



Water Security in India

Review and recommendations
for policy and practice

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Water Security in India: Review and recommendations for policy and practice

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Summary

This paper is an attempt to come up with recommendations for national policies and programmes in the water and allied sectors from the lens of creating water security at the village level. The paper reviews the importance of water security, challenges and concerns, national policies and programmes of water and agriculture sectors, and recommendations for creating water security at the village level. The process involved consultations with water experts, and study of national as well state level documents. The first level draft was shared with over 40 practitioners and experts in this sector for their inputs at a consultation with the NGO and domain experts. An expert group identified to examine the paper and recommendations provided detailed inputs. With the understanding that water security cannot be achieved in its truest sense unless community is involved and takes ownership of the water resources with an understanding and vision for managing this resource in the long term. Water security plans developed at the village level with a scientific and participatory approach would immensely contribute towards enhancing the efforts of the government and various stakeholders. The policy recommendations focusing on water security planning and community participation and creating supporting mechanisms are provided.

Recommendations for policy and practice

Institutional reform at the national level for integrated and conjunctive planning and management of surface and groundwater is imperative. Currently, the National Water Policy of 2012 is applicable. The draft new water policy prepared by the Mihir Shah committee awaits further deliberation and finalisation by the central government.

The draft Water Policy 2020 during its formulation undertook a consultative process involving multiple stakeholders. It recommends a shift of paradigm that has governed water in India from the supply side to demand side, from construction and extraction to management and distribution, from command and control over nature to redefining our relationship with nature through nature-based solutions to move away from high-risk agriculture. It is also cognizant of the increasing complexity of the water crisis in the context of climate change and the need for flexibility, resilience to be built into water management. The draft policy recommends intersectoral convergence, crop diversification in line with agro-ecology, diversification of crop portfolio to include nutri-cereals, pulses, and oilseeds, making nutri-cereals and millets as a part of Integrated Child Development Scheme (ICDS) and Mid-day Meal schemes of the government to improve nutritional status of children in Anganwadis and schools. There is an emphasis on people's participation especially those of women in water governance and management and the need to learn from and strengthen Water Users' Associations, Participatory Irrigation Management, and other structures, emphasising that implementation be done by communities and facilitated by the government. It makes suggestions on wastewater treatment and



reuse especially in cities using bioremediation technologies and building capacities of urban water bodies to make prudent technology choices. It recommends merging the Central Ground Water Board (CGWB) and the Central Water Commission (CWC) into a National Water Board, bringing in varied expertise including primary stakeholders at the same table. In terms of implementation of policy which has been a concern with the earlier policies, a dedicated Task Group for monitoring to be chaired by CEO, Niti Aayog is recommended (Ideas4India, 2022).

It is expected that the draft policy, once formally adopted and implemented, will be transformative, facilitating the strengthening of institutional mechanisms, building knowledge and keeping people's participation at the centre of development, especially those most affected by scarcity, inadequate access and voice in water management. In parallel to country-level policies and programmes, India has a wealth of innovation and experience in bottom-up local approaches. Going forward, while country and state level policy reform will be instrumental for India's water security, there is much that can be done with local initiatives involving users in ownership and management of water resources, and these can enhance local water security.

1. Multi-stakeholder and multi-level approaches, cooperation, and convergence

Water security requires a holistic, multidisciplinary, multi stakeholder approach at multiple levels.

Convergence of various government policies and programmes is acknowledged in policy but requires to be implemented at the local government and user end. Water governance systems should recognise the role of multiple stakeholders including governments, academia, experts, private sector, farmers, women, civil society, Non-Governmental Organisations (NGOs), and international organisations and involve them in enhancing water security ensuring access to all equitably. Water governance systems must be strengthened through creating better and transparent mechanisms and institutions to facilitate vertical

(among levels of government) and horizontal (among sectors) coordination and resolving of conflicts.

Convergence and synergy between existing community/ user group organisations such as Water User Associations, Village Watershed Committees, Pani Panchayats must be actively promoted. Young women and men can be involved and play an active role in water governance and management, data collection and management, and knowledge sharing.

2. Awareness, Education and Training

As a part of the Jal Jeevan Mission (JJM), Key Resource Agencies have been identified to conduct training on drinking water and sanitation, and the process for setting up local systems for functional household tap connections in line with the objectives of the JJM. These agencies drawn from expert groups and NGOs with experience in the water sector are conducting training at local, district and state



levels. These would help rejuvenate and reinforce some of the key areas that should form a part of education and training strategies for the water sector. Building capacity of frontline workers through training and access to contextual knowledge, using digital media where available and possible, would enhance their ability to perform their roles better. The training programmes must include the village level key stakeholders such as women, youth, water users' groups, pani panchayat members, pump operators and those involved in water management. Recognition and certification of the training received, and refresher courses would enable individuals to actively participate. CEE's experience in one of its projects near Ahmedabad, provided insights into the way pump operators can become water custodians and not just employees of the Panchayat, if trained and their role recognised.



A cadre of educators and a portfolio of educational materials, training methods and tools to support communities to develop locally-relevant systems understanding of water and their own action plans for water security may be developed, drawing on the experience of the JJM, the extensive watershed programmes and best practice examples from across the country.

Local cadres of community leaders can put in place community defined access and use rules and establish effective governance mechanisms to enforce these. Village community youth should be trained as para-hydrogeologists to support the gram panchayats in conducting water budgeting exercises, collect and manage data and monitor water levels in water structures, monitor water use. They can also leverage various government schemes and support the gram panchayat in an integrated development planning process. Organisations such as Watershed Organisation Trust (WOTR), Pune and Arid Communities and Technologies (ACT), Bhuj have successfully demonstrated this approach. CEE as a part of the Jal Setu initiative has also created such a cadre with support of ACT in the project villages of Jasdan, Rajkot district.

There is a need to facilitate peer-based learning and enable communities of practice to be created. An inventory of people trained, assets created, knowledge products developed, and data generated by any programme can be created and made accessible across programmes at the block and district level. A Gram Shiksha Kendra at village level could also play such a role. Corporate bodies could support setting up such centres.

We recommend that awareness and education efforts for water security and sustainable water management may be guided by approaches that inculcate “sustainable development competences” (UNESCO, 2017) among individuals and communities, and especially among community organisers, para-hydrogeologists, and frontline workers. Locale-specific frameworks for Education for Sustainable Development (ESD) for the water sector may be evolved, including for knowledge of local surface and groundwater resources and the water cycle, interconnections of water with food security, health,

livelihoods, and pollution etc. Water related initiatives should seek to enhance public understanding of water as a social-ecological system with awareness about local water resources as a shared good. Processes that help express people's knowledge and supplement it with data and knowledge generated through government and other efforts should be part of ESD initiatives. Water budgeting can help to understand the local trends of water use, current and future gaps in access and availability. Further, community-based planning for equitable access and augmenting water resources, water conservation and demand side management need to be part of community awareness initiatives. Sharing inspirational stories and experiences can help envision and encourage the development and adoption of locally-relevant water security plans.

3. Scientific knowledge and local and traditional knowledge

The emphasis on scientific expertise and knowledge to inform the water sector along with a recognition of traditional knowledge and practices has been there in the water policy of 2012 and is there in the 2020 draft water policy as well. Use of satellite technology for mapping of water resources, technologies for desalination and waste-water treatment have been driving many of today's innovative approaches. This information needs to be made available at the block and village level in a form that is understood and used. The Rain Centres which are being set up at the district level as a part of the "Catch the Rain" campaign, could be equipped with such information materials and data sets. These could over a period also be set up at block levels to improve access for the communities.



Recognition and integration of traditional knowledge of water conservation and management can form a repository for contextual understanding and implementation of water conservation initiatives at the village level. Water security planning processes in the village should involve people with traditional and local knowledge of water resources and their conservation.

4. Coherence and coordination of data collection and access

Coordination mechanisms for aggregating disaggregated water-related data that is available within different government and other agencies can be strengthened especially from the context of its availability at the district, block, and village levels. Digital technologies can play an important role as is already demonstrated by the Composite Water Management Index and other platforms being created by the central and state government departments. Aggregation of data in ways and formats required to enable multiple stakeholders to act jointly, decisively to facilitate water security, is crucial. Also, the community's involvement and role in the data generation and collation process makes them actively participate in the way data is generated and used.

5. Decentralised, off-grid solutions to reach dispersed populations

Off-grid solutions for safe water access, water treatment technologies can be a potential answer to the issues faced by communities in remote rural or peri-urban areas. These can cover the gap between supply and demand taking some pressure off the water supply systems and reduce costs. Community-level and hamlet-based rainwater harvesting structures have been created by CEE in some of the peri-urban areas near Ahmedabad to augment water availability and with management processes for equitable use.

Water kiosks for drinking water, decentralised wastewater treatment plants are a few of the technologies which can be encouraged along with the overall rural water supply programmes. Social entrepreneurs are driving the trend to leverage market-based solutions that are affordable and accessible to poor communities, seeing them not as a 'problem to be solved' but as 'customers'. Community processes that help to embed such enterprises as service-providers within a community-anchored water security plan, with members of the community acting as 'citizens' are necessary alongside.

6. Water Security and Ecosystem-Based Adaptation to Climate Change

Ecosystem-based adaptation strategies offer an opportunity to enhance water security, climate-resilient livelihoods, and social cohesion simultaneously, while also benefiting natural systems. Investments in nature-based solutions such as reforestation and riverbank repair can improve the quality of the water supply. This drives economic development while saving on water treatment costs. Nature-based solutions offer some of the most effective and sustainable ways to improve water security, and they frequently offer additional benefits for communities where they are implemented, including improved agriculture, job creation and climate resilience.

Guidelines for developing ecosystem-based approaches and adding these to their village development plans, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) implementation should be made available to the Panchayati Raj Institutions. Orientation of organisations, CSR groups, Panchayati Raj Institutions (PRIs) on ecosystem-based planning and nature-based solutions should be made a part of the training programmes being offered under JJM.

7. Agriculture and water security

The New Water policy already mentions crop diversification, focus on nutri-cereals, oil seeds, and pulses, and crop selection based on the geohydrological context. These are critical recommendations and would require changes in the demand for certain water intensive crops in the market and making them a part of the ICDS and the Public Distribution System (PDS) as the policy recommends. While this may take some time, efforts through multilateral and CSR funding could support local shifts in cropping patterns, community grain banks, and mid-day meals in schools, and income to farmers who make the shift.



Supporting farmers through Farmers Producer Companies and other such grassroot level forums would help to enable this shift. An example for encouraging farmers to choose millets over other cash crops has been implemented by the Deccan Development Society in Zaheerabad, Telangana.

Improved water use efficiency can be achieved by shifting to micro irrigation methods which would be cost efficient as well besides increasing area under irrigation. Judicious use of solar pumps, and reviewing incentives provided to farmers in some states is needed to ensure water use efficiency in agriculture.

8. Water Pricing

The mindset about water being a replenishable resource which can be liberally used, needs to change. The pricing of water and/ or energy can help to do this. The aspect of pricing has been discussed and recommended since many years. The Water Sanitation and Management Organisation (WASMO) in Gujarat introduced a water management fee for every rural household being serviced. Metering of water and building capacities of pump operators and Panchayat members can help them understand the amount of water use and improve the efficiency. Water metres and pricing at the village level has been implemented by CEE in peri-urban areas near Ahmedabad. The initiative has resulted in a substantial amount of saving of water and electricity.



National Water Security - Review and Recommendations

Introduction

The need to inform the state water policy came about owing to CEE's long-time work in the water sector especially the work around gender, water governance and climate change during 2017-19. This paper is an attempt to come up with recommendations for national policies and programmes in the water and allied sectors from the lens of creating water security at the village level. The paper reviews the importance of water security, challenges and concerns, national policies and programmes of water and agriculture sectors, and recommendations for creating water security at the village level.

CEE initiated Jalsetu with support from Hans Seidel Foundation, where participatory water security plans were developed in 10 selected villages of Vichhiya block of Rajkot district. The water security plans were developed through participation of key stakeholders in these villages. Consultation with Panchayati Raj Institution by members from these villages and across the state, and with NGOs provided insights into challenges and suggestions to improve water security as a part of overall strategy for water.

The process involved consultations with water experts, and study of national as well state level documents. The first level draft was shared with over 40 practitioners and experts in this sector for their inputs at a consultation with the NGO and domain experts. An expert group identified to examine the paper and recommendations provided detailed inputs. The recommendations and the water security plans prepared for the 10 villages were presented to the government officials and CSR groups to ascertain their interest in taking this idea forward. Three of the water security plans developed as a part of Jalsetu have received financial support from NABARD.



The importance of water security

Access to water, essential for human health and economy, is a critical issue for many communities across the world and is being exacerbated with changes in consumption and management patterns, quantities abstracted¹, and climate change. According to the UN World Water Development Report, 2021, over 2 billion people live in areas with water stress², and the world will face a global water deficit of 40% by 2030 (UNESCO World Water Assessment Programme, 2021).

Human-induced pressures on water resources include withdrawals for agriculture (UNESCO, 2021), rapid population growth and urbanisation, and changes in consumption patterns and pollution as the living conditions improve (International Centre for Water Security and Sustainable Management, 2019) [ICWSSM, 2019]. Per capita domestic water consumption in cities where more than half of the world's population lives is generally higher than that in rural areas, and as urbanisation increases in Asia and Africa, urban water demand is expected to rise further.

Development of water resources for economic growth, social equity and environmental sustainability will be closely linked with water use in agriculture and human habitations, especially cities.

Sustainable water management must address not only the way we use water, but also climate change that has introduced variability in rainfall and replenishment of freshwater resources, changes in land use and in surface and groundwater regimes that hold water. Water resources planning and management requires an ecosystems perspective, considering long term sustainable development goals of restoring and maintaining planetary boundaries.



¹ Globally, about 70 per cent of freshwater use is for agriculture, 19 per cent for industry and energy sectors, and about 11 per cent for the domestic sector (Ritchie & Roser, 2017). South & East Asia and the Middle East have higher proportions of land under irrigated agriculture, while the United States is the largest user of industrial water (over 300 billion m³ per year), more than double of the quantum used by China, which is the second largest user (140 billion m³ per year) (Ritchie & Roser, 2017).

² The World Resources Institute categorises water stress as low water stress (if withdrawals are less than 10 percent of resources then a country has); low-to-medium stress (10-20 percent); medium-to-high (20-40 percent); high stress (40-80 percent); and extremely high stress² (withdrawals are greater than 80 percent of the country's resources) (Gassert et al., 2013; Ritchie & Roser, 2017).

UN-Water, the United Nations' inter-agency coordination mechanism for all water-related issues, defined³ water security as:

“The capacity of a population to safeguard sustainable access to adequate quantities and acceptable quality of water for sustaining livelihoods, human wellbeing, and socio-economic development, for ensuring protection against waterborne pollution and water related disasters, and for preserving ecosystems in a climate of peace and political stability.”

Freshwater sustainability is one of the most important sustainable development challenges because economic, social and environmental development are dependent on water security. Conversely, social, environmental, and economic risks increase with a lack of water security.

It is not only a question of the physical scarcity of water; water security is deeply rooted in power, poverty, and inequality. To achieve water security, we must protect vulnerable water systems, mitigate the impacts of water-related hazards such as floods and droughts, safeguard access to water functions and services, and manage water resources in an integrated and equitable manner (ICWSSM, (2019). The UN

Sustainable Development Goals explicitly refer to water in Goal 6, Clean Water and Sanitation, but in fact, water security is fundamental to achieving any kind of sustainable economic and human development.

Water security is linked to the biophysical context, and has infrastructural, institutional, political, social and financial dimensions. Addressing water security, therefore, requires interdisciplinary and multi-actor collaboration across sectors, communities and political borders, so that the potential for competition or conflicts over water resources, between sectors and between water users or states, is mitigated and water resources, their conservation, enhancement and use are sustainably managed.

Improving water security is essential for the basic health, livelihood and wellbeing of India's population, food security, and economic growth. The finiteness of existing water resources, increasing urbanisation, industry demand for water, pollution of surface water and groundwater resources and inefficient use are challenges that the country must address.



³<https://www.unwater.org/publications/water-security-infographic/>

Key challenges to water security in India

Finite sources

India has 18 percent of the world's population but only 4 percent of the world's renewable water resources (Kumar, 2021). Natural water availability is highly varied across the country. Moreover, the per capita water availability in India has been declining and is projected to reduce to 1,340 cubic metres by 2050, much below 1700 cubic metres per capita, recognized as the threshold for water shortage (Kummu et al., 2016).

India with an annual groundwater draft of 253 BCM, is the largest groundwater user in the world. While India has a major dependence on groundwater, its availability varies between regions. Over extraction and inefficient use has led to declining water tables, especially in the north-western parts of India. For example, Gujarat where groundwater irrigation contributes to over 90 percent of livelihoods in the farm sector, water availability is a concern.

An analysis by the Indian Council for Research on International Economic Relations (ICRIER) of data from the Central Groundwater Board showed that the peninsular region of India has about 41 per cent of the total wells and 43 per cent of deep tube-wells (Gulati et al., 2019). This region has hard rock aquifers with poor groundwater storage and yield capacity.

Nevertheless, the overall groundwater development in the peninsular region states Karnataka, Telangana, Andhra Pradesh, Maharashtra, except for Tamil Nadu is in the safe zone. However, over-exploited blocks are in the states of Punjab, Haryana, Rajasthan and western Uttar Pradesh which are the same states which produce surplus food for the country. It is especially worrying that Punjab, Haryana, and Rajasthan extract more groundwater than is annually replenished (Gulati et al., 2019).

Also in Maharashtra, water tables have gone down by over 4 metres (Dhawan, 2017). Especially vulnerable regions are the coasts and arid and semi-arid tracts.

India's long coastline is a hub for many economic activities, with major cities and about one-fourth of the population located here. The aquifer systems along the coast are increasingly facing the challenge of seawater intrusion and salinity ingress, already seen in Gujarat and Tamil Nadu (Dhiman & Thambi, 2010).

In a business-as-usual scenario, there will be a serious gap between the availability and requirement for freshwater in India (Kumar, 2021). Several regions in the country have already been increasingly facing chronic water stress. Water scarcity, poor water quality and lack of adequate access to sanitation are major causes of ill health, especially among poorer communities, impacting well-being. Women tend to bear the brunt of water scarcity and poor-quality water. Declining water tables imply increased costs of pumping (and increased energy use), salinization of farmlands, and crop and revenue losses for farmers, and acting as a significant constraint on economic growth (OECD, 2014).



Rising demand, beyond replenishment

The demand for water in India is expected to rise beyond supply and replenishment in the coming years.

In India, the industry sector is the second-highest consumer of water using both surface and groundwater. Industrial units tend to depend on groundwater more as surface water supply from municipal sources is not sufficiently guaranteed. With the pace of industrial growth, the demand for water has also increased, especially in water-intensive industries. The World Bank estimates that the current industrial water use in India is about 13 percent of the total freshwater withdrawal in the country and the water demand for industrial uses and energy production will grow at a rate of 4.2 per cent per year, rising from 67 billion cubic metres in 1999 to 228 billion cubic metres by 2025. All these estimates reveal that the industrial water demand is not negligible in India and that it is bound to grow in the coming years (Aggarwal & Kumar, 2011).

Pollution

The scarcity of water is compounded by pollution of ground and surface water from sewage and waste material. Over the years, surface water bodies including rivers, lakes, wetlands, wells have deteriorated in quality owing to neglect and misuse. Pollutants in the form of sewage, solid waste, chemicals from fertilisers in the surface runoff that falls into these water bodies cause contamination. Overall availability of freshwater gets further reduced owing to these reasons. "In many parts of the country, large stretches of rivers are both heavily polluted by untreated industrial effluents as well as municipal sewage and devoid of flows to support aquatic ecology, cultural needs, and aesthetics. This is affecting the availability of safe water besides causing environmental risks and health hazards" (Ministry of Water Resources, 2012).

The industries' share of freshwater consumption increases manifold when the quantum of pollutants discharged into water resources is considered. Therefore their "share of water use increases by 35-50 percent of the total water used in the country and not the 7-8 percent that is considered as the industrial water use...Relatively clean or reusable water polluted by industrial effluents renders this unfit for irrigation or other consumption and effectively represents a consumptive loss" (Aggarwal & Kumar, 2011).

Inefficient use

The National Water Policy (NWP) 2012 highlights that the existing irrigation infrastructures are inadequately maintained and poorly managed. This leads to wastage and under-utilisation of available resources and there is a widening gap between the irrigation potential created and utilised (Ministry of Water Resources, 2012). NITI Aayog's Comprehensive Water Management Index⁴ 2019 shows that 16 of 27 states in India have poor water management. Collectively, these states account for ~48% of the population, ~40% of agricultural produce, and ~35% of the economic output of India. States such as Uttar Pradesh, Rajasthan, Kerala, and Delhi, are among the top 10 contributors to India's economic output, but have poor water management, indicating risks to economic growth, employment, and livelihood opportunities. Food security is also at risk, as eight of the top ten agriculture producer states are not yet managing their water resources effectively (NITI Aayog, 2019).

Cropping patterns and selection of crops are a major challenge when it comes to water security. Water intensive crops such as sugar cane in water stressed areas are taking up a large share of water resources which could be diverted to drinking water. Adding to these are faulty irrigation practices of flood irrigation by farmers. Subsidies on power to farmers in some states, and the encouragement to use solar pumps somehow incentivises them to use more and extract more groundwater. The analysis by Gulati et al (2019) showed that Punjab has the highest level of electricity subsidy per hectare of

⁴The Comprehensive Water Management Index 2019 (CWMI 2019) published by the Niti Aayog categorizes states based on the hydrological context and status of groundwater and surface water restoration, major and medium irrigation, watershed development, participatory irrigation management, on-farm water use, rural and urban water supply, and policy and governance (NITI Aayog, 2019).

groundwater irrigated area, followed by Tamil Nadu, Rajasthan and Maharashtra. The combination of electricity subsidy, and minimum support prices for paddy and fair and remunerative prices for sugarcane leads farmers in these states to cultivate these crops that require large quantities of irrigation, despite the prevalent water stress conditions. The analysis further shows that if the subsidy that acts as a behavioural driver is modified, such as through reimbursement after the full cost has been paid by the farmers, the propensity of over-extraction of groundwater can be mitigated. (Gulati et al., 2019).

Around 84 percent of the groundwater is used in agriculture irrigation. Yet, as highlighted by Niti Aayog, 52 percent of the cropped area remains without irrigation including some regions which are chronically water-stressed (NITI Aayog, 2019).

Urban water stress

Many urban areas face water stress and have both inequitable access and profligate use. It is predicted that over 50 percent of the population of India will live in cities in the next few years. Cities have been using groundwater along with surface water sources to cater to their growing populations. Many cities today are already water-deficient or water-stressed. According to the 2018 CWMI 2.0, twenty-one major cities including Delhi, Bengaluru, Chennai, Hyderabad and others were in danger of reaching zero groundwater levels by 2020 (“Har Ghar Jal,” 2021).

Peri-urban areas increasingly face the pressure of water availability and supply and depend on groundwater for all their needs in areas not served by the Municipal Corporations or State Governments. Major urban centres to support their growing needs, have also appropriated water sources meant for traditional livelihood and communities living around the sources, creating inequitable availability of a necessary resource, and potentially leading to conflicts (Abdul & Sattar, 2011).

Climate change

The temporal and spatial variations in rainfall are increasing with climate change. The National Water Policy 2012 had cautioned that climate change would aggravate the water availability crisis as well as floods, droughts, and high erosion (Ministry of Water Resources, 2012).

Findings of the study on Climate Change impacts on water by the Indian Institute of Tropical Meteorology (IITM) suggest that the hydrological cycle is predicted to be more intense, with

higher annual average rainfall as well increased drought. There is a predicted increase in extreme rainfall and rainfall intensity and the intensity of daily rainfall is also predicted to increase in certain areas. (Krishnan et al., 2020).

Governance

A review by the Mihir Shah Committee, tasked with the drafting of the National Water Policy 2020, cautions that India's water crisis is grave and exacerbated because of the unpredictability associated with climate change impacts (Ideas4India, 2022). The overall emphasis has been on the supply side management of water and only recently are some shifts being made in implementation towards the demand-side. The NWP 2012 had already pointed out that groundwater continues to be perceived as an individual property rather than a community resource. Its extraction and exploitation continue inequitably and without consideration for its sustainability and without adequate understanding of the variations in underground water quality (Ministry of Water Resources, 2012). While the earlier national policies have presented the need for progressive governance, in the absence of a dedicated mechanism for their implementation, monitoring and assessment, these policies have tended to suffer neglect. The need to shift water management away from construction and extraction towards the management and distribution of water, though now better understood, awaits stronger implementation.

There seems to be a lack of integrated planning, convergence and coordination among government programmes and schemes including those for irrigation, drinking water, agriculture, and others. Sometimes the need for water in a particular sector is so great that longer term planning is

compromised for short term gains. Planning process may not consider the local context and status of water resources as it is often centralised at the state or central government levels. Knowledge about the status of water resources, available technologies and good practices is not readily available to the government officials at the district and block levels for them to use and integrate in planning. Government officials are not necessarily trained or know the tools and methods for community mobilization and gender inclusive water resources planning and management.

Though participation of communities in water management and governance is recommended in policies, updated information, and knowledge especially in the light of uncertainty due to climate change is not available to them and mechanisms for their participation in governance and management of water resources are not adequately evolved. Communities especially in the rural areas may be involved only in managing already planned systems, instead of in the planning of water security for their villages, and making the shift to equitable, sustainable use.

With the installation of centralized water supply systems, there is a gradual erosion of the knowledge and management systems of local water resources.

In urban areas, the scope for participation is almost non-existent at the implementation level. Most policy documents emphasise women's roles as being critical to water governance and management, though these are yet to get the importance they should.

Practitioners⁵ point out that the health and education sectors have cadres for outreach and last mile services, there is no such cadre for Water literacy, resource planning and management, which is the basis of health and economy to strengthen and support ground level implementation of programmes related to water.



⁵ Suman Rathod, pers. Comm. 1 April 2022

Government policies and programmes and water security

Mandate

Under the Constitution of India, water is a state subject, with the states' jurisdiction extending to 'water supplies, irrigation and canals, drainage and embankments, water storage, and water power' (Schedule VII, List II, Entry 17). These powers are, however, subject to the authority of the Centre to regulate the development of inter-state rivers and settle inter-state water disputes (Schedule VII, List I, Entry 56). The most important from the point of view of institutionalisation is the State Panchayati Raj Act. Minor irrigation, water management, and watershed development are included in the list of subjects in the Eleventh Schedule, which can be transferred to Panchayats if the State Government so notifies in terms of the State legislation, as several states have done. Similarly, water supply, public health, sanitation, and solid waste management are included in the list of subjects in the Twelfth Schedule which can be transferred to Urban Local Bodies (ULBs) (Vijay Kumar & Bharat, 2014).

Policy evolution

Traditional and locale-specific water resources management, with regular cycles of cleaning, repair and maintenance, and associated expertise and cultural practices were embedded in rural society (Mishra, 1993). While these eroded during the British regime, watershed development programmes adopted by the Government of India and various state governments have sought to again institute community-based systems over the last few decades. The NWP 2012 calls for a common integrated perspective to govern the planning and management of water resources, that considers local, regional, and national contexts and which is environmentally sound. The Policy clearly states that water needs to be managed as a common pool community resource that is held by the State under the public trust doctrine to ensure equitable and sustainable development for all. NWP 2012 emphasises that the service provider role of the State has to be gradually shifted to that of a regulator of services and facilitator for strengthening the relevant institutions. (Ministry of Water Resources, 2012).

Water policies have evolved over the last few decades with a greater understanding of water resources, use and management. The National Water Policy of the Government of India was first enunciated in 1987. The policy laid down an allocation prioritisation principle for water as Drinking Water, Irrigation, Hydro-power, Navigation, Industrial and other uses. The policy says 'The water rates should be such as to convey the scarcity value of the resource to the users and to foster the motivation for the economy in water use. They should be adequate to cover the Annual Operation and Maintenance (O&M) Charges and a part of the fixed costs of irrigation works. Efforts should be made to reach this ideal over a while ensuring assured and timely supplies of irrigation water. The National Water Policy, 2002 gave importance for the first time to ecological and environmental aspects of water allocation and re-prioritised allocations as drinking, irrigation, hydropower, ecology, industries, navigation, and other uses. The National Water Policy 2012 prioritises water for drinking and domestic needs, irrigation and "minimum ecological needs" on an equal and "high priority" while introducing the concept of minimum ecological needs and that these need to be given a high priority allocation.

Watershed development

State government programmes on watershed development and rainwater harvesting, combined with the Mahatma Gandhi Rural Employment Guarantee Act (MGNREGA) have helped develop rural water assets. Among the most widespread programmes for water resources enhancement in India is the watershed development programme. These have focused on micro watershed planning and management with community participation since the late 1980s. The physical measures include building rainwater harvesting structures including gully plugs, check dams and percolation tanks, desilting streams, farm ponds etc. It is also now understood that groundwater is the major supplier of water for both drinking water and irrigation in the country, while over 50 per cent of agriculture is still rainfed. Water conservation and decentralised rainwater harvesting are thus critical for productivity and wellbeing (Narain, 2021).

A report on watershed programmes in three states in India that were implemented with support from the World Bank has found many gains from the approach such as decentralised participatory, evidence-based planning, capacity building, and linking conservation efforts to livelihoods. However,

the report also highlights that the programmes must focus not only on the rural development and livelihood needs but also on water resources objectives. The extra water available from watershed programmes has generally been used for irrigation at the cost of drinking water and sanitation needs (Smyle et al., 2014).

A national program on spring shed development to revive 3 million springs across 10 states of the Himalayan region has been under consideration since 2019. The resource book on springshed management developed by NITI Aayog and International Water Management Institute (IWMI) adopts a Gender-Equity-Socially Inclusive (GESI) framework for the implementation for improved benefit sharing and sustainability. The GESI framework was first proposed by UN-Women Nepal's working group, a strategy in achieving equal opportunities for the different segments of society based on theories of "inequality and exclusion" (Ravandale, 2022).

Climate change and National Water Mission

The Government of India's National Action Plan on Climate Change (NAPCC) launched in June 2008 includes the National Water Mission⁶ which has as its main objective the "conservation of water, minimising wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management". The eight missions in the NAPCC including the National Water Mission (NWM) and the National Mission on Sustainable Agriculture highlight an integrated approach towards mitigating climate change challenges, and an understanding of the interlinkages between sectors. The NWM has been envisaged as a strategic policy imperative to support water conservation and management (Ministry of Jal Shakti, n.d.-c).

The National Mission on Sustainable Agriculture focuses on location specific improved agronomic practices through soil health management, enhanced water use efficiency, judicious use of chemicals, crop diversification, progressive adoption of crop-livestock farming systems and integrated approaches like crop-sericulture, agroforestry, fish farming, etc. (Ministry of Agriculture and Farmers Welfare, n.d.).

Consolidation and integration of governance

Scientific management of water is increasingly recognized as being vital to India's growth and ecosystem sustainability. As an effort to ensure water security and effective governance and to consolidate interrelated functions pertaining to water management, the Government of India formed the Ministry of Jal Shakti in 2019 by merging the Ministry of Water Resources, River Development & Ganga Rejuvenation, and Ministry of Drinking Water and Sanitation.

"The Government launched Jal Jeevan Mission (JJM) in August 2019 to provide Functional Household Tap Connection (FHTC) at the rate of 55 litres per capita per day (lpcd) to every rural household (Har Ghar Nal Se Jal- HGNSJ) by 2024. It also implements source sustainability measures as mandatory elements, such as recharge and reuse, through greywater management, water conservation, and rainwater harvesting. The Jal Jeevan Mission (JJM) is based on a community approach creating a jan andolan (people's campaign) for water, thereby making it everyone's priority. It recognizes the key challenge of ensuring sustainability of the water supply system so that the focus is on sustainability of water flow in the pipes and taps and not just on infrastructure provision. It recognises the importance of engaging women at all levels of decision-making processes including planning, implementation, management, operation, and maintenance of rural drinking water supply schemes for long-term water security in villages". ("Har Ghar Jal," 2021).

The launch of Jal Jeevan Mission (Urban) was announced for universal water supply in all 4,378 Urban Local Bodies with 2.86 crore household tap connections, as well as liquid waste management in 500 AMRUT cities to be implemented over 5 years. Urban Swachh Bharat Mission is underway, to be implemented over 5 years from 2021-2026 (Prabhu, 2021).

⁶National Water Mission <http://nwm.gov.in/?q=objective-national-water-mission>

The Ministry launched the Jal Shakti Abhiyan - a campaign for water conservation and water security in 1592 water stressed blocks in 256 districts - to ensure five important water conservation interventions. These include water conservation and rainwater harvesting, renovation of traditional and other water bodies/tanks, reuse, bore well recharge structures, watershed development and intensive afforestation. These water conservation efforts are expected to be supplemented by special interventions including the development of Block and District Water Conservation Plans, and promotion of efficient water use for irrigation and better choice of crops through Krishi Vigyan Kendras (KVKs).

The Government of India launched the Catch the Rain campaign in March 2021 with the tagline “Catch the rain, where it falls, when it falls” to nudge the states and stakeholders to create appropriate Rainwater Harvesting Structures (RWHS) suitable to the climatic conditions and subsoil strata before monsoon. These include check dams, water harvesting pits, rooftop Rainwater Harvesting Structures, removal of encroachments and desilting of tanks to increase their storage capacity, removal of obstructions in channels bringing water from the catchment areas, repairs to step wells, using defunct borewells and unused wells to put water back to aquifers, with the active participation of local communities. Technical guidance centres at the district level in the form of “Rain Centres” with trained personnel and dedicated helplines are envisaged to be set up as a part of this campaign (Ministry of Jal Shakti, n.d.-a). Awareness and education form a crucial component of the strategy for the campaign involving building capacity of PRIs, schools, and youth in the community. UNICEF and CEE have developed an online training resource which is available on the Government of India's DIKSHA portal.

Groundwater programmes

The common pool nature of groundwater and the difficulty of observing it directly make this resource difficult to monitor and regulate. The Central Water Commission (CWC) and the Central Ground Water Board (CGWB) develop tools and guidelines for state governments and local level conservation and management of water resources.

The Ministry has developed a Model Bill to facilitate the enacting of groundwater legislation covering its management including augmentation through rainwater harvesting. This legislation has been adopted and implemented by 19 States and Union Territories (UTs). The CGWA constituted under Section 3 (3) of the “Environment (Protection) Act, 1986” to regulate and control groundwater development and management in the country has advised States and UTs to take measures to promote and adopt artificial recharge to groundwater and rainwater harvesting wherever feasible. The latest guidelines for control and regulation of groundwater extraction with pan-India applicability was notified by the Ministry in September 2020. CGWB prepared a Master Plan for Artificial Recharge to Groundwater in 2020 in consultation with States/UTs. This is a macro-level plan indicating various structures for the different terrain conditions of the country including estimated cost. The Master Plan envisages construction of about 1.42 crore Rainwater harvesting and artificial recharge structures in the Country to harness 185 billion cubic metres (BCM) of monsoon rainfall. CGWB developed an Aquifer Mapping and Management Programme during the XII Plan, under the scheme of Ground Water Management and Regulation. The Aquifer Mapping is aimed to delineate aquifer disposition and their characterization for preparation of aquifer/ area-specific groundwater management plans with community participation. The management plans are shared with the respective State governments for taking appropriate measures/implementation (Ministry of Jal Shakti, n.d.-d).

The Atal Bhujal Yojana was launched in December 2019 for sustainable management of groundwater with community participation and demand-side interventions in identified water-stressed areas in 8,353 Gram Panchayats in 78 districts of seven states - Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh in the country (Prabhu, 2021).

Intersectoral convergence

The interconnectedness of water issues with several aspects from agriculture, food to livelihoods and quality of life, calls for convergence and a multidisciplinary approach. Over the years, the focus on convergence is visible across policies.

The Ministry of Rural Development in consultation and agreement with the Department of Water Resources, Rural Development and Ganga Rejuvenation and the Ministry of Agriculture and Farmers' Welfare has developed an actionable framework for Natural Resources Management (NRM), titled 'Mission Water Conservation' to ensure synergies in Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Integrated Watershed Management Programme (IWMP) now a component of the PMKSY and Command Area Development & Water Management (CADWM), given their common objectives and programmes such as water conservation and management, water harvesting, soil and moisture conservation, groundwater recharge, flood protection, land development, Command Area Development & Watershed Management.

The Central Government supports the construction of water harvesting and conservation works primarily through Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) and Pradhan Mantri Krishi Sinchayee Yojana Watershed Development Component (PMKSY-WDC).

A joint advisory of Department of Rural Development (DoRD), Department of Water Resources, RD & GR (DoWR, RD & GR), Department of Land Resources (DoLR) and Department of Drinking Water & Sanitation (DoDWS) has been issued in April 2020 to all States/UTs to emphasise efforts in water conservation and water management in the country. The activities include augmentation of existing water sources(s), groundwater recharge, rainwater harvesting and greywater management and recharge.



The Model Building Bye-Laws

(MBBL) 2016 circulated by the Ministry of Housing & Urban Affairs include provisions for Rainwater Harvesting. These have been adopted by 32 States / UTs so far.

Addressing river pollution

The Government of India initiated river pollution abatement programmes in 1985 with the launch of the Ganga Action Plan (GAP-1). A National River Conservation Plan (NRCP) came into being in 1995 to include all major rivers of the country. NRCP's role is to reduce pollution load in rivers and improve their water quality through a variety of pollution abatement measures in conjunction with the States. This includes setting up of Sewage Treatment Plants, diverting sewage from flowing into rivers, construction of low-cost sanitation toilets, electric crematoria to reduce water pollution in the rivers (National River Conservation Directorate, n.d.).

In 2014, the Ministry of Water Resources, River Development and Ganga Rejuvenation launched the Namami Gange programme as a separate focused initiative for effective abatement of pollution, conservation, and rejuvenation of the river. Along with a focus on developing new and strengthening existing infrastructure, initiating afforestation, the Namami Gange programme aims to restore endemic and endangered biodiversity of the river through involving scientific institutions, involving communities in conservation and protection, training a cadre of volunteers 'Ganga Praharis', and developing a floating

interpretation centre 'Ganga Tarini' and interpretation centre 'Ganga Darpan' to create awareness on biodiversity. (Ministry of Jal Shakti, n.d.-b)

Water conservation and judicious use

The Government has launched several campaigns and instituted awards as a part of incentivizing efficient and judicious use of water and popularising water conservation among people. The Ministry compiles best practices of water conservation by organisations, state governments, private entities, individuals on its website in an effort to share and motivate adoption, adaptation and scaling up of innovative approaches to water conservation and management. Niti Aayog has compiled a Compendium of Best Practices in Water Management⁷ (NITI Aayog, 2021).



⁷The compendium is available at https://www.niti.gov.in/sites/default/files/2021-11/Compendium-of-Best-Practices-in-Water-Management_03-11-2021_compressed.pdf

Case Studies

There are many innovative approaches adopted by the state governments, NGOs, CSR bodies, and individuals for achieving water security at the village level. The paper presents some examples that are possible to implement and integrate into the national water policy and implementation programmes.

Bhujal Jankar help village panchayats to ensure Participatory Groundwater Management - an initiative by Arid Communities & Technologies (ACT), Bhuj, Kachchh

ACT came up with this initiative in 2004 to build a cadre of youth or Bhujal Jankar from villages, who understand the principles of Groundwater Management and its connection to agriculture. The youth are trained to build their perspective as well as a variety of skills to undertake baseline surveys and hydrological monitoring; carry out participatory action research pilots with selected farmers; monitoring visits to demonstration plots; create a database for results of pilots. The Bhujal Jankar can become Technical Arms of the gram panchayats to undertake and oversee water related works to be implemented through different schemes in the village; to collect and update groundwater data from observatory wells to monitor groundwater level; to provide and update the information required for digital display board; help facilitate Participatory Groundwater Management (PGWM) committee to develop norms and protocols; to facilitate crop water budgeting exercise in each agriculture season and to monitor its effective execution on farmers' field, and provide services to farmers on groundwater-related issues. Panchayats can employ Bhujal Jankar covering their remuneration from the grant/funds received from different government schemes to be implemented in the village and the panchayat can also allocate some amounts from its own funds. This initiative has been effectively implemented over several projects of ACT and where it has been a consultant.

In the MGNREGS, there is a provision for "Barefoot technicians" to be trained by a designated institute through a 90 days certificate course. The person enrolled and trained under this training gets a certificate that enables him/her to get supervision work to be undertaken from MGNREGA schemes. Trained Barefoot Technicians can be employed by gram panchayats to supervise works to be executed in the village. There is also a provision for his/ her remuneration under the scheme. Panchayat can enrol the Bhujal Jankar trained under this project for such training to get them recognition as Barefoot Technicians and can employ them. (Arid Communities & Technologies, n.d.)

Water Stewards - Champions of Good Governance - an initiative by WOTR

Watershed Organisation Trust (WOTR) launched the Water Stewardship initiative (WSI) in 2016 to promote and implement climate-smart water governance in semi-arid regions. This has helped in the efficient use of water that is socially equitable, environmentally sustainable, and economically efficient with a focus on demand-side management.

One of its initiatives using the WSI is being implemented in 41 villages in two regions of Jalna and Ahmednagar district in Maharashtra with support of CAF India. Several stakeholder-engagement workshops, aquifer level workshops and training on organic farming were conducted to train the Village Water Management Team (VWMT) to prepare Stewardship Plans (Water Health Chart, Water Budget, Water Harvesting and Water Use efficiency plan). VWMT members took forward the process for the implementation of these plans at the village level. Water budgeting, participatory aquifer management, promotion of vermicompost for improving soil fertility, enhancing water holding capacity, repair and maintaining existing water harvesting structures, and promoting micro-irrigation systems for efficient use of water are few key components of this initiative.

All these efforts resulted in institutional building, in demand-side water management as well as awareness among the villagers on water issues. Incentives and motivation measures were adopted to appreciate villages who demonstrate action. These awards were decided through a participatory peer assessment across components such as a) governance and institutions, b) supply-side management, c) demand-side management, d) and equity and sustainability. Implementation of the water budget and water use efficiency were also focused in the assessment process. (Dahale, 2021)

Community Roof Rain Water Harvesting - Srujal Project implemented by CEE supported by Baxter Pharmaceuticals in Peri-urban Ahmedabad

Navanagri is a hamlet of 25 families belonging to the Scheduled Caste community, situated around 5 kms from the Vasna Chacharwadi main village in Sanand, Ahmedabad. These 25 families did not have access to drinking water supply from the village, owing to their location. They brought drinking water from an RO plant of a nearby company. Sometimes, they also used the borewell of the nearby Chacharwadi temple to fetch drinking water. For domestic use, community members brought water from another company. However, the supply was limited. The travelling of communities to bring water from distances resulted in wastage of quality time for the women, which could be used for other important work. During summers, this travel for drinking water increased.

As part of the Srujal project, a 1.96 lakh litre capacity, community based roof rainwater harvesting system was constructed by CEE, as a reliable and economic option to meet the demand of Navanagri residents. The system connected some of the flat roofs in the settlement to the RRWH collection system. Participatory community-based water management mechanism was put in place putting women in charge of the system, who evolved the rules and regulations for collection and management of the system.

Reviving a water percolation tank in Pune

The Pune Municipal Corporation has recently made efforts to revive a water percolation pond. The management of streams and wells has been neglected over time as the area is urbanising. Road Department officials came across the pond during road construction work in the ward. The need for space for a footpath was extended into an opportunity for the revival of the percolation pond and the creation of a unique public open space around it. Springs, uncovered when the pond was de-silted, are now protected. A stone and sand filter has been created to receive and harvest rainwater run-off from the now built-up neighbourhood. The recharge wells enable percolation into the deeper aquifer when the pond is full during the monsoons and the effort has already shown results with improved groundwater availability in the area. (Menon, 2022)

Community water management in Bengaluru

Rainbow Drive is a private gated residential area in Bengaluru. The city's water utility has not been supplying water to Rainbow Drive which has been completely dependent on borewells. Groundwater levels have been falling in this area of the city since the 2000s leading to water scarcity. The plot owners' association has responded by involving the wider community to address water waste, rainwater harvesting and groundwater recharge, wastewater treatment and re-use to reduce the extraction of groundwater. With these measures, the layout has been successful in rainwater recharge more than the withdrawal. The experience has shown that such measures can be taken up by the community in a decentralised manner. (Krishnamurthy, 2017)

Women take lead in promoting Millet based agriculture

The Deccan Plateau region of India is a semi-arid tract. In Zaheerabad, the Deccan Development Society Farming is rainfed. Traditionally communities in this area were involved in biodiverse millet farming, a crop that is climate resilient and hardy, needing little rain, no irrigation, and no pesticides. Traditionally grown biodiverse millets can provide superior familial nutrition, with higher amounts of essential nutrients than rice, wheat, and other cereals. Traditional millet-based farming systems contain a variety of different crops growing on the same plot, as demonstrated by the Pannendu Pantalu cropping system used in the Deccan Plateau region. This system grows millets in combination with pulses, oilseeds, and uncultivated greens, which provide critical micronutrients for families. Millet cropping systems faced a decline with the introduction of rice and wheat as a part of the Public Distribution System in India. To counter this challenge, the Deccan Development Society (DDS) organised Dalit women into women's groups or Sanghams and gain control over resources, promoting traditional and sustainable agriculture. Millets based agriculture is central to this strategy leading to improved food, nutrition, and water security. (UNDP, 2021)

Celebrating the role of hill women in spring sheds

Hill women have been leading efforts at reviving forest, water, and springs in the Himalayan region of India. The women from Nagaland could revive 99 springs in collaboration with North East Initiative Development Agency (NEIDA) and state government, the women from Uttarakhand must have revived more than 1000 springs in collaboration with organisations such as People's Science Institute, CHIRAG, Himmothan, ACWADAM, and BAIF Development and Research Foundation, Pune. Women have been organised into Pey Jal Samiti in collaboration with existing Van Panchayat Samitis to lead efforts of conservation, inclusion and equitable distribution of water. Their interventions include participatory hydrogeological studies to identify recharge areas, soil water conservation techniques on recharge areas, community-based data monitoring systems, setting up social protocols to conserve and protect the area, and benefit-sharing protocols for equitable water distribution. (Ravandale, 2022).



Recommendations

Institutional reform at the national level for integrated and conjunctive planning and management of surface and groundwater is imperative. Currently, the National Water Policy of 2012 is applicable. The draft new water policy prepared by the Mihir Shah committee awaits further deliberation and finalisation by the central government.

The draft Water Policy 2020 during its formulation undertook a consultative process involving multiple stakeholders. It recommends a shift of paradigm that has governed water in India from the supply side to demand side, from construction and extraction to management and distribution, from command and control over nature to redefining our relationship with nature through nature-based solutions to move away from high-risk agriculture. It is also cognizant of the increasing complexity of the water crisis in the context of climate change and the need for flexibility, resilience to be built into water management. The draft policy recommends intersectoral convergence, crop diversification in line with agro-ecology, diversification of crop portfolio to include nutri-cereals, pulses, and oilseeds, making nutri-cereals and millets as a part of ICDS and mid-day meal schemes. There is an emphasis on people's participation especially those of women in water governance and management and the need to learn from and strengthen Water Users' Associations, Participatory Irrigation Management and other structures, emphasising that implementation be done by communities and facilitated by the government. It makes suggestions on wastewater treatment and reuse especially in cities using bioremediation technologies and building capacities of urban water bodies to make prudent technology choices. It recommends merging the CGWB and the Central Water Commission into a National Water Board, bringing in varied expertise including primary stakeholders at the same table. In terms of implementation of policy which has been a concern with the earlier policies, a dedicated Task Group for monitoring to be chaired by CEO, Niti Aayog is recommended (Ideas4India, 2022).

It is expected that the draft policy, once formally adopted and implemented, will be transformative, facilitating the strengthening of institutional mechanisms, building knowledge and keeping people's participation at the centre of development, especially those most affected by scarcity, inadequate access and voice in water management. In parallel to country-level policies and programmes, India has a wealth of innovation and experience in bottom-up local approaches. Going forward, while country and state level policy reform will be instrumental for India's water security, there is much that can be done with local initiatives involving users in ownership and management of water resources, and these can enhance local water security.

1. Multi-stakeholder and multi-level approaches, cooperation and convergence

Water security requires a holistic, multidisciplinary, multi stakeholder approach at multiple levels. Convergence of various government policies and programmes is acknowledged in policy but requires



to be implemented at the local government and user end. Water governance systems should recognise the role of multiple stakeholders including governments, academia, experts, private sector, farmers, women, civil society, NGOs, and international organisations and involve them in enhancing water security ensuring access to all equitably. Water governance systems must be strengthened through creating better and transparent mechanisms and institutions to facilitate vertical (among levels of government) and horizontal (among sectors) coordination and resolving of conflicts.

Convergence and synergy between existing community/ user group organisations such as Water User Associations, Village Watershed Committees, Pani Panchayats must be actively promoted. Young women and men can be involved and play an active role in water governance and management, data collection and management, and knowledge sharing.

2. Awareness, Education and Training

As a part of the Jal Jeevan Mission, Key Resource Agencies have been identified to conduct training on drinking water and sanitation, and the process for setting up local systems for functional household tap connections in line with the objectives of the JJM. These agencies drawn from expert groups and NGOs with experience in the water sector are conducting training at local, district and state levels. These would help rejuvenate and reinforce some of the key areas that should form a part of education and training strategies for the water sector. Building capacity of frontline workers through training and access to contextual knowledge, using digital media where available and possible, would enhance their ability to perform their roles better.



The training programmes must include the village level key stakeholders such as women, youth, water users' groups, pani panchayat members, pump operators and those involved in water management. Recognition and certification of the training received, and refresher courses would enable individuals to actively participate. CEE's experience in one of its projects near Ahmedabad, provided insights into the way pump operators can become water custodians and not just employees of the Panchayat, if trained and their role recognised.

A cadre of educators and a portfolio of educational materials, training methods and tools to support communities to develop locally-relevant systems understanding of water and their own action plans for water security may be developed, drawing on the experience of the JJM, the extensive watershed programmes and best practice examples from across the country.

Local cadres of community leaders can put in place community defined access and use rules and establish effective governance mechanisms to enforce these. Village community youth should be trained as para-hydrogeologists to support the gram panchayats in conducting water budgeting exercises, collect and manage data and monitor water levels in water structures, monitor water use.

They can also leverage various government schemes and support the gram panchayat in an integrated development planning process. Organisations such as WOTR and ACT have successfully demonstrated this approach. CEE as a part of the Jal Setu initiative has also created such a cadre with support of ACT in the project villages of Jasdan.

There is a need to facilitate peer-based learning and enable communities of practice to be created. An inventory of people trained, assets created, knowledge products developed, and data generated by any programme can be created and made accessible across programmes at the block and district level. A Gram Shiksha Kendra at village level could also play such a role. Corporate bodies could support setting up such centres.

We recommend that awareness and education efforts for water security and sustainable water management may be guided by approaches that inculcate “sustainable development competences” (UNESCO, 2017) among individuals and communities, and especially among community organisers, para-hydrogeologists, and frontline workers. Locale-specific frameworks for ESD for the water sector may be evolved, including for knowledge of local surface and groundwater resources and the water cycle, interconnections of water with food security, health, livelihoods, and pollution etc. Water related initiatives should seek to enhance public understanding of water as a social-ecological system with awareness about local water resources as a shared good. Processes that help express people's knowledge and supplement it with data and knowledge generated through government and other efforts should be part of ESD initiatives. Water budgeting can help to understand the local trends of water use, current and future gaps in access and availability. Further, community-based planning for equitable access and augmenting water resources, water conservation and demand side management need to be part of community awareness initiatives. Sharing inspirational stories and experiences can help envision and encourage the development and adoption of locally-relevant water security plans.

3. Scientific knowledge and local and traditional knowledge

The emphasis on scientific expertise and knowledge to inform the water sector along with a recognition of traditional knowledge and practices has been there in the water policy of 2012 and is there in the 2020 draft water policy as well. Use of satellite technology for mapping of water resources, technologies for desalination and waste-water treatment have been driving many of today's innovative approaches. This information needs to be made available at the block and village level in a form that is understood and used. The Rain Centres which are being set up at the district level as a part of the “Catch the Rain” campaign, could be equipped with such information materials and data sets. These could over a period also be set up at block levels to improve access for the communities.

Recognition and integration of traditional knowledge of water conservation and management can form a repository for contextual understanding and implementation of water conservation initiatives at the village level. Water security planning processes in the village should involve people with traditional and local knowledge of water resources and their conservation.

4. Coherence and coordination of data collection and access

Coordination mechanisms for aggregating disaggregated water-related data that is available within different government and other agencies can be strengthened especially from the context of its availability at the district, block, and village levels. Digital technologies can play an important role as is already demonstrated by the Composite Water Management Index and other platforms being created by the central and state government departments. Aggregation of data in ways and formats required to enable multiple stakeholders to act jointly, decisively to facilitate water security, is crucial. Also, the community's involvement and role in the data generation and collation process makes them actively participate in the way data is generated and used.

5. Decentralised, off-grid solutions to reach dispersed populations

Off-grid solutions for safe water access, water treatment technologies can be a potential answer to the issues faced by communities in remote rural or peri-urban areas. These can cover the gap between supply and demand taking some pressure off the water supply systems and reduce costs. Community-level and hamlet-based rainwater harvesting structures have been created by CEE in some of the peri-

urban areas near Ahmedabad to augment water availability and with management processes for equitable use.

Water kiosks for drinking water, decentralised wastewater treatment plants are a few of the technologies which can be encouraged along with the overall rural water supply programmes. Social entrepreneurs are driving the trend to leverage market-based solutions that are affordable and accessible to poor communities, seeing them not as a 'problem to be solved' but as 'customers'. Community processes that help to embed such enterprises as service-providers within a community-anchored water security plan, with members of the community acting as 'citizens' are necessary alongside.

6. Water Security and Ecosystem-Based Adaptation to Climate Change

Ecosystem-based adaptation strategies offer an opportunity to enhance water security, climate-resilient livelihoods, and social cohesion simultaneously, while also benefiting natural systems. Investments in nature-based solutions such as reforestation and riverbank repair can improve the quality of the water supply. This drives economic development while saving on water treatment costs. Nature-based solutions offer some of the most effective and sustainable ways to improve water security, and they frequently offer additional benefits for communities where they are implemented, including improved agriculture, job creation and climate resilience.

Guidelines for developing ecosystem-based approaches and adding these to their village development plans, MGNREGA implementation should be made available to the Panchayati Raj Institutions. Orientation of organisations, CSR groups, PRIs on ecosystem-based planning and nature-based solutions should be made a part of the training programmes being offered under the Jal Jeevan Mission.

7. Agriculture and water security

The New Water policy already mentions crop diversification, focus on nutri-cereals, oil seeds, and pulses, and crop selection based on the geohydrological context. These are critical

recommendations and would require changes in the demand for certain water intensive crops in the market and making them a part of the ICDS and the PDS as the policy recommends. While this may take some time, efforts through multilateral and CSR funding could support local shifts in cropping patterns, community grain banks, and mid-day meals in schools, and income to farmers who make the shift.

Supporting farmers through Farmers Producer Companies and other such grassroot level forums would help to enable this shift. An example for encouraging farmers to choose millets over other cash crops has been implemented by the Deccan Development Society in Zaheerabad, Telangana.



Improved water use efficiency can be achieved by shifting to micro irrigation methods which would be cost efficient as well besides increasing area under irrigation. Judicious use of solar pumps, and reviewing incentives provided to farmers in some states is needed to ensure water use efficiency in agriculture.

8. Water Pricing

The mindset about water being a replenishable resource which can be liberally used, needs to change. The pricing of water and/ or energy can help to do this. The aspect of pricing has been discussed and recommended since many years. The Water Sanitation and Management Organisation (WASMO) in Gujarat introduced a water management fee for every rural household being serviced. Metering of water and building capacities of pump operators and Panchayat members can help them understand the amount of water use and improve the efficiency. Water metres and pricing at the village level has been implemented by CEE in peri-urban areas near Ahmedabad. The initiative has resulted in a substantial amount of saving of water and electricity.



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