

With rising population, climate change, changes in land use pattern and water cycle, particularly rainfall pattern, desertification- water management and conservation has become global priorities. Various initiatives are being taken by the Government of India for water conservation in producing maximum yield with minimum water like Sahi Fasal campaign, River Development and Ganga Rejuvenation, National Water Mission, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)- Har Khet Ko Pani (HKKP), Per Drop More Crop, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Repair, Renovation and Restoration (RRR) of Water Bodies Scheme etc.

Water Resources in Agriculture: Availability and Projections

- The availability of both surface and groundwater varies from one region to another.
- Major portion of water is drawn for use by the Agriculture sector, followed by other sectors like energy, drinking water etc.
- The main sources of irrigation in the country are canals, tanks, and wells, including tube wells.
- Groundwater contributes more than 79 per cent of the total ultimate potential through minor irrigation.
- At the same time, water scarcity coupled with high demand in farming, small and fragmented land holdings, depleting soil organic carbon, and degradation are challenging the sustainability factor in farming.

Water Conservation Strategies in Agriculture

A slew of schemes have been initiated by the Government of India to prevent non- judicious use of water resources, viz.

- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY):**
 - It was launched during 2015-16 with the vision of extending the coverage of irrigation "Har Khet ko Pani" and improving water use efficiency, i.e., 'Per Drop More Crop'.
 - It offers an end-to-end solution for irrigation through source creation, distribution, management, field application, and extension activities and is an amalgamation of schemes, viz. Accelerated Irrigation Benefit Programme (AIBP), River Development & Ganga Rejuvenation, Integrated Watershed Management Programme and On Farm Water Management (OFWM).
- **Per Drop More Crop:**
 - This scheme focuses on enhancing water use efficiency, productivity and reduction in inputs costs through Micro Irrigation technologies, i.e., drip and sprinkler irrigation systems.
 - It is being implemented under Rashtriya Krishi Vikas Yojana (RKVY) from 2022-23.
 - A Micro Irrigation Fund of initial corpus 5000 crore rupees was created with NABARD to facilitate the States in mobilising the resources for expanding coverage of Micro Irrigation by taking up special and innovative projects. This corpus was increased to Rs.1000 crores in Budget 2021-22.
- **Sahi Fasal Campaign:** It is a component of the National Water Mission initiated by the Ministry of Jal Shakti for raising awareness amongst the farming community on water efficient farming through selection of agricultural crops that utilises water more efficiently and micro irrigation technology.
- **Bhartiya Prakratik Krishi Paddhati:** It promotes natural farming and aims at minimising the cost of cultivation, recreation of soil ecosystem, resource conservation, enhancing farmers' income, and ensuring environment sustainability.

Along with these schemes, measures are underway to mitigate the water footprints of crops through diversification and dietary shifts. Concerted efforts were made by the Ministry of Agriculture and Farmers Welfare in promoting states to diversify agricultural/ horticultural crops as per the local need through various ongoing

schemes viz National Food Security Mission (NFS), National Mission on Oilseeds and OilPalm (NMOOP), Rashtriya Krishi Vikas Yojana (RKVY) etc. Through the State Agriculture Department / Indian Council of Agricultural Research (ICAR)/ Krishi Vigyan Kendras (KVKs) farmers awareness campaigns and capacity building initiatives were undertaken and awareness on land and water pattern, climate smart farming, new agri-technologies, and efficient irrigation techniques were demonstrated at farmers' fields. Nutritious Millets such as Shree Anna Bajra and Shree Anna Jowar are being encouraged for cultivation in water scarce regions of the country.

Monitoring of SDG Indicator

The SDG indicator measures changes in Water Use Efficiency (WUE) to address the economic component of SDG target 6.4. together with indicator 6.4.2, it will provide vital information to ensure that water resources support the world's ecosystems and continue to be available for future generations.

Water Efficient Goods

The Bureau of Water Use Efficiency (BWUE) was set up by the Government of India under Department of Water Resources, RD & GR for promotion, regulation, and control of efficient use of water in irrigation, industrial and domestic sectors. BWUE have published the Indian Standards for the micro-irrigation and sanitary products towards addressing water efficiency.

Community Participation

Water conservation methods in agriculture like rainwater harvesting measures, groundwater recharge, use of micro-irrigation technology, climate smart cropping patterns and resource conservation technologies can be disseminated through community participation, women self-help groups, cooperatives, etc.

Way Forward

Water is a State subject and requires cooperation to harness steps for augmentation, conservation, and efficient management of water resources across States. Natural resource conservation is needed to guide land and water allocation to ensure sustainable agriculture and socio-economic development. Ecosystem services, and incentives should be considered to encourage efficient use of water.

WATER CONSERVATION THROUGH COMMUNITY PLANNING

The magnitude of India's population, their prevailing socio-economic conditions, and the quality of their lives demand an all-round development of basic infrastructure in order to achieve the objectives of inclusive growth with equity and social justice. Out of such immediate infrastructure needs, an important component is to arrange an adequate, timely, and affordable water supply for becoming a water-secure nation, and ensuring a healthy and economically productive society.

Need To Conserve Water Resources

- Increased demand for freshwater, dependency on rain-fed irrigation, varied rainfall patterns, population growth, rapid industrialisation, and urbanisation have led to massive exploitation of water, and reduction in the groundwater levels.
- Fragmentation of landholdings coupled with a gradual reduction in farm-size necessitates extensive and over-exploitation of groundwater resources.

Community Participation in Water Conservation

- To limit the adverse impacts of large-scale water projects, public policy-makers and development practitioners have advocated a gradual shift from state assisted large-scale water resource management projects to community-based and participatory water resource management programmes.
- Civic participation in the management processes of any public development endeavour results in better outcomes.

Water Conservation Programmes implemented by various States

State	Initiative
Andhra Pradesh	Neeru-Chettu for rejuvenating and revitalising natural resources.
Bihar	Jal Jeevan Hariyali for identification, restoration, and renovation of all public water storage structures - ponds / canal / pines, etc.
Gujarat	Sujalam Sufalam Jal Sanchay Abhiyan for deepening water bodies in the state before monsoon arrives to increase storage of rainwater to be used during times of scarcity.
Haryana	Jal Hi Jeevan Hai for encouraging farmers to adopt crop diversification and sow crops which require less water like Maize, Arhar, etc., instead of water guzzling crops such as paddy so as to conserve water.
Odisha	Pani Panchayat for ensuring voluntary activity of group of farmers engaged in the collective management (harvesting and distribution) of surface water and groundwater (wells and percolation tanks).
Maharashtra	Jalyukt Shivar Abhivaan for deepening and widening of water streams, construction of cement and earthen stop dams, works on nullahs and digging of farm ponds.
Rajasthan	Mukhya Mantri Jal Swawalamban Abhiyan for extending conservation efforts to manage rainfall, runoff, groundwater & in-situ soil moisture.

Water Conservation Initiatives of Union Government

1. **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**- Its vision is to ensure sustainable access to some means of protective irrigation to all agricultural farms in the country through efficient management of water resources and by propagating the tagline - 'Per Drop More Crop', thus bringing the much desired prosperity along with water security for future generations.
2. **Jal Shakti Abhiyaan**- It has been implemented to improve water availability including, ground water conditions, in the water stressed blocks of 256 districts in India.
3. **Atal Bhujal Yojana**- It aims at sustainable management of ground water with community participation in identified over-exploited and water stressed areas of the States of Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh.
4. **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)**- It emphasizes on construction of water harvesting and conservation works and allows watershed development activities.
5. Other initiatives include National Water Policy, National Aquifer Mapping and Management (NAQUIM) Programme, Rainfed Area Development Programme (RADP), National Perspective Plan, Catch the Rain and Sahi Fasal Campaigns, etc.

Type of Watershed Development Works	Engagement of the Community
<ul style="list-style-type: none"> ➤ Contour trenching for water conservation in plantations and grassland development. ➤ Loose boulder bunding by erecting dry stone walls across the hill slopes at pre-determined spacing for developing land for cultivation. ➤ Spring-shed development in north eastern States to revive springs and protect these against drying up during dry season. ➤ Village ponds excavation and renovation of existing ponds to increase water storage space. ➤ Bench terracing to use the hill slopes for crop production on sustainable basis. ➤ Gabion structures of stone and wire dams across drainage lines to address soil erosion issues. 	<ul style="list-style-type: none"> ➤ Intensive participatory planning exercise is adopted to prepare watershed development plans with active involvement of villagers. ➤ Identification of workable watershed boundaries [with around 500-1000 hectares of area] by referring to watershed atlas available with the States concerned. ➤ Carrying out Baseline/benchmark Surveys viz. climate, soil types, fertility, rainfall pattern, runoff volume, land-use pattern, vegetation to make the plan outcome-oriented. ➤ Active participation of community makes the programme community-driven and community managed/owned. ➤ Adoption of Participatory Rural Appraisal which combines various tools like social mapping, resource mapping, seasonal mapping, transect walk, focus group discussions enables community to express and analyse their own situation, clearly delineating location-specific water needs and priorities.

Why Community Planning and Participation in Water Conservation?

- Community's involvement in planning and execution ensures success in the endeavour by enhancing the economic viability of the implementation of development interventions, their operation and maintenance, the better upkeep of assets due to inherent community belongingness, and also increasing the life span of the system so created.
- Effective planning and implementation of water conservation-related schemes demand active community engagement through Farmer's Group, Panchayati Raj Institutions (PRIs), Self- Help Groups (SHGs), and Cooperatives.
- Issues in Community Planning-
 - a) How to arrest the rapid depletion of groundwater levels through judicious extraction by the farm and non-farm sectors?
 - b) How to control construction activities in rural areas and remove encroachments of the erstwhile water bodies?
 - c) How to identify water courses, revive, de-silt rural water bodies, and improve water storage capacities?
 - d) What steps to be taken to address issues due to erratic rainfall, droughts, or drought-like conditions?
 - e) How to ensure integration of crop-planning, crop-rotation, and crop-diversification planning with the conservation plans of the community?
- Ways to address the issues:
 - Social mobilisation, initiation of need analysis, preparation of the Water Security Plan, Irrigation Plan and Village Action Plan;
 - Discuss and deliberate on the sustainability of water schemes - both drinking and irrigation purposes, explore new revenue sources like user fees, operation and maintenance fees, if any, for smooth operation, maintenance, and conservation of water systems;
 - Prepare a water reserve audit, water safety plan to ensure recharge, storage, and availability of water and to meet issues relating to quality water usage;
 - Demand and support setting up of the technical support cells in consultation with the District/ Block administration to ensure convergence in the community and near the water project areas;
 - Coordinate with District or Block level authorities for promoting timely execution of water projects and fund utilisation;
 - Coordinate with District or Block level authorities for adopting technologies and digital medium for monitoring of water schemes;

- Arrange training and capacity building programmes on rainfall data capture, water collection, storage, and usage for grass-root workers like health workers, anganwadi workers, science teachers, high school students, panchayat members, retired army officials, etc. Monitor water availability, water sources, and water quality.

Concluding Remarks

Water conservation programmes would be successful in achieving their objectives only if the community and the end-beneficiaries were duly engaged in various stages of the programme's implementation - from the stage of identifying the need to prioritisation of conservation activities, implementation, and community monitoring of water works.

EDUCATING PEOPLE TO SAVE EVERY DROP OF WATER

Water scarcity is a growing challenge as India has 18 per cent of the world's population and only 4 per cent of global water resources. Apart from implementing policies and programmes to promote water conservation, we also need to address this crucial challenge to ensure the success of these efforts-taking every citizen along in the fight against the water crisis. This will not only require structured long-term campaigns to build awareness and educate people but also to incentivise and reward them to save every drop of water.

A Collective Responsibility

- An important strategy in this fight is to secure support and active involvement of the people that society looks up to.
- The water consumption and management ecosystem involves layers of stakeholders playing their roles in various ways at various places.
- Any change can happen if we look at the issue in its entirety and involve all important stakeholders.
- Prime Minister Narendra Modi has underlined the importance of citizens' involvement in dealing with the water crisis in the country. He emphasised that "there shall be a tomorrow only if there is water, and for this, we must make joint efforts from today". He even wrote to Sarpanches of 2.6 lakh villages to organise Special Gram Sabhas on water conservation and the importance of water.

National Water Mission's (NWM) Efforts

- It is one of the 8 missions under the National Action Plan on Climate Change (NAPCC).
- Its main objective is 'Conservation of water, minimising wastage, and ensuring its more equitable distribution both across and within States through integrated water resources development and management'.
- It's one of the five goals is to promote citizen and State actions for water conservation, augmentation, and preservation and one of its strategies is to incentivise the organisations or companies through awards for water conservation and efficient use of water.
- Its Annual NWM Water Awards recognise excellence in water conservation, efficient water use, and sustainable water management practices.
- Efforts-
 - **'Catch The Rain' Campaign-** It uses a slogan 'Catch the rain, where it falls, when it falls" which is nothing but an expression of the desire to collect, save, and manage every drop of water in whichever form it comes to us. It aims to encourage States and stakeholders to build appropriate Rainwater Harvesting Structures (RWHS) based on the local climatic conditions and sub-soil strata before the monsoon season

and involves active role of the local community in the implementation of several measures like the construction of check dams, water harvesting pits, rooftop RWHS, and desilt tanks to enhance the storage capacity of water bodies

- **Water Talk-** It takes place on the third Friday of every month, and features presentations from experts and practitioners in the field. The principal objective of this series is to raise awareness, build the capacity of stakeholders, and encourage active participation in water conservation.

Strategies to Educate People

- **Social Media-** Specialised campaigns can be run on various social media platforms and websites. Mobile applications can be developed to disseminate information, run contests, deliver incentives and rewards, recognise the local heroes and answer queries of the people. For example, 'Know Your Water' app from the Central Water Commission is a platform for sharing authentic information on water issues, spreading awareness, promoting water conservation measures, sensitising people regarding water quality issues and making people aware of Governmental policies on water resources.
- **Conventional Media:** Awareness campaigns can be conducted via various mediums like TV, radio, and newspapers. Their vast footprint across the country can be of great importance like an old campaign on Doordarshan with the slogan- 'Jal ki boond boond bachaiye'.
- **Educational Institutions:** Including water conservation education in school curriculums can help instil a sense of responsibility in children from a young age towards water conservation.
- **Engaging Communities:** Community programmes such as seminars, workshops, and interactive sessions can be organised to educate people about water conservation practices and motivate them to adopt these practices.
- **Incentives and Rewards:** To encourage people to conserve water, incentives like tax rebates or discounts can be offered to households that adopt water-saving practices.
- **Involving Private Sector:** develop and implement water conservation initiatives can increase awareness and reach a wider audience. Examples- Environmentalist Foundation of India, Tarun Bharat Sangh, SARA (Sustainable Alternatives for Rural Accord), Jal Bhagirathi Foundation, Sehgal Foundation etc.
- **Engaging with Eminent Personalities:** Celebrity involvement can be sought to attract public attention and promote water conservation initiatives as they are often seen as role models and have a large following.

Amplifying Success Stories

- Vedant Goel and Yusuf Soni from the Pune- based organisation IneedSai developed an initiative to conserve water by educating children about the importance of water and encouraging them to practice water conservation methods.
- The Run Blue campaign's India chapter was launched recently in New Delhi, with the aim of Creating awareness about the importance of water conservation.
- Larsen & Toubro (L&T) launched an extensive programme to create awareness about water conservation, which included a massive awareness campaign and road rallies organised by WET-IE (Water & Effluent Treatment Independent Company) employees at 286 schools across different states in India.
- The Paani Foundation runs an annual inter-village competition called Water Cup for water conservation work in drought-prone areas of Maharashtra.

VAJIRAM & RAVI
MAKING VILLAGES WATER SUFFICIENT

In the emerging discussion on localisation of Sustainable Development Goals, rural bodies such as panchayats, which are the last mile institutions have been put in the centre of attention and efforts are being made to improve their governance capability and strengthen them to promote equity and inclusiveness, along with social justice and economic development of the community. The 17 UN-SDGs have been remapped into nine broad themes such as:

Theme 1- Poverty free and enhanced livelihoods village.	Theme 2- Healthy village.	Theme 3- Child friendly village.	Theme 4- Water sufficient village.		
Theme 5- Clean and Green village.	Theme 6- Self-sufficient infrastructure in village.	Theme 7- Socially secured village.	Theme 8- Village with Good Governance.	Theme 9- Engendered Development in village.	

Envisioning Water Sufficient Village

- The stated vision under theme 4- 'Water Sufficient Village' addresses both quantitative and qualitative challenges to water resources.
- Due to climate change, over the years, there has been uncertain and erratic rainfall, and water bodies are disappearing.
- Availability of quality water is also a critical issue.
- In rural areas, the health burden of poor water quality is enormous. Rural masses, especially children are often affected by waterborne diseases and die of diarrhoea.
- The problem of chemical contamination is also prevalent in India. The major chemical parameters of concern are fluoride and arsenic. Iron is also emerging as a major problem with many habitations showing excess iron in the water samples.
- The theme water sufficient village is multi-dimensional and directly related to health, education, gender equality, sustainable and efficient use of natural resources, recycling and safe reuse of water, climate change impact mitigation and adaptation measures, and so on.
- Gram Panchayat (GP), in its efforts towards water sufficient village, has to undertake series of activities like a detailed situation analysis; set the water and sanitation goals and targets for the GP; appropriate technology for water supply and grey water management in the GP based on participatory assessment; ensure adequate, functional clean toilet facilities in schools (separately for boys and girls), water conservation, watershed management, etc., and reduction for source contamination, and waste water management programmes etc.
- A robust and process driven convergence plan is the need of the hour which ensures that resources (human, financial, knowledge, administrative) reach the end-point (village, farmer, or family) from different sources in the required quantity, sequence, and time.
- The Panchayati Raj functionaries and all officials of various line departments must have the basic knowledge of various on-going schemes and ability to develop comprehensive action plans.

Learning from Good Initiatives and Practices

- **Mission Amrit Sarovar-** Launched with the objective of harvesting and conserving water for the future generation. It is based on 'Whole of Government' approach with the participation from the Ministry of Rural

Development, Ministry of Jal Shakti, Ministry of Culture, Ministry of Panchayati Raj, Ministry of Environment, Forest and Climate Change and technical organisations. Under the Mission, every district of the country will construct or rejuvenate at least 75 Amrit Sarovars.

- **Catch the Rain-** It was started in 2022 to optimise rainwater harvesting and robust conservation.
- **Mission Bhagiratha Scheme-** It is being implemented in all the villages for providing safe and sustainable drinking water to all households.
- **Mission Kakatiya Scheme-** It was implemented to restore the irrigation tanks to their full capacity and a number of water conservation works (i.e., construction of farm ponds, construction of Percolation Tanks, construction of check dam and other water harvesting structures, de-silting of feeder and filed channels etc.).
- **Water Budget-** Kerala has become the first state in the country to prepare a water budget based on local self-government bodies by calculating water availability and consumption.
- **Jal Dhara Vikas Initiative-** Using resources of Mahatma Gandhi-NEGA, it attempts to enhance the water discharge in the springs and ensure water security in the Sikkim.

Conclusion

A nation-wide 'water literacy programme' is the need of the hour. Panchayat secretariat can play a role of 'hyper local platform' or a 'point of contact' by coordinating and closely working with all stakeholders towards making Indian villages water sufficient which will ensure water security for sustainable development with equity.

WATER USE EFFICIENCY ENSURING WATER SUSTAINABILITY

SDG target 6.4 addresses water-use efficiency and water stress, aiming by 2030, to 'substantially increase in water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity'.

Water Use Efficiency

- It is the ratio between effective water use and actual water withdrawal.
- In India, a major chunk of water usage is for agricultural purposes, and a small percentage is for drinking and domestic purposes. Thus, enhancing water use efficiency in every sector of water use including irrigation, is crucial and imperative for sustaining life faced with the challenges posed by climate change in the water sector in the present times.

Water Use Efficiency in Agriculture Sector

- Water Use Efficiency (WUE) in irrigation is the percentage of total applied water stored in the soil and available for consumptive use by the crops. Some water is lost in conveyance, distribution, and application in the field.
- Many factors that affect WUE in the irrigation sector include seepage, percolation, soil depth, texture, evaporation, evapotranspiration, the design of irrigation structures, and their operation and maintenance, and management skills.

Methods for Improving Water Use Efficiency in Agriculture

- **Micro Irrigation-** The Water use efficiency of micro irrigation including drip irrigation, is as high as 80- 95 per cent in comparison to only 30-50 per cent in conventional flood irrigation with several benefits in terms of water saving (30-60 per cent), yield enhancement (40-75 per cent), weed reduction (20-50 per cent).
- **Fertigation Studies-** Different fruit and vegetable crops showed that there is 25 per cent savings in fertilisers with this technology.

- **Mulching**- Either through polythene sheets or organic materials spread on top of the soil, it helps in increasing water use efficiency by controlling evaporation losses from the plant root zone. It saves about 10% water.
- **Drought-Tolerant Crops**- Growing crops that are appropriate to the region's the climate is another way that farmers are getting more crops per drop.

Other Methods of Improving Water Use Efficiency

- Reduce conveyance losses by lining channels or, preferably, by using closed conduits.
- Reduce direct evaporation during irrigation by avoiding midday sprinkling.
- Reduce transpiration by weeds, keeping the inter- row strips dry and applying weed control measures where needed.
- Enhancement of crop growth Select the most suitable and marketable crops for the region.
- Use optimal timing for planting and harvesting. Use optimal tillage (avoid excessive cultivation).
- Use appropriate insect, parasite, and disease control.
- Apply manures and green manures where possible and fertilise effectively (preferably by injecting the necessary nutrients into the irrigation water).

Initiatives to Increase WUE in the Agriculture Sector

- **Ministry of Jal Shakti**- created to consolidate inter-related functions pertaining to water management.
- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**- a centrally sponsored scheme (core scheme) launched in 2015 to expand the cultivable area under assured irrigation (Har Khet Ko Pani), to improve on-farm water use efficiency and reduce wastage of water.
- **Accelerated Irrigation Benefit Programme (AIBP)**- launched during 1996-97 to provide Central Loan Assistance (CLA) to major and medium irrigation projects that were in an advanced stage of completion to achieve the targeted potential, ultimately resulting in saving water and improving efficiency. It got amalgamated under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) in 2015-16.
- **Command Area Development and Water Management (CADWM)**- Launched in 1974-75 to bridge the gap between Irrigation Potential Created (IPC) and Irrigation Potential Utilised (IPU). Some of the works proposed under this programme are the Completion of On-Farm Development (OFD) works, levelling, drainage, Warabandi, participatory irrigation management (PIM), etc., With the launch of the PMKSY, it got included under the Har Khet Ko Pani component.
- **Har Khet Ko Pani**- Under PMKSY, it ensures water to every farm through assured irrigation.
- **National Water Mission**- Five goals have been identified under the National Water Mission. One of the most important goals of the NWM is to improve the Water Use Efficiency (WUE) by at least 20 per cent. To achieve this goal, research in the area of increasing WUE in agriculture, Industry, and domestic water is one of the important strategies.
- **Bureau of Water Use Efficiency (BWUE)**- Set up to achieve the target of improvement in WUE by 20 per cent. It will be a facilitator for the promotion of improving water use efficiency across various sectors namely irrigation, drinking water supply, power generation, industries, etc., in the country.
- **Baseline Studies**- NWM has awarded Baseline Studies to four institutes with the objective to evaluate the Water Use Efficiency of the completed major and medium irrigation projects.

- **Sahi Fasal Campaign-** launched to increase water use efficiency in the agriculture sector namely 'Sahi Fasal' to nudge farmers in the water-stressed areas to grow crops that are not water intensive, but use water very efficiently, are economically remunerative; are healthy and nutritious; suited to the agro-climatic-hydro characteristics of the area; and are environmentally friendly.

Water Use Efficiency in Industrial Sector

Many industrial sectors have already experienced physical, reputational, regulatory, or a combination of these risks owing to the prevalent water issues. Moreover, water scarcity has already caused India's 20 largest thermal utilities to shut down at least once between 2013 and 2016, taking a total financial toll of USD 1.4 billion. Initiatives for Increase in WUE in Industrial Sector-

- **Benchmarking Studies-** To enhance WUE in some of the water-intensive industries namely thermal power plants, textile, pulp and paper, and steel industry, benchmarking study has been awarded to TERI which will focus on two industrial sectors namely thermal power plants and textile industries in phase-I and scoping exercise, the preliminary baseline assessment and comprehensive water audit in pulp & paper, and steel industries in phase-II.

Initiative for Increasing WUE in Domestic Sector

- **Water Efficient Plumbing Products-** The Bureau of Indian Standards (BIS) issues standards for Water-Efficient Plumbing Products which cover the requirement for standardising the guidelines and specifications of various fixtures and sanitary wares used in plumbing systems to be water efficient to reduce water requirements for effective operations and maintenance of these appliances.

AMRUT Mission of Ministry of Housing and Urban Affairs

The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for sustainable management of water in urban areas through its national mission, such as use efficiency in cities is also improved through centralised control and monitoring of water supply using smart technologies. Some cities have adopted Supervisory Control and Data Acquisition (SCADA) system under AMRUT projects for better management of city infrastructure.

Conclusion

Enhanced water use efficiency through persistent and concerted efforts of individuals, groups and associations of people, and the Government implementation agencies and institutional mechanisms will go a long way in effectively coping with the challenges posed by climate change and an ever-increasing population on available water resources.

WATER CONSERVATION AND MULTIPLE USE MANAGEMENT

In some areas, water withdrawals are so high relative to supply that surface water supplies are literally shrinking and groundwater reserves are being depleted faster than they can be replenished by precipitation. Efficient use of water resource is essential to the survival of the ever-increasing population of a country.

Water Availability

- India's total water availability from precipitation is around 3,880 billion cubic meters (BCM) each year.
- Natural runoff contains 1,999 BCM of water after evaporation.
- Due to geological and other causes, the available usable water is limited to 1,128 BCM per year, which includes 690 BCM of surface water and 438 BCM of replenishable groundwater.

- The average annual per capita water availability in the years 2001, 2005 and 2011 was assessed as 1816, 1703, and 1,545 cubic meters, respectively, which is projected to further reduce due to an increase in population, rapid industrialisation, urbanisation, cropping intensity and declining groundwater table.

Water for Agriculture

- Agriculture uses 70 per cent of water withdrawals worldwide.
- Water as a source of irrigation has emerged as the mainstay of the food-agricultural economy. Therefore, in the future, available water resource will not be sufficient to fulfil the water needs of all sectors, unless water is conserved and used efficiently.
- Water resource development and management plays a pivotal role in enhancing agricultural productivity through optimum use of water resources and seeks to allocate water on an equitable basis to satisfy all agricultural uses and demands.

Rainwater Conservation

- Rainwater harvesting, conservation and its efficient utilisation through multiple use management play a crucial role in rained agriculture and are being taken up on a massive scale through various Govt schemes.
- Large-scale water harvesting will reduce the possibility of flooding and improve groundwater recharge.
- The in-situ rainwater harvesting is generally carried out through various agronomic and engineering measures, where the rainfall is collected where it falls. Some of the widely adopted techniques are bunding, terracing, contour farming, broad bed furrow systems, micro basins, ridge & tie ridging, mulching, deep ploughing, etc.
- In the case of ex-situ rainwater harvesting, the runoff is diverted and stored in a natural or artificial reservoir for later use through dugout ponds, diversion bunds, tanks, tank cum well system in the plateau region, traditional system of rainwater harvesting like khadins, and haveli.
- A Tank cum Well system has been found to be a potential option for improving water productivity under watershed as well as canal irrigation commands in Odisha through conservation of rainwater and groundwater.

Traditional Water Conservation Systems

- **Rajasthan**
 - **Khadin**- It is a system whereby rocky catchment areas are used to collect run-off water in a valley by constructing a bund across the flow. The system combines two adjoining physiographic land units. The arrested water stands in Khadin throughout the monsoon period. Its soils are extremely fertile due to frequent deposition of fine segments.
 - **Rela**- It is a water conservation practice aims to channel water from streams in hills to terraced farms on the edge of adjacent plain. This provides a secure water supply in drought-prone areas.
 - **Tal Farming**- It is found where runoff rainwater flows into low-lying valleys, forming stagnant pools. During the monsoon, water is lifted and used in adjacent fields. After the monsoon, crops are grown under residual moisture in the Tal bed when water has evaporated and percolated.
 - **Kundi**- It is an artificial well, which stores runoff from an artificially prepared catchment surrounding it so that rainwater that falls on the catchment rapidly runs into the well and gets stored.
- **Gujarat**
 - **Virda**- It is like a well in a tank for procuring potable sweet water in an area where rainwater is scarce and groundwater is saline. Maldharis who have invented the technique, locate low-lying areas that accumulate a great quantity of rainwater from very large catchment basins. Some of this water infiltrates into the

ground and is stored in a layer above the salty ground water at a shallow depth. By digging small shallow wells, called Virdas into the layer of accumulated rainwater, they obtain fresh drinking water.

- **Bandharas-** In this method, gunny bags filled with sand and stones are arranged in rows across the rainfed village streams to arrest water flow.

- **Madhya Pradesh**

- **Haveli-** The fields are embanked, and farmers work out an arrangement amongst themselves to allow rainwater to flow from one field to another. The Collected water seeps into the soil and gives it enough moisture to grow a good crop in the following dry period.

- **Karnataka**

- **Niru Oni-** An outlet for each field) is used to control runoff. The type of outlet depends on the type, size, and location of a certain field. Surface runoff is controlled according to a timetable, that coincides with the growth of a crop and various cultural operations.

- **North West Himalayas**

- **Khuls and Ghuls-** Used to divert water from the source to agricultural fields.
- **Khatri, or Diggi-** An innovative structure to harvest rainwater, found in the sub-Himalayan regions of Himachal Pradesh. It is a horizontally dug tunnel with steps going down towards the basin.

- **Nagaland**

- **Zabo-** A water harvesting system where ponds are constructed in such a manner that surplus water from one pond flows down to another.

- **Arunachal Pradesh**

- **Apatani System-** It consists of terraced plots connected by inlet and outlet channels.

Way Forward

The message of water conservation and multiple use management need to be communicated across all levels; creation of awareness and an enabling environment for water conservation at various levels through information, education, and communication is an important activity to face the challenges of water scarcity.

2023:YEAR OF INTERNATIONAL WATER COMMITMENTS AND WHAT IT MEANS FOR RURAL INDIA

In 2017, the United Nations (UN) adopted a resolution declaring 2018-28 as the International Decade for Action on Water for Sustainable Development. The year 2023 is the mid-year to the decade for action on water and also for the Sustainable Development Goals (SDGs). Goal 6 of the SDGs focusses on the availability and sustainable management of water and sanitation for all. In this context, the alignment of SDG 6 and SDG 13, which emphasises urgent action to combat climate change and its impact is very important.

Water Matters for Rural India

- 53 per cent of districts in India are rural as per Census 2011, out of these districts, 37 per cent are vulnerable to the impacts of extreme hydro met disasters. Thus, there is an urgent need to ensure water security in rural areas to mitigate the impacts of droughts, floods, and cyclones.
- Two of the major sectors competing for water in India are agriculture and WASH (water, sanitation, and hygiene). WASH is important from the point of view of public health. Considering that occurrence of climate extremes will further exacerbate in the future, climate-proofing of WASH infrastructure and services are crucial for building the resilience of communities.

- The adverse impact of climate variability and change on hydrology has also increased the dependence on groundwater for meeting sectoral water demands.
- Considering more than 80 per cent of the rural water supply schemes in India are based on groundwater based sources, non-regulation of groundwater use in such areas can be a matter of concern in the future.
- The year 2023 began with India announcing the formation of its 'Water Vision' as a part of Prime Minister's Vision India @2047 plan. The goals and vision, which Government of India intends to achieve with regard to water have been endorsed by it on several international and national forums this year.

Major International Commitments and Outcomes

- **Group of Twenty (G20)**- India is leading the G20 presidency for the first time this year and the focus is on prioritising water action towards achieving sustainable water resources management in alignment with the SDG6 by 2030.
- **Conference of the Parties(COP)**- Negotiations around the water sector have become increasingly important at COP. The Water Action Track was launched at COP25 in 2019 to mobilise stakeholders from across the water sector to increase ambition and action on climate change adaptation and mitigation, with a particular focus on achieving SDG 6. COP26 came as a breakthrough and saw the establishment of the Water Pavilion and water and sanitation were also introduced for the first time in agendas. At COP27, India also emphasised the need for a 'bottom-up approach' to address water management challenges and highlighted the importance of community participation in decision- making.

Some Relevant Schemes and Policies by the Government of India

1. **'Jal Jeevan Mission (JJM)**- It addresses SDG 6, with the aim to achieve target 6.1 which focuses on achieving universal and equitable access to safe and affordable drinking water for all by 2030. By ensuring access to clean drinking water, India can save an estimated USD 1.34 billion per annum from reduction in medical expenditure on the treatment of water-borne diseases. The JJM also has tremendous potential to create various kinds of jobs in rural areas, such as in plumbing, water quality testing, community mobilisation, and water supply, and wastewater treatment operations.
2. **Swachh Bharat Mission-Gramin (SBM-G)**- India is steadily moving towards ODF-Plus, with almost 3,00,000 villages (out of 6,00,000) in the country declaring themselves ODF-Plus as of May 2023. This has progressed the country towards achieving SDG 6.2, that aims to achieve adequate and equitable sanitation access for all and ending open defecation by 2030, with a focus on women and girls and other vulnerable groups.
3. **Atal Bhujal Yojana (ABY)**- The aim of the scheme is to improve the management of groundwater resources in such areas, which accounts for about 37 % of such blocks in country. It has the potential to provide the country with necessary data for planning of water resources and for climate action through community participation.
4. **National Aquifer Mapping and Management Programme (NAQUIM)**- Under this, groundwater aquifers have been mapped and management plans have been made for 80 per cent of the country.

Way Forward

- **Knowledge Transfer from International Collaboration**- India can leverage the collective knowledge and experience gained at forums like COP, UN Summits, and G20 to strengthen the existing policies and strategies to address climate change and build resilience in the water sector.
- **Data Production by Leveraging Traditional Knowledge**- Community-based monitoring and data collection programs as initiated under the ABY will enable sustainable and equitable management of natural resources while providing opportunities for community engagement and decision-making.

- **Better Reporting of Data on Safely Managed Drinking Water Services-** CEEW 2022 analysis highlights that the data reported by different agencies on the progress with the safely managed drinking water services in India needs to be strengthened to include all its components, i.e. access, reliability, and safety (potable water quality).
- **Learnings from Experience-** India can learn from the experience of its own existing policies and programmes in the WASH sector and ensure that they are able to improve resilience to climate extremes.

RAINWATER HARVESTING FOR SUSTAINABLE AGRICULTURE

The complexity of problems associated with rain fed agriculture is greater than that of irrigated agriculture. In India, more than USD 2 billion per year is being invested on rainwater harvesting interventions to mitigate climate related risks. It demands for an in-depth analysis of the rainwater management problem in rained ecosystems and the development of a cost-effective technology for sustainable agricultural production. To further cope with these challenges, there is a need to adapt alternative food crops and irrigation practices for sustainable agriculture.

Need for Rainwater Harvesting

- The Central Ground Water Board (CGWB) has classified 16.2 per cent of the total assessment units like blocks, mandals or talukas as 'over-exploited'; additional 14 per cent as either at 'critical' or 'semi-critical' stage.
- Unsustainable groundwater use necessitates demand management and supply augmentation measures for improved water use efficiency in the agriculture sector.
- In India, annual rainfall is around 1183 mm, out of which 75 per cent is received in a short span of four months during the monsoon (July to September). This results in runoffs during the monsoon and calls for irrigation investments for the rest of the year. Even if 5 per cent of annual rainfall were harvested properly, that would produce a substantial quantum of water to the tune of 900 million litres.
- Due to a dearth of storage procedures, lack of adequate infrastructure, and inappropriate water, only 18-20 per cent of the rain water is actually used in India's surface and groundwater bodies. Therefore, rainwater harvesting becomes very important.

Potential of Rainwater Harvesting

- It is estimated that about 24 million hectares of rainwater can be potentially harvested through small water harvesting structures in different rainfall zones of India. If the harvested water is suitably stored, about 30 per cent of it can be utilised for providing supplemental irrigation to rabi crops covering an area of about 95 million ha.
- An additional yield of 1 tonne per hectare can be realised through supplemental irrigation. A part of the remaining 70 per cent of the harvested water would help in recharging the groundwater aquifers, which may help in raising the groundwater level by 2metre as experienced in different agro-climatic regions.
- With innovative and sustainable practices, we can conserve water in agriculture and ensure a bright future for both food production and the environment.
- Rainwater harvesting is an ideal solution to arrest the declining trend of water levels. The surface runoff, which goes to storm drains, is utilised. It helps reduce the flooding of roads and roundabouts.

Indigenous Knowledge of Rainwater Harvesting

- Surface water tanks in southern India; *haveli* system in central India; *khadins* and *johads* in western India, and *ruza* in eastern India are traditional practices of decentralised water harvesting systems.

- In these methods, the generated surface runoff is harvested through the construction of small-scale water structures.
- These systems have significantly contributed not only to generating various provisioning services but also in supporting the landscape to maintain biodiversity and continue to be productive.
- Traditional rainwater management systems (haveli systems) have contributed towards rehabilitating degraded landscapes and changing them into productive forms in the Bundelkhand region. However, this system became defunct due to neglect.
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and consortium partners have introduced an innovative approach for haveli rejuvenation by constructing a masonry core wall along with an outlet at a suitable location.
- Rejuvenation of the haveli system created an opportunity to harvest surface runoff within farmers' fields, which helped to improve groundwater levels in shallow dug wells, which remain available during the following years. This has increased cropping intensity by converting about 20 per cent of permanent fallow lands into productive agriculture lands and also ensured irrigation availability, especially during the critical crop growth stage.

Government Initiatives

- Formulation of a Master Plan for Artificial Recharge to Groundwater in India which aims to implement around 11 million rainwater harvesting and Artificial Recharge structures to augment groundwater resources in India.
- Circulation of a Model Bill to all States/UTs to enable them to enact suitable legislation for groundwater regulation, including provisions for rainwater harvesting.
- Implementation of the National Aquifer Mapping and Management Programme (NAQUIM) to map major aquifers, characterise them, and develop Aquifer Management Plans to ensure the sustainability of groundwater resources in India.
- These initiatives, along with various other schemes and programmes like the Atal Bhujal Yojana and Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Har Khet Ko Pani (HKKP), and Ground Water Irrigation (GWI), focus on improving groundwater management in water-stressed areas, ensuring community participation, and creating additional irrigation potential from groundwater resources.
- The Jal Shakti Abhiyan (JSA) was launched in the year 2019 in 1592 blocks out of 2836 blocks in 256 water stressed districts of the country.

Future Initiatives

- Governments should enact laws to check the blatant and unscientific use of this resource.
- Excessive digging of wells should be avoided or restricted in severely affected areas.
- Permission for digging wells should be linked with the construction of water harvesting structures.
- In urban areas, the harvesting of rainwater should be made mandatory so that the stored water can be used for other than drinking.
- The focus should also be on water reuse and recycling technologies, which are innovative ways to manage water resources sustainably. Smart water management can help reduce water waste, lower costs, and improve the reliability of the water supply.