Esi, Hyderabad's Nizam **Mahboob Ali Khan engaged Sir M Visvesvaraya** to prepare a comprehensive plan for the flood protection of the city.
- **Er Kunwar Sain Gupta**, also known as **father of Indira Gandhi Canal** (IGC), gave a vision to build this canal in 1940.
 - IGC is the longest canal in India and the largest irrigation project in the world.

Water Structures

- Many water harvesting and water conservation structures were built by the Princely States' rulers. Just before freedom, many 'multi-purpose reservoir' projects were conceived.
- **Raniya Kuhl** (1800) irrigation system was re-constructed by Rani of Kangra. In addition to providing irrigation water, Kuhl used to meet all the water needs of the villages they flowed through.
- **Sarkari Bagicha ki Bawdi** Indore was got made by Devi Ahilya Bai Holkar in around 1835 at the time of construction of Baneshwar temple.
- **Seshadri Iyer** was responsible for initiating the **first hydro-electric project in Asia**, at Shivanasamudra in the Mandya district of Karnataka, which began generating power in 1902 for the Kolar gold fields and for Bangalore in 1905.
- **Thol Lake Sanctuary** near Ahmedabad is made up of a reservoir that was created in 1912 as an irrigation tank when the Sayajirao Gaekwad of Baroda Kingdom ruled the region.
- **Rankala lake** in Kolhapur city was constructed by Chhatrapati Shahu Maharaj in 1890s.
- Envisioned by **Jamshedji Tata**, Valvan dam Lonavala, Pune was near constructed in 1916.
- **Nizam Sagar** is the oldest dam in Telangana which was built by 7th Nizam of Hyderabad, Mir Osman Ali Khan and designed by famed engineer Ali Nawaz Jung Bahadur.
 - It was built in 1931 over Manjira River which is the tributary of the Godavari River.
- **Mulshi dam on Mula River** in Pune district was constructed by the Tata Industries in 1927 for hydroelectricity generation.
 - This project was the main subject of the **Mulshi Satyagraha led by Senabati Bapat**, a Gandhian revolutionary.

- *Maharaja Ganga Singh* conceived the idea of bringing area of Bikaner State under irrigation from Satluj Waters.
- *Thippagondanahalli Reservoir* was constructed by King Chamaraja Wodeyar VIII of Mysore, at the confluence of **Arkavathi and Kumudavathi rivers**.
- The **first hydro-electric project in Kerala** was established at Pallivasal during the reign of Maharaja Shri Chithira Thirunal Balarama Varma.
- **Bhakra dam was built on Sutlej River** in Bhakra village near Bilaspur in Himachal Pradesh. Construction of the dam started in 1948 and was completed under the guidance of *Er Kunwar Sain Gupta*.

Conclusion

- This instills a feeling of pride to learn how devoted king and queens, talented engineers, patriotic freedom fighters, and unsung heroes have made enormous contribution in developing and conserving water resources while fighting for the freedom of India.