NATIONAL POLICY INTERFACE OF SDGS AND SUSTAINABLE AGRICULTURE

Goal 6. Ensure availability and sustainable management of water and sanitation for all

Agriculture is both a major contributor to and a victim of water scarcity. On average, 70% of the world's freshwater withdrawals are used for agriculture. By 2050, the FAO estimates that irrigated food production will have increased by more than 50%, but agricultural water withdrawals will only have increased by 10%, assuming better irrigation techniques and higher yields (FAO, 2017). As the primary cause of inland and coastal eutrophication, agricultural pollution from the use of nitrogen and phosphorus, insecticides, herbicides, fungicides, and bactericides has surpassed contamination brought on by cities and industry in many industrialized countries. As a result, there are toxic algal blooms, habitat degradation, biodiversity loss, and long-term decrease or loss in fish catches. Farm and agro-processing chemicals runoff into surface streams and seepage into aquifers, which pose threats to the environment and human health by groundwater contamination. According to research, globally, farmers apply around 115 million tonnes of nitrogen to their crops every year. Only around 35% of this is used by crops, meaning 75 million tonnes of nitrogen run off into our rivers, lakes, and natural environments (Ritchie, 2021).

India is the world's largest user of groundwater, with over 60% of irrigated agriculture and 85% of drinking water depending on this resource. The quality of groundwater is also influenced by the excessive use of fertilizers and pesticides for agricultural production and industrial activity (CBWG, 2021; World Bank, 2012). About 89% of total annual groundwater extraction, i.e., 217.61 bcm, is for irrigation use (CBWG, 2021). Recently, groundwater monitoring has shown elevated levels of uranium in several community water systems and private wells. As a result of subsidized/free electricity for pumping groundwater to support smallholder farmers, groundwater depletion has become a widespread issue (Mishra, et al., 2018). Groundwater depletion is a significant issue in Andhra Pradesh, Gujarat, Punjab, Karnataka, and Haryana (Devineni, Perveen, and Lall, 2022).

National Policy and Stakeholder Mapping

Policies	Stakeholders	Pre-Production	Production	Post-production
Jal Jeevan Mission (JJM)	• Ministry of Jal Shakti • Department of Drinking Water and Sanitation • Public Health and Engineering Department (PHED) • Anganwadi Centres • Village Water and Sanitation Committee	X	X	X
Swachhta Action Plan	• Ministry of Environment, Forest and Climate Change • Department of Drinking Water and Sanitation (rural) • Ministry of Jal Shakti (rural) • Ministry of Housing and Urban Affairs (urban)	X	X	X

Namami Gange Programme	• Ministry of Environment, Forest and Climate Change • National Ganga River Basin Authority • Central Water Commission • Central Public Health Environmental Engineering Organisation • Public Health Engineering Department	X		
Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)	• Ministry of Agriculture and Farmers Welfare • Department of Agriculture and Cooperation • Agriculture Technology Management Agency • Indian Council of Agricultural Research • National Rainfed Area Authority	X	X	
National Water Mission	• Ministry of Jal Shakti • Department of Water Resources • River Development and Ganga Rejuvenation	X	X	X
Atal Bhujal Yojana (Atal Jal)	• Ministry of Jal Shakti • Department of Water Resources • River Development and Ganga Rejuvenation • Central Ground Water Board • India Meteorological Department • National Water Informatics Centre • State Ground Water Resource Centre • Water Management Committee • Village Water and Sanitation Committee	X	X	X

Synergies and Trade-offs

Targets	Synergy	Trade-off
Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all		
Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations		

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping, and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally		
Target 6.4: By 2030, substantially increase 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		
Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate		
Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes		
Target 6.a: By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies		
Target 6.b: Support and strengthen the participation of local communities in improving water and sanitation management		

Through activities such as groundwater recharge and water purification, agriculture can positively impact the hydrological cycle (OECD, 2010). Sustainable agriculture can greatly aid in sustainable water management. By implementing practices such as drip irrigation and micro-irrigation, water conservation practices can be promoted in the agriculture sector. Moreover, sustainable agriculture practices promote the usage of bio-fertilizers and bio-pesticides that can have a huge impact on the prevention of underground and surface water contamination. Reducing synthetic fertilizer use has been linked with improved overall water quality, less eutrophication, and lower levels of surface water contamination. Furthermore, using organic wastes as fertilizers can increase the sustainability of fertilizers and reduce pollution (Bose, 2023).

Farmers can play a crucial role in expanding the world's food supply while preserving and enhancing natural resources, particularly water, in a sustainable manner. It is essential to encourage and guide farmers to conserve natural ecosystems and biodiversity while reducing the harmful environmental impacts of agriculture by implementing appropriate governance practices and incentives. Farmers are at the centre of any process of change involving natural resources (FAO, 2017).

A well-functioning international trade system would encourage nations to export or import items based on their endowment of natural resources. For instance, nations with limited access to water and land would be net importers of agricultural products provided by countries with abundant water resources. Such a system would be more likely to achieve an optimal utilization of both land and water resources (Nkonya, et al., 2023).

Gaps and Barriers

Water managers in arid regions globally, including the western United States, face significant challenges due to insufficient and inconsistent data on evapotranspiration and water use in irrigated agriculture (Melton, et al., 2021). The increasing demand for land and water resources driven by factors such as biofuels, urbanization, and industrialization, often crossing national

borders through globalization, are further straining the availability and quality of these resources for food production (Nkonya, et al., 2023).

Policies that regulate the use of on-farm water resources, particularly groundwater, typically involve licenses and regulations. However, these policies are not always enforced due to high transaction costs, leading to issues like groundwater degradation and illicit pumping (OECD, 2010). Climate change and variability pose threats to water supply reliability, flood risk, agriculture, energy, and ecosystems, with current water management practices potentially insufficient to address these challenges. Some countries have been slow to revise their agriculture and water policies to ensure sustainable resource management (OECD, 2010). With over 1.5 billion people living in areas where water resources are already over-allocated across various sectors, including agriculture, environment, urban, and industrial uses, and land and soil degradation are ongoing, regions like the North China Plains and Central Asia, which lack additional water for agriculture, face the challenge of enhancing land and water efficiency while preserving ecosystem resilience (Nkonya, et al., 2023).

To address the growing challenge of diminishing water resources for irrigation, there is a pressing need for effective technological advancements and resource management practices. These include adopting efficient irrigation systems and improved water utilization strategies (Sehgal Foundation, 2021). Given the intricate nature of agricultural water resource management, it is essential to strengthen institutional frameworks and property rights related to water management. Also, it is crucial to ensure that water supply costs are adequately reflected in charges and that policies spanning agriculture, water, energy, and the environment are aligned (OECD, 2010). G20 members can contribute by supporting international organizations that promote sustainable agricultural technologies. They can also increase awareness and adoption of these technologies to ensure a sustainable water supply for agriculture (FAO, 2017).

Furthermore, efforts should be directed towards assisting developing countries in water and sanitation programmes, especially by offering financial resources, capacity-building, and technology transfer, particularly in areas such as water-use efficiency, modern irrigation systems, wastewater treatment, and desalination for agricultural and industrial purposes. Policymakers should also focus on enhancing the resilience of the agricultural sector to water-related challenges, minimizing its impact on freshwater resources and improving the overall water-use efficiency. The OECD recommends a range of policy responses tailored to specific water resource systems.

Emerging Policy Solutions

Strengthening Atal Bhujal Yojna (ABY): One of the major contradictions in the policy is that it is committed to groundwater issues in water-stressed regions but leaves out states like Punjab and Bihar, where the water table is declining rapidly. As per a report by the Central Ground Water Board (CGWB), Punjab is one of the major contributors to both groundwater depletion and contamination. Hence, to tackle the problems of groundwater, it is crucial to add such states under the purview of the scheme.

On the front of groundwater contamination, Atal Bhujal Yojana undertakes ‘six-monthly’ monitoring of contaminants such as fertilizers, pesticides, and other toxic elements in recharging water, soil, or treated municipal wastewater that could be used for irrigation. There is also a provision for an independent audit of the scheme’s environmental performance. However, the scheme does not emphasize the treatment of contamination of groundwater by agricultural activities, which is one of the major sources of groundwater contamination. It

would be more effective to create a unified framework that addresses both issues simultaneously rather than treating them in isolation.

Comprehensive Water Management Strategies: To effectively manage water resources, it is imperative to implement inclusive approaches that involve all stakeholders. These strategies should prioritize sustainable practices such as agroforestry and animal husbandry while addressing water management challenges with innovative solutions. To prevent water blockages and environmental degradation, eco-friendly alternatives must be promoted. The focus should be on the promotion of integrated management of both surface and groundwater resources while also incorporating climate-resilient practices to adapt to changing environmental conditions.

Empowering Farmers: Empowering farmers is crucial for ensuring their interests are at the forefront of water management projects. This entails building trust through transparent communication and active community involvement. Farmers should have an active role in decision-making processes, and water management strategies need to be customized to address regional and local needs. Capacity-building and training programmes are essential to empower farmers and government staff. It is also crucial to equip farmers with the knowledge and tools they need to access markets and receive fair prices for their produce.

Efficient Resource Allocation: Efficient resource allocation can be achieved by retrofitting and upgrading existing infrastructure to ensure cost-effectiveness. Providing financial incentives and green credit facilities can motivate the adoption of sustainable practices. It is important to identify and support local leaders to drive community engagement. Proper utilization of allocated funds is essential for achieving water management project goals. Implementing metering and spatial science technology can aid in better resource allocation.

Community Engagement and Knowledge Sharing: Community engagement and knowledge sharing are crucial for successful water management initiatives. Sharing success stories and best practices not only inspires stakeholders but also guides them in the right direction. It is essential to create centralized platforms for data sharing and access can streamline information exchange among stakeholders. Maintaining coordination between relevant agencies and the Central Pollution Control Board (CPCB) is also vital. Additionally, promoting allied activities such as pisciculture, horticulture, and sericulture alongside traditional farming can enhance the overall income and resource use efficiency.

Climate-Resilient Practices: Given the challenges posed by climate change, it is imperative to incorporate climate-resilient practices into water management schemes. This involves taking into account the effects of climate change on water resources and ecosystems. ICT and IEC campaigns can raise awareness and promote climate-resilient practices. It is important to maintain regular coordination and updates between various agencies involved in water management to ensure effective adaptation to climate change.

Market Access and Income Diversification: To make agriculture sustainable, it is important to equip farmers with the skills and resources needed to sell their produce in the market and receive fair prices. This involves providing them with the necessary knowledge and tools. Promoting income diversification through activities such as agroforestry, animal husbandry, and non-farm ventures can improve overall economic stability and resource utilization.

Exploring Collaboration: Collaboration with civil society, local NGOs, and the Central Water Commission (CWC) can help mobilize resources, expertise, and community engagement for sustainable water management. Repairing and improving canal infrastructure is essential for efficient water distribution to farms and mitigating water loss due to leakage and evaporation.

Ensuring a consistent and efficient project cycle is crucial for the timely and effective implementation of water management projects.

The objective of *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY)'s Per Drop More Crop (PDMC) is to improve water-use efficiency on farms through micro irrigation via drip and sprinkler irrigation systems. However, attaining water efficiency can be identified as a separate component/mission under the NMSA scheme, which enables the government to give it more importance. The distribution uniformity parameter can be used to assess the evenness of water distribution across an irrigated field. Installation of soil moisture sensors can help farmers monitor soil moisture levels and irrigate only when necessary. This can help prevent overwatering and reduce water wastage. Monitoring the quality and quantity of water can also be included in the scheme and engaging farmers to identify water health can also be enhanced.

Strengthen Reporting on Metrics for Policy Design and Implementation

Some proposed metrics that could be monitored include:

- Convergence of schemes related to groundwater (in numbers)
- Budgetary allocation for schemes related to groundwater conservation (INR crores)
- Water-use efficiency in agriculture (litres/cubic metres/tonnes)
- Number of groundwater quality monitoring stations