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E-PAVAS

A Digital Decision Support Tool for Water Users' Associations

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India's water crisis

Agriculture consumes between 78 and 90 percent of India's water (depending on the estimate), with the state of Maharashtra exemplifying how unequally this precious resource is distributed. A [government report in 2015–2016](#) found that in Maharashtra, sugarcane – a water-intensive crop – accounts for about 70 percent of irrigation water though it covers only about four percent of farmland. This situation often excludes farmers at the tail end of water distribution systems, even though all farmland in a command area is legally entitled to irrigation. Because farms closer to the head of these irrigation systems access water more easily, distant tail-end farms get irregular supply, low pressure, or no water at all. This inequality is reinforced by laws linking water rights to land ownership, which exclude many agricultural workers from accessing surface irrigation.

In Maharashtra, most farmers lack access to surface irrigation systems, leaving them increasingly dependent on groundwater. Limited surface water, low adoption of soil and water conservation practices, and irregular, unpredictable rainfall patterns all contribute to this reliance. Consequently, groundwater reserves are being depleted, intensifying the risk of drought. A third of Maharashtra's regions now face chronic water scarcity. Meanwhile, the diversion of water from agriculture to urban areas and industries is igniting conflict over this essential resource, affecting both livelihoods and regional stability.

The problems of India's water sector reveal an urgent need to reform water governance by enhancing current policies, laws, and institutions – or creating new ones – to ensure that public irrigation systems are more equitable and sustainable. This policy brief introduces E-PAVAS, a digital app designed as a decision support tool for Water Users' Associations (WUAs) to improve efficiency, transparency, accountability, and participation. It also addresses the policy support needed for E-PAVAS to fulfill its potential and expand across Maharashtra.

»India is suffering 'the worst water crisis in its history'«

- ▶ Over 600 million Indians face high to extreme water stress
- ▶ 75% of households lack on-site drinking water
- ▶ 84% of rural households do not have access to piped water
- ▶ About 200,000 people die every year due to inadequate access to safe water
- ▶ By 2030, India's water demand is projected to be twice the available supply
- ▶ Approx. 6% loss of Gross Domestic Product due to water crisis (under business-as-usual scenario)

Source: Niti Aayog 2018

Potential of Participatory Irrigation Management to address irrigation

In the late 1980s, Participatory Irrigation Management (PIM) was introduced as a solution to problems of public irrigation. The 1987 National Water Policy advocated for this shift and proposed the formation of local WUAs (i.e., to manage minor canals each irrigating 500 to 750 hectares). WUAs exist at different levels of the irrigation system, from distributary to project levels. The aim is that eventually the management of the entire system, except for the dam and head works, can be handed over to the users.

PIM soon became part of public policy, with the establishment of pilot WUAs, such as Maharashtra's first WUA in Ahmednagar in 1988–1989, led by the NGO Society for Promoting Participative Ecosystem Management (SOPPECOM). Until now, 16 Indian states have enacted PIM legislation (either exclusively or as part of another act); Maharashtra, for example, passed the *Maharashtra Management of Irrigation Systems by Farmers (MMISF) Act* in 2005.

A key feature of the MMISF Act is the assignment of bulk water entitlements (or quotas) to each WUA. These are formalized through a memorandum of understanding signed by the WUA Chairperson and the Water Resources Department (WRD). The Act also promotes a shift from area-based water pricing to volumetric pricing, requiring WUAs to track and measure water usage for more efficient management.

The Draft National Water Policy (2020–2021) promotes PIM as an essential approach to addressing inefficiencies in public irrigation, including maintenance shortfalls, poor cost recovery, and unsustainable water use. This policy foresees WUAs managing tertiary-level canals, enabling better last-mile distribution, and encouraging agronomical practices such as water-saving to improve efficiency.



Demand-driven irrigation in Maharashtra

In Maharashtra, irrigation is driven by demand. Water users in a command area must request water each season, specifying the crop and area for each of the three cropping seasons (*kharif*, *rabi* and hot seasons). Currently, this process is manual – each WUA collects data, assesses seasonal demand, checks it against their water quota, and then plans water schedules accordingly.

In 2022, during a public review of the MMISF Act (2005), WUA leaders highlighted the need for a digital app to support WUA operations. SOPPECOM, participating in the review, endorsed this idea, recognizing that an app could streamline WUA tasks, lower costs, and improve transparency and accountability.

Supporting the functions of WUAs through E-PAVAS

SOPPECOM and Berlin-based TMG Think Tank for Sustainability developed and piloted an app – E-PAVAS – to improve the management of WUAs. The E-PAVAS app operates on two levels. First, it supports individual WUA members in the submission of water demand forms and in reporting problems such as water shortages or system breakages. Second, it assists WUA management through a Web interface that consolidates crop and seasonal water demand data, checks these against the WUA's water quota, and helps prepare irrigation schedules. The app notifies members of their water allocation schedules and generates records required for compliance with the MMISF Act, thus aiding with member-specific water tariffs, whether area-based or volumetric. E-PAVAS also serves as a communication channel, allowing WUA management to update members directly. The app complies fully with India's data protection laws.

E-PAVAS operates across individual WUAs, distributary federations, and project-level apex federations. Each WUA manages its data independently, while federations (groupings of WUAs) can access and analyze data across WUAs to generate broader insights. E-PAVAS simplifies demand submission, data processing, water scheduling, and user charges, enhancing transparency and accountability, and reducing transactional costs for both WUA members and management.

Results and farmer experiences with E-PAVAS

First launched in December 2023, the E-PAVAS app was piloted in two locations: Atpadi (Sangli District) and the Buddhihal Medium Irrigation Project (Solapur District). The most significant difference between the two models is that the Buddhihal project bases water entitlement on land area, while the Atpadi model is based on equity and volume.



Initial monitoring results indicate the utility of E-PAVAS:

- ▶ **Widespread adoption:** About 5,000 farmers have downloaded and actively use E-PAVAS. The app's simple interface makes it user-friendly, thanks to multiple login options on shared devices.
- ▶ **Ease of filing water demands and complaints:** Farmers can submit water demand and complaint forms directly via the app, eliminating the need for physical forms. This has improved convenience and reduced transaction costs.
- ▶ **Transparency and reliability:** The digital submission of forms means that requests go directly into the system, ensuring they aren't lost or overlooked. E-PAVAS makes WUA data, such as irrigation schedules, accessible and secure, reinforcing transparency.
- ▶ **Communication and updates:** The app is not merely a tool for submitting requests; it also updates farmers on irrigation rotation cycles and water allocation, keeping members informed and fostering a responsive management structure within the WUA.

Upscaling E-PAVAS: required policy and other support

Our on-the-ground experiences with the app shows that E-PAVAS could be scalable across Maharashtra. As a decision-support system, E-PAVAS can facilitate seasonal planning, monitor water use, and enforce usage quotas while ensuring the state Water Resources Department (WRD) meets its commitments. With its emphasis on community involvement and transparency, E-PAVAS has the potential to revolutionize water governance across the state.

The following policy actions are key to ensuring the successful use of E-PAVAS across Maharashtra:

Official endorsement: The WRD should formally endorse E-PAVAS as a state-approved app to encourage its adoption by all WUAs. By standardizing its use, the WRD can streamline irrigation project management, foster consistency in WUA practices, and set standards for robust data governance.

Incentives for adoption: The WRD could encourage the adoption of E-PAVAS by offering WUAs a five percent discount on water charges if they integrate it into their management practices. This incentive would encourage broader usage while reinforcing the WRD's commitment to digital transformation.

Digital infrastructure investment: The WRD should provide one-time financial grants of approximately ₹200 per hectare for each WUA service area to encourage adoption of E-PAVAS. This funding would help WUAs acquire essential tools, such as computers and internet connectivity. To make E-PAVAS operational, WUAs must gather accurate data on members while complying with data protection rules. Additional funding (of approx. ₹300 per hectare) should be allocated for WUAs to gather essential data and manage the digital system.

Training for WUA members and leadership: A year-long, phased capacity-building program would enable WUA members and leaders to fully leverage E-PAVAS. Training programs should focus on app functionality, data management, data privacy governance, and effective use of real-time information.

Engagement of NGOs: NGOs with expertise in WUA operations should be contracted at a rate of ₹250 per hectare to provide training and ongoing support. These organizations would be responsible for ensuring that WUA personnel are proficient in app usage and fully understand its capabilities.

State-level steering committee: The WRD should form a state-level steering committee, consisting of WRD officials, representatives of the four irrigation development corporations (IDCs), WUA representatives, and NGO members, to oversee the implementation of E-PAVAS. Led by the Command Area Development Secretary, this steering committee would provide strategic oversight and ensure alignment across all regions.

Regional support cells: Each IDC (e.g., Maharashtra Krishna Valley, Tapi, Konkan, and Godavari Marathwada) should establish support cells that include IDC, WUA, and NGO representatives. Led by the respective IDC Chief Engineers, these cells would manage resource allocation for upscaling E-PAVAS, monitor program activities, and provide technical support to WUAs as needed. Support cells should submit biannual reports to the WRD steering committee to track progress, identify challenges, and refine strategies for program delivery.



Indian-German collaboration on digitalization

SOPPECOM and TMG Think Tank for Sustainability began collaborating in early 2022 as part of the SEWOH Lab project. Financed by the German Federal Ministry for Economic Development and Cooperation (BMZ), this project explores how digital and social innovations can support Sustainable Development Goal 2 (“Zero Hunger”), focusing on inclusive rural and agricultural development in sub-Saharan Africa and India.

SOPPECOM undertook several explorative field studies throughout 2022 and during the first half of 2023. These studies revealed a lack of digital solutions to support local Water Users Associations (WUAs). Following a needs assessment to incorporate stakeholder input, SOPPECOM and TMG worked with Microware, a specialist in digital applications for agriculture and rural development, and Shramik Mukti Dal Equitable Water Distribution Movement (SMD), which campaigns for equitable water distribution movement in the region, to develop the E-PAVAS app.

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