KURUKSHETRA

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Our Selected Students in IAS 2020

Congratulations to Our Toppers

01 Ranks in Top 10 | **10** Ranks in Top 50 | **26** Ranks in Top 100

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SHRUTI SHARMA

RANK 58
FAIZAN AHMED

RANK 96
MINI SHUKLA

RANK 125
MD. MANZAR HUSSAN ANJUM

RANK 133
KISHLAY KUSHWAHA

RANK 176
SHREYA SINGHAL

RANK 203
MOHAMMAD AAQUIB

RANK 270
HARIS SUMAIR

RANK 283
AHMED HASANUZZAMAN CHAUDARY

RANK 389
MOHIBULLAH ANSARI

RANK 447
FAISAL RAZA

Jal Shakti Abhiyan : Catch the Rain

Why Yuou Should Know?

- Creating water secure communities is at the heart of Government of India's efforts in the water sector.
- We have great challenges; India is home to 18 percent of the world's population but we have just 4 percent of the fresh water resources of the world.
- This availability is also variable and dependant on the rains. Climate change, which is manifesting itself through changes in the water cycle, also threatens our water security.

Jal Shakti Abhiyan 2019

- To address this problem, the Government of India, inspired by the Hon'ble Prime Minister's impetus on water conservation, launched the Jal Shakti Abhiyan (JSA) in 2019.
- This was a time-bound, mission mode water conservation campaign, implemented in the July - November 2019 period in 1,592 blocks of 256 water-stressed districts of the country.
- These blocks fell under the critical or over-exploited groundwater category, where groundwater was being extracted faster than it could be replenished.
- JSA was a collaborative effort of various ministries of the Government of India and state governments, coordinated by the Department of Drinking Water and Sanitation, Ministry of Jal Shakti.
- During the campaign, officers, groundwater experts and scientists from the Government of India worked together with the States and district officials in India's most water-stressed districts for water conservation and water resource management by focusing on accelerated implementation of five targeted interventions.
- The JSA aimed at making water conservation a jan andolan through extensive communication and involvement of communities.
- JSA focused on five aspects: water conservation and rainwater harvesting, renovation of traditional and other water bodies, reuse of water and recharging of structures, watershed development, and intensive afforestation.

- Besides, the special interventions included development of Block and District Water Conservation Plans, Krishi Vigyan Kendra Melas, Urban Waste Water Reuse, Scientists and IITs, and 3D Contour Mapping of all villages.
- The combined efforts of all stakeholders achieved the creation of 2.73 lakh water conservation and rainwater harvesting structures, renovation of 45,000 water bodies/ tanks, creation of 1.43 lakh reuse and recharge structures, 1.59 lakh watershed development related works, 12.36 crore trees planted and preparation of 1372 block water conservation plans.
- Beyond these numbers, the campaign created a strong environment for bringing together all stakeholders working on water recharge and management.
- Many States did more than that was originally planned. Some states extended the campaign to all their districts, going beyond the water-stressed districts that were selected initially.

Jal Shakti Abhiyan: Catch the Rain 2021

- Encouraged by this, the "al Shakti Abhiyan: Catch The Rain" (JSA:CTR) campaign with the theme "Catch the Rain, where it falls, when it falls" was launched by Hon'ble Prime Minister, Shri Narendra Modi on 22 March 2021, World Water Day.
- Jal Shakti Abhiyan : Catch The Rain campaign, taken up in all 734 districts (7213 rural blocks and all urban areas) of the country during the pre monsoon and monsoon period, i.e from March 2021 to 30 November 2021, was to "nudge the states and stakeholders to create and maintain appropriate Rain Water Conservation Structures, suitable to the soil strata and climatic conditions of the area, with people's participation, before the onset of monsoons so that they are ready to catch the rain, where it falls, when it falls".
- This unique campaign – by converging funds for all water conservation related schemes (MGNREGS, AMRUT, CAMPA Funds, etc) of central and state governments, funds mobilised locally and from corporate sectors - aimed to create and maintain RWHS with total participation of people.
- The campaign implemented by National Water Mission (NWM), had the following five focused interventions.

1. Rainwater harvesting and water conservation conservation
2. Enumerating, geo-tagging and making inventory of all water bodies; preparation of scientific plans for water conservation

3. Setting up Jal Shakti Kendras in all districts
4. Intensive afforestation and
5. Awareness generation
    - Water conservation and rainwater harvesting included renovation of traditional and other water bodies/ tanks; recharge using old bore wells; watershed development.
    - Activities taken up under this included roof top RWHS on all buildings with priority for government buildings, water harvesting pits in all compounds, maintenance of old/ building of new check dams/ponds, removal of encroachments of tanks/lakes, de-silting of tanks to increase their storage capacity, removal of obstructions in their channels, repairs to traditional step-wells and other RWHS, use defunct bores/unused wells to recharge aquifers, rejuvenation of small rivers and rivulets, revival of wetlands and protection of flood-banks.
    - These works are taken up in rural areas from funds under MGNREGS or Finance Commission grants or locally mobilised; in urban areas from AMRUT and its own funds and in forest areas with CAMPA funds.
    - Every district was to enumerate all existing water-bodies/Water Harvesting Structures A WHS) based on old revenue records and using Chemote sensing images from National Remote Sensing Agency (NRSA) and GIS mapping technology and using the data to plan scientifically new WHS. NWM had prepared guidelines for preparation of GIS based water conservation plans and inventory of water bodies of districts and forwarded it to all the districts for its implementation.
    - State Governments were to set up Jal Shakti Kendras' (JSKS) in all district HQs.
    - These JSK are to act as resource or 'knowledge centers' for disseminating information related to water, techniques for water conservation and water saving and also provide technical guidance to local people as well as to the district administration.
    - Afforestation drive taken up to plant saplings to increase green cover.
    - Awareness generation to be taken-up to make Jal Andolan a Jan Adolan.

Development of portal

- ♣ National Water Mission, with the help of NIC, developed a portal (http://jsactr.mowr.gov. in/) for monitoring the progress of the campaign.

The portal showcases the campaign's progress in interventions:

i. water conservation and rainwater harvesting;
ii. renovation of traditional and other water bodies/ tanks;
iii. reuse/recharge structures;
iv. watershed development
v. intensive afforestation;
vi. enumeration of water bodies and scientific planning

- ♣ Capacity and Awareness Building: It is a major part the campaign. Nehru Yuva Kendra Sangathan (NYKS) and its youth clubs have engaged over 2.90 crore people in the campaign through their activities like rallies, Jal Choupals, quizzes, debates, slogan writing competitions, wall writings etc.
- ♣ NWM has conducted 150+ webinars on the subject to build awareness and capacities of various stakeholders and NGOs/ INGOs.
- ♣ It has engaged with many universities and premier education institutions like IIM, IITs, etc. to focus on the urban areas, a meeting with all State Principal Secretaries (Urban Development), Mission Directors of Smart City projects and Municipal Commissioners of all cities with 5 lakh+ populations was held.
- ♣ IEC Materials: NWM got information, education and communication (IEC) materials developed in regional languages on water harvesting and conservation by professional agencies and uploaded in the official website of NWM for the use of stakeholders.
- ♣ These included slogans for wall writings, social media posting, e-posters, scripts for Nukkad Nataks, topics for debates and essay writings, quiz questions, etc. The link was also shared in webinars/meetings to maximise its outreach.
- ♣ Collaboration with Nehru Yuva Kendra Sangathan (NYKS): NWM has collaborated with NYKS, Department of Youth Affairs to spread awareness on JSA:CTR campaign. NYKS helped in generating awareness on JSA:CTR campaign in 623 districts of the country.

Major outcomes of JSA:CTR campaign - 2021

- Since the launch on 22 March 2021, till 28 March 2022, both urban and rural areas put together, 46,76,852 water related works are completed/on-going (10,69,649 water conservation and rainwater harvesting structures have been completed while 5,58,028 works are on-going thus totaling to 16,27,677 WHS; 1,79,950 traditional water bodies have been renovated while 1,17,716 works are on-going; 8,32,596 reuse and recharge structures were created/ getting made; 19,18,913 watershed development activities have been undertaken/going-on); in addition to 36,76,60,580 afforestation activities carried out under the campaign.
- The expenditure under MNREGS alone is Rs 65,666 crores. As per information on the portal, 374 Jal Shakti Kendras were set up in various States/UTS.
- As reported by the Ministry of Rural Development, more than 2.03 lakh GPs out of the 2.69 lakh GPs have prepared water conservation plans.
- 15.32 lakh water bodies have been enumerated with its details like its latitude and longitude, ownership, state of health, photos, etc under the campaign.
- Over 16.67 lakh photos on the activities undertaken/works done under the campaign have been uploaded on the portal.
- Reduction in water run-off and rise in water table across the country due to successful implementation of the "Catch the Rain" campaign is acknowledged by those who monitor it for their cause.

Jal Shakti Abhiyan: Catch the Rain 2022

- Building on the success of the Jal Shakti Abhiyans of 2019 and 2021 in generating awareness amongst the citizens of the country, this year Jal Shakti Abhiyan: Catch The Rain-2022" (JSA:CTR-2022) campaign was launched by Hon'ble President of India on 29.03.2022. JSA:CTR-2022 is being taken up in all districts (rural as well as urban areas) of the country with the main theme Catch the Rain, where it falls, when it falls.
- The campaign is being implemented from 29 March 2022 to 30 November, 2022 - the pre-monsoon and monsoon period in the country.
- Under this campaign activities are also undertaken under the following new interventions in the campaign in addition to the activities considered under interventions of JSA: CTR-2021: (a) Spring Shed Development and

Management (b) Wetland Development and Management (c) Catchment area protection and development

Amrit Sarovars

- ♣ India is celebrating the Azadi ka Amrit Mahotsav, marking 75 years of Independence. It has been decided that, in order to commemorate this momentous occasion, 75 water bodies will be created or rejuvenated in every district. These will be called Amrit Sarovars. The creation/rejuvenation of the Amrit Sarovars will be a special effort under JSA-CTR 2022.
- ♣ As a part of this exercise, district authorities have been requested to –

i. Identify possible sites for the creation of new water bodies. This may be done by using contour maps of the District, identifying available lands that are already in the possession of the Government. The exercise may also include afforestation/ tree planting around water bodies and its catchment area.

ii. In case of rejuvenation of existing water bodies, there are detailed guidelines that have been issued by the National Water Mission. Rejuvenation may include cleaning/ de silting, removal of encroachments, ensuring that the channels for water flow are clear and treatment of the catchment area, if required. It may also include actions to improve water quality, if required. This exercise has to be completed within this Financial Year.

- ♣ Resources for this activity will be available both from MGNREGA and PMKSY funding and these resources may be accessed. In addition, the broad guidelines issued under the Jal Shakti Abhiyan will apply.

Visit of Central Team to the Districts

- ♣ This year it is proposed to send a Central Team consisting of one Central Nodal Officer (CNO) and one Technical Officer for one field visit to the districts during the campaign for interaction with district authorities on Jal Shakti Abhiyan.
- ♣ They will observe the progress of ongoing and completed works in the districts on water conservation related structures, spring shed development (wherever applicable), Intensive afforestation, reuse and recharge structures, renovation of traditional bodies, rejuvenation of rivers/ rivulets and wet-land protection (wherever applicable) and other interventions of JSA: CTR 2022. CNOs will monitor the progress on 'Amrit Sarovar' also in the districts assigned to them. Together we can make this a Jan Andolan from Jal Andolan!!

Water Management in Agriculture

Why Yuou Should Know?

- ♣ Water is the most critical input for agricultural productivity having a determining effect on the eventual yield. All other inputs/investments (quality seeds, fertilizers, high-end technologies, etc.) fail to achieve their full potential if crops are not optimally watered.
- ♣ Being a predominantly agricultural country, India needs huge amount of water for farming and allied activities.
- ♣ But, the country has only four percent share of global freshwater resources which is managed to support nearly 18 percent of world population.

- ♣ **Increasing population coupled with food and nutritional security has created additional pressure on water resources.**
- ♣ **Demand of water from various sectors of economy (urban, industry, and agriculture) is rapidly increasing while the supply of freshwater is constant.**
- ♣ **As a regular source of fresh water, India receives nearly 4,000 BCM (Billion Cubic Metre) of precipitation (rainwater, snow, hails etc.) per year, but approximately 80 percent of this is received during monsoon season (June-September) only.**
- ♣ **This results in huge run-off losses during monsoon and calls for irrigation investments for rest of the year.**
- ♣ **Due to limited water harvesting infrastructure, only less than one third of this precipitation can be utilised.**
- ♣ **The per-capita storage capacity is India is low as compared to other countries. Annual utilisable surface and groundwater resources are estimated to be 690 BCM and 431 BCM respectively.**
- ♣ **Average flow of rivers is estimated to be 1869 BCM. Groundwater is a replenishable source which gets nearly 74 percent recharge from rainfall and the rest is contributed by canals, ponds, reservoirs and other water conservation practices.**
- ♣ **Agriculture sector uses 89 percent of the groundwater for irrigation, while 11 percent is consumed in the domestic and industrial uses.**
- ♣ **Overall, the agriculture sector is the largest freshwater user in the country accounting for almost 85 percent of the total water usage.**

- This is mainly due to cultivation of water intensive crops such as rice, wheat, sugarcane and cotton, and very low irrigation efficiency.
- The common pool nature of groundwater and the difficulty of observing it directly make the resource challenging to monitor and regulate.
- Hence, unsustainable extraction levels that exceed natural recharge rates are depleting groundwater resources rapidly. Water table is receding at an alarming rate of 0.3 meter per year.
- The Central Groundwater Board has categorised 16.2 percent of the total assessment units (Blocks, Mandals or Talukos) numbering 6,607 as 'over-exploited'.
- Additional 14 percent units have been categorised at 'critical or 'semi-critical stage.
- However, if rainfall is collected and managed properly with the help of rainwater harvesting and artificial recharge structures for augmentation of ground and surface water, this can reduce dependence on groundwater to the tune of about 500 BCM out of the total annual water requirement of 1200 BCM for all sectors.
- The unsustainable groundwater use necessitates demand management and supply augmentation measures for increased water use efficiency in agriculture sector. In this context, agricultural water management is an imperative in the country.
- Although irrigation is a major component in agricultural water management, it also includes soil, land, and water conservation practices; improving the efficiency of water use in irrigation; and technologies for lifting, storing and conveying water.
- Further, the National Water Policy 2012 recommends conservation of existing water bodies, rivers, river corridors, etc.

Managing Water at Source

- Soon after independence, Government of India pushed 'Creation and Expansion of Irrigation Facilities' into its top agenda to mitigate recurrent famines and hunger.
- During initial years, development of canal irrigation remained a priority area in which Government of India invested profusely through various irrigation projects across the country.

- As a result, the area irrigated by canals increased from 71 lakh hectares during 1950-51 to 144 lakh hectares during 1980 81; and further reached a peak level of 173 lakh hectares by the year 1991-92.
- However, during 1980s groundwater irrigation expanded at a much faster rate than canal irrigation.
- Consequently, area under canal irrigation not only stagnated but declined and hovered around 160 lakh hectares during 2011-12 to 2014-15, which is 10 lakh hectares less than what was achieved 20 years back.
- As a result, the share of canal irrigation in the total irrigated area has declined from 37.5 percent in 1984-85 to 23.43 percent in 2014-15.
- There are some specific reasons for making canal irrigation out of favour : low reliability and reduced flow of water at source; poor maintenance of canal and tributaries; poor utilisation of the irrigation potential created; and an increase in cultivation of water intensive crops; and adoption of water intensive practices.

Cultivation Command Area

- Presently, canals are irrigating those lands, which have large plains, fertile soils and perennial rivers. The plains of north India are mostly canal irrigated.
- Meanwhile, many major (Cultivation Command Area, CCA, more than 10,000 hectare), medium (CCA 2,000 - 10,000 hectare) and minor (CCA less than 2,000 hectare) irrigation schemes were launched to improve status of irrigation in India.
- Water resources development and management are planned, funded, executed and maintained by the State Governments as per their own state-specific priorities and resources, while Government of India supplements /supports the efforts of State Governments by providing financial and technical assistance through various schemes and programmes.
- With collective and concerted efforts at various levels, utilised irrigation potential (surface and groundwater combined) has reached to 87 million hectare, while ultimate irrigation potential touched 140 million hectare.
- As per latest estimates (2018-19), against total agricultural land of 1,80,888 thousand hectares, the cultivated land in the country was 1,53,888 thousand hectares, out of which net 71,554 thousand hectares was irrigated.

- ♣ Rest of the cultivated area, nearly 54 percent, is rainfed; that is, depends on rainfall for irrigation. Even if ultimate irrigation potential is achieved, nearly 31 percent of cultivable area will remain under rainfed condition.
- ♣ There has been substantial disparity in rainfall, it varies from less than 100 mm in western Rajasthan to more than 2500 mm in north-eastern part of the country. Such condition necessitates formulation of different set of strategies to manage irrigation for whole year.
- ♣ It is generally observed and well recognised that Indian farmers use 2 to 4 times more water to produce a unit major food crop than in China or Brazil. Hence, wise and efficient use of water is a must for sustainable development of agriculture sector and national food security.

Direct Seeded Rice

- ♣ In this context, two crops-rice and sugarcane-deserve special attention as only these two crops consume almost 60 percent of the country's irrigation water. Technologies are available which can produce the same output with nearly half the irrigation water in these two crops.
- ♣ For instance, around 3,000 litres of water is used to produce one kilogram of paddy grain under the traditional flood irrigation, Whereas, under drip system of irrigation the requirement can be slashed to just 842 litres.
- ♣ New technologies, such as Direct Seeded Rice (DSR) and System of Rice Intensification (SRI) can also save 25 to 30 percent of water compared to traditional flood irrigation. In sugarcane, trench farming has been found very effective in saving water. About 300 farmers in Uttar Pradesh have been able to reduce water usage using trench farming and they have saved an estimated 60 million litres of water during 2019-2021.
- ♣ State Governments need to motivate farmers for adoption of scientifically designed cropping patterns to ensure optimum utilisation of water. Scheduling of irrigation is another simple and effective methodology to save water and energy.
- ♣ In the process, the correct frequency and duration of watering is determined on the basis of moisture in the soil and stage of the crop growth. About 35-40 percent water can be saved by scheduling of irrigation along with significant reduction in fertilizer use.

- ♣ Moisture sensors and automated irrigation systems which can be controlled by a farmer using smart phone, will help in deciding the time and amount of irrigation to be carried out.
- ♣ The traditional methods of irrigation, mainly flood irrigation, have low irrigation efficiency (38 percent) due to excessive seepage loss and inequitable and untimely supplies.
- ♣ Adoption of water saving technologies such as sprinkler and drip irrigation systems have proven extremely effective in not just water conservation but also lead to higher yields.
- ♣ It has been observed that among various methods of irrigation, drip irrigation has achieved highest application efficiency of 90 percent with over-all efficiency ranging between 80-90 percent.
- ♣ New agronomic practices such as raised bed planting, ridge-furrow method of sowing, sub-surface irrigation and precision farming are also helpful in increasing irrigation efficiency.
- ♣ In this context, Government of India has launched new policies and schemes to increase area under irrigation and enhance water use efficiency.

Pushing Irrigation to New Heights

- ♣ Among various schemes launched by Central Government, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) is the most comprehensive one aiming at protective irrigation for all agricultural farms in the country. Launched in 2015-16, it has the following 4 major components.

1. Accelerated irrigation Berencaiere samme (AIBP).
2. Har Khet Ko Pani (HKKP),
3. Per Drop More Crop (PDMC)
4. Integrated Watershed Management Programme.

- ♣ AIBP covers major to medium irrigation projects that involve an area of more than 2,000 hectare. During 2016-17, 99 on-going major/medium irrigation projects have been prioritised in consultation with States for completion in phases.
- ♣ Out of this, 44 projects have been reported to be completed/almost completed and an additional irrigation potential of 21.45 lakh hectare has been reported to be created by these projects. HKKP-Command Area Development and Water Management (CADWM) programme aims to utilise created irrigation potential as soon as project is completed.

- ♣ Further, its objectives include improving water use efficiency; increasing agricultural productivity and production; and bring sustainability in the irrigated agriculture in a participatory environment.
- ♣ So far, about 14.85 lakh hectare cultural command area has been developed. Under HKKP-Surface Minor Irrigation scheme, the total number of sanctioned projects are 6,213 and 3,098 schemes have been completed upto March, 2020. During 2017-20, Surface Minor Irrigation (SMI) scheme could achieve irrigation potential of 1.20 lakh hectare.
- ♣ HKKP also runs a specific program for repair, renovation and restoration of water bodies. Out of 2,319 water bodies approved, 1,359 have been renovated as of March, 2020 with net irrigation potential of 0.5283 lakh hectare.

'Per Drop More Crop'

- ♣ Watershed Development Programme, running across the country, has successfully and significantly improved the availability of surface and groundwater in project areas.
- ♣ Since 2014-15, 7.09 lakh water harvesting structures have been created/rejuvenated and an additional area of 15.17 lakh hectare was brought under protective irrigation up to third quarter of 2020-21.
- ♣ The programme has also led to increase in productivity, vegetative cover, livelihood opportunities and household incomes causing socio-economic transformation. 'Per Drop More Crop' component of PMKSY focuses on enhancing water use efficiency at farm level through micro irrigation systems (Drip, Sprinkler, Fogger etc.).
- ♣ This component also supports micro level storage or water conservation/management activities to supplement source creation for micro-irrigation. During 2015-16 to March, 2021, micro-irrigation has achieved an impressive coverage of 53.69 lakh hectare on All-India basis.
- ♣ In addition, 4.84 lakh micro level water harvesting/secondary storage structures have been created to supplement the micro-irrigation.
- ♣ To provide impetus to micro-irrigation, Government of India created a special Micro-Irrigation Fund with a corpus of Rs. 5,000 crore during 2018-19 with NABARD as implementing agency.
- ♣ This fund facilitates the States in further mobilising the resources to provide additional incentives to farmers beyond the provisions available under PMKSY-PDMC. This fund is facilitating to bring another 12.83 lakh hectares

area under micro-irrigation in the States of Andhra Pradesh, Gujarat, Tamil Nadu, Haryana, West Bengal, Punjab and Uttarakhand.

- In view of growing interest of many other States in micro irrigation, Government of India, in its budget for 2021-22, has doubled the initial corpus of Rs 5,000 crore by augmenting in by another Rs 5,000 crore.
- In addition to efficient use of water, micro irrigation ensured higher productivity, reduction in labour cost, saving in power consumption, and reduction in fertilizer use.
- Micro-irrigation techniques help farmers to get better returns due to higher productivity, high quality of produce and savings on other inputs. Several State Governments also acted simultaneously and designed their own participatory irrigation management programmes.
- In the State of Bihar, interventions by 'Jal Jeevan Hariyali Abhiyan' have increased the number of water structures (over 2,600 checks dams constructed); developed plantations (over 41,600 plantations); and enhanced the use of micro irrigation significantly.
- In Chattisgarh, construction of small dams, canals and dykes resulted in additional groundwater recharge. The State of Jharkhand launched a special scheme, 'Neelambar Pitambar Jal Samridhi Yojana" in May, 2020 for creation of field bunding, rejuvenation of nalas and construction of soak pits.
- As a result, currently, on an average five schemes of water conservation are running in every village in the Lohardaga district of Jharkhand. "Birsa Munda Krishi Kranti Yojana' in Maharashtra has increased micro-irrigation area and took up construction new wells and ponds along with repair unused wells. Now, irrigation water is availak in water scarce tribal areas.

Conservation is Another key

- Delhi Among various water conservation techniques, mulching is a simple, 'easy-to-do', effective and comparatively low cost means that reduces water loss by checking evaporation from soil surface.
- Mulch is any covering material, either organic or inorganic, applied on soil surface to create a barricade which does not allow escape of soil moisture.
- The moisture is conserved for many days thus reducing the demand of irrigation during the period of crop cultivation. Additionally, mulching improves soil structure, reduces soil salinity and also controls weeds.

- Various types of plastic mulches are available in market, but mulching can also be effectively done by using agri wastes such as wheat straw, gross clippings, leaf debris, etc.
- Plastic film lining has proved to be an effective tool against loss of water through seepage in canals, ponds and reservoirs. By reducing seepage losses up to 100 percent, it improves water availability over a longer period of time for irrigation purposes.
- It also prevents soil erosion and is highly useful in porous soils where water retention in ponds in a challenging issue. Rainwater harvesting and recharging groundwater is one of the most popular strategy by which rainwater is gathered and stored for irrigation during lean periods.
- Rainwater harvesting systems are cost-effective and considerably easy to maintain with additional benefit of recharging local aquifers.
- Rainwater harvesting structures allow collection of large amounts of water that have the potential to mitigate the effects of drought.
- It also reduces soil erosion and flood hazards by collecting rainwater and reducing the flow of storm water to fields and rural habitats.
- Various schemes run by Central and State Governments are promoting/financing construction of new water harvesting structures such as check Dam/Cement Plug/ Nala Bund, Percolation Tank, Dugwell Recharge, Contour Bund, Gully plug etc.; and also helping rejuvenation/repair of old and traditional water harvesting structures.
- Although rainwater harvesting seems to be a modern concept, India has a long tradition of rainwater harvesting methods which are still in use in various regions.
- Baoli, Dighi, Johar, Kund, Tanka, Dang, Kul, Naula and Zing are some of the popular structures seen in rural areas of the country. To further accelerate the pace of rainwater harvesting, Ministry of Jal Shakti launched a special campaign Jal Shakti Abhiyan: Catch the Rain' with the tag lines 'Catch the rain, where it falls, when it falls' during 22 March to 30 November 2021.
- It covered all blocks of all districts across the country including both rural and urban areas.
- Campaign included creation of new and maintenance of old rainwater harvesting structures and revival of traditional rainwater structures; to motivate farmers for growing less water intensive crops; afforestation;

preparation of scientific water conservation plans; and most importantly setting up of Jal Shakti Kendras.

- ♣ In this context, ICAR Krishi Vigyan Kendras organised training and awareness programmes for farmers across the country.
- ♣ Ministry of Jal Shakti, under its National Water Mission, launched a special awareness programme called 'Sahi Fasal' in 2019 to nudge the farmers to grow less water intensive crops in water stressed areas.
- ♣ A series of workshops were organised in desired regions wherein exports recommended cultivation of appropriate crops with micro-irrigation techniques.

Atal Bhujal Yojana

- ♣ "Atal Bhujal Yojana', a centrally sponsored scheme, is dedicatedly pursuing sustainable ground water management in identified water stressed areas through community participation and demand side interventions.
- ♣ Currently, the scheme is being implemented in 8,774 gram panchayats of 81 districts of seven States (Haryana, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh).
- ♣ Central Ground Water Board (CGWB) is working towards aquifer rejuvenation, water conservation and artificial recharge by implementing innovative schemes.
- ♣ It has prepared a 'Master Plan for Artificial Recharge to Groundwater-2020' indicating various structures for different terrain conditions.
- ♣ The master plan envisages construction of about 1.42 crore rainwater harvesting and artificial recharge structures to harness 185 BCM of monsoon rainfall.
- ♣ Further, CGWB is organising Public Interaction Programmes at grassroots level to disseminate nuances of the aquifer management plans for the benefit of stakeholders.
- ♣ So far, over 1,000 such programmes have been conducted in different regions in which over 84,000 people have participated. Over the last eight years, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) has emerged as a driving force in water conservation efforts across rural India.
- ♣ Nearly 75 percent activities (works) permissible under the scheme directly improve the water security and water conservation efforts. The major works

taken up under natural resource management include construction of check dams, ponds, renovation of traditional water bodies, land development, embankment, fields bunds, field channels, plantations, contour trenches, etc.

- ♣ Encouraged by the results, many States are pooling their own resources along with MGNREGS funds to take up water conservation works.
- ♣ A national evaluation has found increase in productivity, ingerie farmers, fodder availability acreage and L ificant rise in water table due to NRM works.

Way Forward

- ♣ Management of water in agriculture is te bote only for increasing productivity of crops but also for sustainable employment and income in agriculture sector.
- ♣ In this context, farmers need to be educated on various aspects of irrigation management to increase water use efficiency and equity.
- ♣ Use of Information Technology, drones and other cutting-edge technologies in management of irrigation systems can play a positive role in sustainable use of water.
- ♣ Participatory Irrigation Management has been conceived as the thrust area as progressive involvement of farmers in water management has yielded desirable results in terms of equity, efficiency and economy.
- ♣ Creating appropriate infrastructures and adopting scientific management practices will help augment water resources and improve the efficiency of the facilities.
- ♣ In nutshell, the future programmes and policies of the Government for irrigation development need to be focused on increasing per capita availability of water; reduction in cost and time of irrigation projects; rationalisation of water rates; better maintenance of works and infrastructures, and sustainable management of all natural resources including water.

AGNIi Mission:

Why Yuou Should Know?

- Clean water is a necessary resource that sustains human life and fuels socio-economic processes. Hence, it is an essential pre-requisite for sustainable development.
- The inclusion of Goal 6 on Clean Water and Sanitation in the Sustainable Development Goals 2030 fortifies the same. Clean water has both intrinsic and instrumental importance.
- Intrinsically, clean water is an end in itself as it is vital for life. Instrumentally, the lack of availability or access to clean water imposes a significant burden on public health with ultimate negative consequences on multidimensional poverty, human development, and economic growth.
- In the Indian context, the clean water problem comprises two parts. First, lack of an improved source of drinking water within household premises and second, lack of adoption of proper drinking water treatment facilities.

National Family Health Survey

- According to the latest National Family Health Survey (NFHS - 5), about 99 percent and 95 percent of urban and rural households respectively have access to an improved source of drinking water, a promising statistic.
- However, the improved source of drinking water is 'piped into dwelling/yard/plot' only for 54 percent of the urban and a meagre 23 percent of rural households.
- Hence, a significant percentage of Indian households both rural and urban, lack an improved source of drinking water within the household premises.
- Further, NFHS-5 data suggests that 58 percent of Indian households do not treat water prior to drinking. With respect to treatment as well rural areas are trailing.
- While 44 percent of urban households do not treat their water, corresponding statistic for rural India stands at 66 percent.
- Additionally, while 44 percent of urban households use an appropriate treatment methods, in rural areas this figure stands at only about 21 percent.

- ♣ Thus, official estimates categorically highlight that availability of and access to clean drinking water, particularly in rural India, is a challenge that poses a significant public health as well as a socio-economic development burden.
- ♣ As per estimates about 21 percent of communicable diseases in India are water related translating into a loss of 73 million days of labour imposing an estimated economic cost of USD 600 million annually.
- ♣ Hence, it becomes imperative for governments and policymakers to pay immediate and adequate attention to the clean drinking water challenge that afflicts a significant percentage of Indian population, primarily in the rural hinterlands.

- ♣ **In this regard, the untiring efforts of the Government of India need to be lauded. In 2019, the Government formed the Ministry of Jal Shakti by merging the earlier two ministries of - Water Resources, Rural Development and Ganga Rejuvenation, and Drinking Water and Sanitation to address India's water problems holistically and comprehensively.**
- ♣ **Additionally, the government has taken proactive cognisance of the clean drinking water issue. An institutional mechanism in the form of the Jal Jeevan Mission (JJM) was created to ensure provisioning of safe and adequate drinking water via providing individual Functional Household Tap Connections by 2024 to all rural Indian households.**
- ♣ **At the launch of the Mission on August 15, 2019, only 17 percent of rural Indian households had a tap water connection.**
- ♣ **However, in just a matter of three years this percentage has significantly increased to 50 percent Additionally, besides development of rural piped water supply infrastructure, undertaking technological interventions to improve water quality is an important component of the JM.**
- ♣ **Adoption of technical solutions and innovations can play a pivotal role in providing rural Indian households with clean drinking water.**
- ♣ **They can help overcome barriers such as inhospitable geographies, groundwater contamination, in situ geogenic contamination.**
- ♣ **Technology and innovation solutions help nations and communities to do more and achieve better outcomes with limited resources.**
- ♣ **Hence, their deployment in the water segment especially in the Indian context becomes crucial as the country houses 18 percent of the world's**

population with just 4 percent of its water resources. Further, climate change is set to exacerbate India's existing water stress.

- **At this juncture it becomes critical to highlight the transformational role that AGNIi Mission (Accelerating Growth of New India's Innovations), a flagship Programme under the Office of the Principal Scientific Adviser (PSA), Government of India is playing in facilitating adoption of technologies and innovations for clean water.**

AGNIi Mission

- AGNli is one of the nine missions under the Prime Minister's Science, Technology, and Innovation Advisory Council, working under the aegis of the Office of the PSA and executed at Invest India, the National Investment Promotion and Facilitation Agency.
- The AGNII Mission focuses on helping to capture the value of Indian technology: assisting Indian innovation, engage key national priorities designated by the Office, in domains ranging from human development through ecological sustainability to public safety. AGNli's approach focuses on the following:
- Bridging the Gap between Innovators and Adopters: AGNli helps resolve the mismatch between innovations and adopter needs.
- AGNIi partners with agencies and organisations - understanding their strategic, policy, and programmatic priorities at leadership tier, and their operations in the field; surfacing and identifying pain-points which, if resolved, would help adopters achieve their own internal priorities.
- Around these pain-points, AGNli formulates operational scenarios that these agencies themselves would recognise: describing 'a day in the life' of enduring that pain-point, both for field officers and leadership.
- To detail these, the AGNli team will run professional mixed-method research initiatives, combining quantitative surveys with ethnographic research techniques.
- This allows AGNli executives to understand, as closely as possible, what the world looks like through their partners' eyes.
- Then, against these operational scenarios, AGNli outlines technology stacks, comprising Indian innovation (e.g., from Indian technology startups) that can resolve these pain-points.

- AGNIi innovation teams reach out across innovator networks to identify these Indian technologies.
- Field technology showcases facilitated by AGNli help innovators understand the needs of the adopter better and also allows the later to experience technology solutions first hand.
- Creating a Scalable Impact: AGNli helps Indian technologists and innovators engage major adopters - and their networks.
- For example, in rural livelihood domains, AGNli will partner with women's Self-Help or Common Service Centre groups - which are part of communities scaled nationwide across rural India.
- This ensures that innovations are presented to a larger network, thus, creating an ecosystem for enabling impact at scale with a built-in feedback mechanism.
- Robust dissemination channels are must for successful innovation diffusion. As a pogramme of the Office of the PSA, AGNI therefore able to translate its role into institutional engagement that maximises the beneficial impact of Indian innovation, Mor Indian citizens.
- AGNli institutional partnerships establish channels that help to better understand community needs, to build relevant technology use cases, and to facilitate end-user adoption.
- Empowering the Bottom of the Pyramid: A primary AGNli aim is to ensure that Government's guiding principle of Antyodaya - that the poor, marginalised, and those left behind-are engaged to the maximum possible extent, with the capacity Indian technology can create.
- AGNli seeks, in its partnerships, to ensure that grassroots and field-level insights are prioritised in AGNli operational scenarios, and technology stack development.
- AGNli's tasking often focuses on ensuring Indian emerging technology and innovation solutions are targeted at grassroots economic and human development outcomes.
- Supporting the Competitiveness and Capturing the value of Indian Technology.
- AGNIi has refined its technological focus. This includes engaging Indian innovation in the domains of artificial intelligence, quantum computing, robotics, cyber-physical, materials, and energy.

- By connecting pain points to, and defining operational scenarios for, Indian innovators: AGNII offers insight into opportunity for Indian innovation to evolve solutions and scale.
- With respect to clean water, AGNli is playing a significant role by way of mapping rural pain points, building India's clean water technology ecosystem, and collaborating with stakeholders to facilitate high technology interventions. The Mission's roles and activities in each are elaborated below.

Mapping Rural Pain Points

- Evidence-based technology intervention forms the core of AGNli's work. Primary surveys, field-visits, focus group discussions (FGDs), and key informant interviews are utilised to gauge rural pain points, technology preferences, and barriers to technology adoption.
- In the context of clean water, AGNli executed a primary survey among 2,142 Village Level Entrepreneurs (VLES)" from Bihar, Chhattisgarh, and Madhya Pradesh to understand water, sanitation, and hygiene (WASH) challenges.
- Additionally, the survey probed on impact of COVID on the existing challenges, and the VLES technology preferences.
- Findings indicate that 93 percent of the surveyed VLEs perceived access to clean drinking water' as an important challenge and 93 percent VLEs also felt that the same has been aggravated by the pandemic.
- On the brighter side, 95 percent of the surveyed VLEs opined that technology that 'improves water quality can be an effective technology solution for resolving WASH challenges. Further, 96 percent VLEs stated that for them the priority features of technology solutions would be 'low maintenance cost', 'simple and easy to use', and 'environment friendly.
- Moreover, FGD conducted with a sub-sample of surveyed respondents highlighted access and availability challenges pertaining to clean potable water and the health repercussions of the same.

Building India's Clean Water Technology Ecosystem

- AGNli extensively interacts and collaborates with innovators and technology providers to address India's pressing clean water challenges.
- The clean water management ecosystem in India is at a growth stage wherein increasing resources are being infused to develop sustainable, low-cost, and cutting-edge technologies.

- These clean water specific technologies and innovations developed by both startups and public R&D labs, many of which are also a part of AGNli's portfolio, are targeted towards improving availability as well as quality of water to ease challenges faced by Indian citizens.

Improving Water Availability

- Innovative technology solutions like Atmospheric Water Generators (AWGs) are alternatives that can help make affordable clean water available to Indian citizens.
- AWGs essentially extract water from humid ambient air and convert the same into potable water.
- These are decentralised, economical and environment friendly systems that generate clean water through a multi-stage filtration process and then mineralise the same before dispensing.
- Such Systems developed by indigenous startups are available in various sizes and have capacity to process 30 to 2,000 litres of water/day.
- Recently such solutions have gained traction and have been installed in public spaces such as the Secunderabad railway station in Telangana' by the Indian Railways and schools in Uttarakhand to ensure availability of improved quality water.
- Additionally, as noted above a major clean water availability challenge in India is lack of clean drinking water within the household premises.
- In this context, there are indigenous solutions available that enable doorstep delivery of safe drinking water through remote supervision and control through GPRS connectivity in real time. Such solutions have been deployed across locations in Gujarat, Maharashtra, Uttar Pradesh, and Delhi.
- Last but not the least, leveraging technology and innovations for restoration of water bodies is another sustainable method for improving water availability.
- Water bodies become the first victim of water pollution. Rapid urbanisation and industrialisation are the major causes of depletion of water bodies as they become dumping ground for industrial effluent, garbage, and silt.
- Technological solutions can help restore these water bodies and reverse the effects of pollution.
- Such innovations utilise artificial intelligence based electromagnetic mapping technology that enables them to predict presence of perennial water

sources with high accuracy (90 percent and above) and develop the source within 100-120 days.

Improving Water Quality

- ♣ Availability of water is half the battle won. The other half is to ensure that the available water is free of contaminants and fit for human consumption as otherwise it has severe repercussions for human health.
- ♣ In the context of water quality, innovative technology solutions can be broadly classified into two categories:

Filtration solutions:

- ♣ The Indian innovation ecosystem provides various sustainable water filtration and membrane-based cost effective technologies for treating water.
- ♣ Indian startups have developed patented water purifier technologies to produce clean potable water.
- ♣ Meanwhile, from the public R&D ecosystem, the Council of Scientific and Industrial Research (CSIR)- Central Salt and Marine Chemicals Research Institute, Bhavnagar has developed an indigenous hollow-fiber membrane technology that provides sustainable cost-effective process with nearly 100 percent water recovery to treat water containing suspended particles, pathogens, and other harmful micro Arganisms.
- ♣ Similarly, CSIR- Indian Institute of Ekicology Research, Lucknow has developed deer an innovative water technology that elminates pathogens such as virus, bacteria, Yungi, protozoa, and cyst to provide safe drinking water to communities as per national and international standards prescribed for potable water.
- ♣ The community level model is of 450 LPH (liters per hour) capacity and can be scaled up to 5,000 to 1 lakh liters per day.

Monitoring solutions:

- ♣ Water monitoring systems essentially utilise sophisticated tools such as loT that enables low-cost, low-power, and real time monitoring of water quantity (water levels, flow, soil moisture, and rainfall intensity) and quality (pH, conductivity, turbidity, dissolved oxygen, trace metals, and microorganisms).
- ♣ Additionally, advance sensors, and data analytics systems also help in efficient monitoring of drinking water quality in a cost-effective manner.

- Platform solutions also address water monitoring concerns by generating information such as groundwater levels, quality, and quantity, calculate daily water footprints among other things.

Collaborating for Clean Water

- AGNli collaborates with various stakeholders to fulfill India's clean water needs.
- These stakeholders include non-profit organisations, government departments, ministries, and corporates among others.
- Below are some of the major water engagements that have been led by AGNI

Quenching Eastern India's thirst

- Metallic groundwater contamination is a major problem in the Ganga-Brahmaputra plains of India.
- As a result, a large section of the Indian population that resides in these fertile river basins faces severe drinking water quality challenges.
- In this context, AGNII collaborated with Aga Khan Foundation in December 2018 to conduct a technology scouting exercise for identification of affordable water filtration technologies to be deployed by the Foundation in selected sites in Eastern India.
- AGNII recommended water purification technologies developed by Bhabha Atomic Research Centre (BARC).
- These technologies addressed issues related to arsenic, iron, and multi-contaminants. AGNII helped facilitate the engagement between the Foundation and BARC.
- Through AGNII Mission's support, Aga Khan Foundation entered into a licensing agreement with BARC for deployment of these solutions at selected sites.

Strengthening Grassroots Networks

- Meity's CSC network with its strong on ground presence can play a pivotal role in facilitating adoption of clean water technologies to rural remote areas of the country.
- To this end, AGNli collaborated with CSC in February 2021 to organise a technology showcase for VLES of Uttar Pradesh.

- The theme for the showcase was affordable and sustainable solutions for water purification and portability.
- A total of five startups and public R&D institutes presented their solutions to the VLEs.
- These solutions ranged from water filtration technologies to water portability solutions.
- Multiple engagements were facilitated between the VLES and innovators for deploying these solutions in remote areas of Uttar Pradesh.

Partnering with Global Stakeholders

- WaterAid, a multinational NGO works towards empowering local communities and ensures delivery of right innovations and technologies in pursuit of clean water and sanitation for all.
- In pursuance of these objectives in India, WaterAid partnered with AGNII to organise a virtual technology showcase in early November 2021.
- Two clean water technology specific startups from AGNli's portfolio that are associated with development of AWGs were shortlisted by WaterAid to present their solutions.
- These startups interacted with the WaterAid Educat team to understand the applicability of se solutions in different sites identified by that NGO.

Conclusion

- Lack of clean water poses a signal human development challenge that can severely compromise the capabilities of large swathes of Indian population in contributing positively towards the country's economic growth and development.
- Taking cognisance of the same the Government of India has taken concrete steps like the JJM to resolve India's clean water challenges.
- Assisting the Government of India in this quest, AGNli will continue to work to facilitate high impact water related interventions, to leverage affordable, scalable, sustainable, and universal technology and innovation solutions to ensure provisioning of clean water to Indian citizens, both rural and urban inclusive of those residing in geographically difficult and remote locations.
- Going ahead, AGNII's focus would be to utilise indigenous innovations and technologies to –

1) ease the water related challenges accentuated by climate change events to ensure ecological sustainability and climate resilience across rural and urban India;
2) provide for the primary sector's water needs to help improve agricultural outcomes and India's food and nutritional security. This emanates from the fact that water, primarily groundwater is a critical input for agriculture; and
3) and last but not the least, cater to urban India's rising water demands.

- ♣ As per estimates, India's urban population is expected to add another 416 million people to its urban areas by 2050'.
- ♣ This rapid pace of urbanisation calls for immediate and better utilisation of technology solutions to meet India's water requirements effectively and efficiently.
- ♣ Thus, AGNII remains committed to help India achieve its climate related goals, better public health outcomes, improve agricultural and industrial output, and propel the country towards timely achievement of SDG 6 as well as overall better socio-economic and human development outcomes.

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