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TECHNICAL BRIEF

Leadership Development for Fast-Tracking Participatory Groundwater Management (PGWM) in India

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Front cover photo: Community leadership development training with women Community Resource Persons in Pali district, Rajasthan, India. (*photo:* Nishtha Paliwal for IWMI)
Back cover photo: Male and female members participate in a group activity during a leadership training, highlighting inclusive approaches to community leadership development in Pali district, Rajasthan, India. (*photo:* Nishtha Paliwal for IWMI)

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Parts of this document were refined using artificial intelligence (AI) tools to assist with formatting, grammar, and language clarity. All substantive content, analysis, and interpretations remain the responsibility of the authors.

Contents

Key Messages

- **Leadership is the missing link**: Technical training and data alone do not sustain behaviour change; credible local leaders turn knowledge into durable collective action.
- **Investing in leadership pipelines**, especially for women, youth, and marginalised farmers, creates legitimacy, equity, and continuity that extends beyond individual projects.
- **Leadership training is cost-effective**: soft skills in communication, negotiation, and empathy deliver high-impact governance at low cost.
- **Institutions matter**: Embedding leadership development into Water and Land Management Institutes (WALMIs), Krishi Vigyan Kendra (Farm Science Centre) KVKs, and state groundwater programs ensures scalability and sustainability.

Leadership for PGWM - Rationale and Background

Effective participatory groundwater management (PGWM) hinges on credible local leadership. Studies have long shown that resolving the collective-action dilemma of a shared aquifer requires more than technical solutions (Ostrom, 1990; Meinzen-Dick, 2007; Meinzen-Dick et al., 2018). Leadership builds legitimacy for difficult decisions, enables coordination for rule-setting and enforcement, fosters resilience to sustain practices over time, and promotes equity by amplifying the voices of marginalised users. With the accelerating decline of groundwater in drylands and the impracticality of state-led policing of millions of wells, local leadership remains one of the few viable mechanisms for behavioural change and collective stewardship (World Bank, 2010; Jasechko et al., 2024).

However, leadership alone is not sufficient. The broader political economy and governance environment mediates its effectiveness. Groundwater institutions in India are embedded within unequal power structures where large landholders, politically connected users, and entrenched bureaucracies often dominate decision-making arenas (Birkenholtz, 2009; Pahl-Wostl, 2012; Whaley & Cleaver, 2017). Because groundwater rights are legally tied to land ownership, and most states lack enforceable regulatory authority, local leaders often operate without formal mandates or sanctioning power (Kulkarni, Shah & Shankar, 2015). The energy–groundwater nexus further complicates governance, as subsidised electricity, pump ownership, and informal water markets have created powerful constituencies resistant to regulation or collective restraint (Shah, Giordano, & Mukherji, 2012).

This dynamic reflects a form of negotiated governance, where water and energy policies evolve through continuous bargaining among political actors, bureaucracies, and interest groups rather than through consistent, rule-based enforcement. Without this institutional scaffolding, leadership risks becoming symbolic, co-opted by elites, or fading, once external facilitation ends. The case box below highlights some of the notable leadership models in India, but also the operational and transferability challenges therein when they lack the system or institutional support/legitimacy.

Leadership development, therefore, must be coupled with an enabling governance architecture that bridges local initiative with institutional legitimacy. This requires:

I. Embedding leadership training within state platforms such as WALMIs, Krishi Vigyan Kendras/Farm Science Centers (KVKs), or PRIs.
II. Providing legal authority, financial incentives, and accountability mechanisms to sustain leadership beyond project cycles.

III. Ensuring inclusion of women, tenant farmers, and other marginalised social groups in leadership pipelines.
IV. Aligning groundwater, energy, and agricultural policies to reinforce collective action rather than individual extraction.

Investing in local leadership is the critical lever to translate technical knowledge into collective action, driving the shift from weak governance to sustainable, community-owned water institutions. Structured programs that cultivate diverse local champions and equip them with communication, negotiation, and conflict-resolution skills are a low-cost, high-impact complement to technical investments. When paired with hydrogeological tools, this approach ensures legitimacy, coordination, equity, and durability of participatory groundwater management.

Participatory training on groundwater management, where participants engage in management and decision-making exercises and share knowledge. *(photo:* Anurag Banerjee/IWMI)

Case Box: Leadership in Action – Experiences of PGWM from India

Case / Location[1]	Strengths	Opportunities	Challenges to scaling	Transferable design elements
Hiware Bazar, Maharashtra	Charismatic leadership (Popatrao Pawar); strong community mobilisation; integration of watershed measures	Institutionalising leadership through local committees to reduce dependence on individuals	Elite capture; Heavy reliance on a single leader; limited transferability beyond context	- Embed leadership within collective governance structures (e.g., village committees, Water users Association (WUAs)) rather than individuals - Combine watershed-based planning with livelihood incentives for community buy-in - Link local champions to formal recognition and peer-learning networks to diffuse practices
APFAMGS (Andhra Pradesh Farmer-Managed Groundwater Systems)	Peer-to-peer learning; farmer-led data collection; collective crop planning	Embedding farmer-led monitoring in state groundwater governance	Institutional fragility; difficulty sustaining without continuous facilitation	- Use community groundwater budgeting as a participatory entry point for PGWM - Institutionalise farmer data ownership and reporting through local "hydro-literacy" cells - Integrate social learning cycles (measure–reflect–adapt) within state extension systems
Jal Sahelis, Bundelkhand	Women's leadership in water-scarce contexts; grassroots legitimacy; demonstrated impact on local water conservation	Mainstreaming women-led water groups into panchayat processes	Social pushback; heavy voluntary burden; marginalisation of women leaders without policy support	- Build gender-responsive water governance modules in leadership training - Provide institutional anchoring and modest honoraria to sustain women's participation - Create multi-scalar alliances (NGOs–PRIs–line departments) to legitimise women's leadership in water management

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Locally legitimate leaders, often drawn from within communities, who combine soft skills with technical knowledge, can mobilise diverse actors around a shared vision. Women's leadership adds resilience and inclusivity, as seen in Jal Sahelis. However, over-reliance on charismatic individuals, project-bound facilitation, or voluntary leadership without institutional backing might not be as successful (case box). The pathway forward is to blend individual champions with institutional support, thereby embedding leadership training into formal water governance structures, ensuring gender equity, and creating an enabling environment that fosters local leadership.

Principles of Successful Implementation of Leadership Training

1. Rooting in Theories of Experiential Learning

To turn training into impact, we need to design it around how people and institutions actually learn and adapt. The framework draws on Kolb's Experiential Learning Cycle, guiding participants through a sequential process of doing, reflecting, conceptualising, and applying. This cyclical structure enables participants to internalise abstract concepts by linking them to lived experiences, field realities, and peer dialogue.

To make the process transformative rather than instructional, the program integrates the COM-B behavioural model, which focuses on strengthening participants' Capability, Opportunity, and Motivation. Capability is enhanced through structured exposure to both technical and social competencies; Opportunity is created by embedding collaborative exercises and institutional linkages; and Motivation is reinforced through reflective sessions and peer recognition.

The training develops a well-rounded leadership competency framework, covering:

I. Convening and facilitation skills – mobilising diverse groups (farmers, panchayat members, extension officers) and fostering trust across stakeholder hierarchies.
II. Conflict mediation and negotiation – addressing competing water uses and building consensus on water budgeting and cropping choices.
III. Hydroliteracy and systems thinking – understanding aquifer dynamics, recharge–extraction balance, and interlinkages with energy and crop systems.
IV. Strategic communication and advocacy – articulating community priorities to government platforms and programs; and
V. Adaptive problem-solving by applying monitoring data to adjust practices and interventions dynamically.

To deliver these competencies, the training employs diverse experiential learning methods:

I. Participatory games and simulations (e.g., groundwater budgeting games) to demonstrate commons dilemmas.
II. Water resources and aquifer mapping to contextualise hydrogeological concepts.
III. Role-play and scenario exercises to practice conflict resolution and stakeholder engagement.

IV. Reflection circles and peer-to-peer exchanges to consolidate learning and sustain motivation.

Typically, the program spans 12-13 hours delivered over two days, and should be followed by mentoring and refresher sessions over subsequent months. Each module balances conceptual inputs with hands-on practice, ensuring that by the end of the training, participants are not merely aware of PGWM principles but are capable, enabled, and motivated to mobilise collective groundwater stewardship in their communities.

2. Addressing the Barriers to Scaling

Scaling up community leadership programs for Participatory Groundwater Management (PGWM) presents considerable barriers related to resources, implementation capacity, and institutional commitment. Successfully replicating these efforts is often difficult due to the substantial time and resource investment required for effective community mobilisation. Three significant challenges hinder widespread scalability:

- **Finding appropriate Civil Society Organisations (CSOs):** CSOs with significant years of experience are required to scale leadership development programs. Such engagements also require continued resources for follow-up capacity development and creating an enabling environment at the local level.
- **Time and resources for community mobilisation:** Mobilising communities requires substantial effort, and consistency in success varies. Effective water management committees have proven viable where long-term capacity-building efforts were implemented.
- **Risk of ineffective replication:** Active end-to-end engagement is a must to ensure the success of such efforts. may become difficult. Additionally, achieving success may become challenging.
- **Limited funding and continuity:** Leadership programs often depend on short-term project cycles, lacking stable financial support for follow-up mentoring, refresher training, and institutional embedding.
- **Shortage of trained trainers:** Few facilitators possess both hydro-technical and social mobilisation skills, constraining program quality and outreach.

3. Sequential Planning for Effective Participation and Active Learning

Sequential planning is paramount for ensuring effective participation and active learning within leadership development training programs for Participatory Groundwater Management (PGWM). The training should be meticulously structured to

i. Ensure sessions logically build upon one another, moving participants from foundational awareness to complex application and action planning.

ii. Establish conceptual clarity and self-awareness, utilising experiential learning games.

iii. Understand the principles behind Water Security Plans (WSPs)

iv. Design pathways to ensure successful implementation of the WSPs in one's own village.

This carefully designed sequence culminates in the creation of formalised action plans, ensuring that the gained motivation and knowledge translate into specific steps that new leaders can implement in their villages.

4. Learnings from the Pilots

To test the effectiveness of the module, IWMI, in partnership with PRADAN and CmF, piloted it in the states of Madhya Pradesh and Rajasthan. The pilot rounds of the training proved the manual's ability to shift knowledge, attitudes, and motivation toward shared responsibility and local leadership for groundwater stewardship at scale. Several key learnings have emerged that are critical for enhancing the program's impact and ensuring its scalability and sustainability. These learnings are synthesised below (Table 1) as core principles for effective community capacity development in the water sector.

- **Align with local routines**: Schedule short sessions that do not conflict with agricultural crop calendars (e.g., harvesting). Use accessible, central venues like community halls to ensure maximum attendance.
- **Focus on facilitation, not just teaching**: Facilitators should act as guides, simplifying complex topics (like government schemes) and turning passive listening into interactive discussions that connect with participants' real-life experiences.
- **Prioritize practical learning**: Replace lectures with problem-solving activities, such as calculating water usage. Use local success stories to make lessons relatable and introduce leadership concepts early.
- **Secure institutional backing**: Active involvement from government or project partners creates legitimacy. It also ensures these institutions understand the model well enough to replicate it elsewhere.
- **Incentivize with certification**: Providing formal certificates validates participants' efforts and boosts their standing in the community, motivating them to apply their new skills.

Table 1. Illustrative Metrics for Assessing PGWM Leadership Training Effectiveness

Indicator Category	Metric / Definition	Remark
Participation and Retention	Attendance retention rate (% of registered participants completing all sessions)	Indicates the training's logistical fit and relevance to community routines (high retention suggests effective scheduling and facilitation).
Gender and Inclusion	Women's speaking time (% of total participant speaking time)	Reflects inclusiveness and gender balance in participation, serving as a proxy for empowerment and voice.
Knowledge Application	Share of trained groups initiating at least one Water Security Plan (WSP) action within 90 days	Captures the immediate translation of training into collective groundwater action (e.g., recharge pit planning, crop water budgeting).
Behavioural Monitoring	Share of wells reporting hours pumped (%); Adoption of microirrigation infrastructure (%); Use of displayed/shared data (%)	Measures adoption of data-driven monitoring behaviour; key for long-term sustainability.
Institutional Engagement	Regularity of follow-up meetings (number per quarter)	Indicates the continuity of local engagement and leadership activity post-training.
Facilitation Quality	Ratio of trained facilitators to participant groups	Ensures manageable group sizes for participatory learning and interactive sessions.
Motivation and Recognition	Number of participants receiving completion certificates (number of certificates)	Serves as an intrinsic motivator and enhances legitimacy for local leaders.

Post-Training Continuity Engagement	Follow-up mentoring or refresher sessions held within 6 months	Sustains behavioural reinforcement and ensures institutional linkages remain active.

Towards Institutionalisation and Policy Integration

The pilot experience highlights that community leadership for PGWM can move beyond isolated successes if formally embedded within state and national water programs. The approach aligns strongly with existing policy frameworks such as Atal Bhujal Yojana, Jal Jeevan Mission, and National Rural Livelihood Mission (NRLM), which already invest in capacity building and community engagement. Integrating the leadership module within Water and land Management Institute (WALMI), Krishi Vigyan Kendra/Farm Science Centres (KVKs), and Panchayati Raj Institutions (PRIs) can institutionalise behavioural change, ensure continuity beyond projects, and create a pipeline of certified grassroots leaders.

To manage the risks of elite capture and politicisation, leadership cohorts should be diverse and selected transparently through community validation processes. Role rotation, peer review, and participatory monitoring of training outcomes can further enhance accountability. Embedding quotas for women, smallholders, and marginalised groups within training batches ensures an equitable voice and shared decision-making power.

The comparative advantage of this model lies in combining behavioural transformation with institutional integration. Unlike conventional awareness or infrastructure programs, the PGWM leadership framework develops hydro-literate, socially legitimate, and motivated leaders capable of sustaining local water governance systems. This dual emphasis on soft skills and systemic alignment makes it both cost-effective and scalable for India's diverse hydro-social contexts.

Equity, Climate Resilience, and Transferability: Insights for Policy and Practice

Effective participatory groundwater management (PGWM) must simultaneously address inequity, climate stress, and institutional fragmentation. Groundwater governance is also about justice - who has access, who decides, and who bears the cost of depletion or reform. Global experience spanning Africa, Central Asia, and the Americas demonstrates that equitable participation enhances legitimacy, climate learning improves resilience, and transferability depends on enabling local adaptation rather than replicating external models. The lessons below (Table 2) distil these insights into three interconnected themes for leadership and policy design.

Table 2. Insights from global experiences of decentralised groundwater governance for policy and practice

	Learnings	Policy Takeaway
Equity – From Participation to Power Redistribution	**Core Problem**: Decentralization efforts frequently result in "participation without power," where communities participate formally but lack real influence.	Equity requires institutional design that redistributes power — by granting local groups legal recognition, ensuring gender and

	Sub-Saharan Africa: Water User Associations are often dominated by elites. Despite having formal representation, women and smallholders frequently lack a genuine voice (Bruns, 2021). ***Central Asia***: Water User Groups (WUGs) emerged to improve fairness and counter bureaucratic control. However, they struggled to succeed because they lacked legal authority (Hirsch et al., 2010; Abdullaev et al., 2009). ***Latin America***: Experience varies by country. While Brazil's committees institutionalized participation without granting actual influence, initiatives in Ecuador and Mexico demonstrated that long-term durability depends on local ownership and legitimacy, not just formal inclusion.	caste representation, and embedding accountability mechanisms within higher-level agencies.
Climate Relevance – Adaptive Learning and Social Resilience	**Core challenge**: As climate pressures (droughts, variable rainfall) intensify, groundwater is a critical buffer. However, true resilience relies on social capacity rather than just hydrological control. ***Africa:*** Small-scale, collective measures like sand dams and recharge pits prove more effective than centralized schemes when paired with participatory monitoring (Tringali et al., 2017). ***Uzbekistan***: Even under restrictive governance, scenario modeling and role-play exercises in the Amudarya Basin helped communities better understand and manage drought risks (Schmidt et al., 2024). ***The Andes***: Blending indigenous knowledge with modern hydro-science has successfully strengthened trust and enabled adaptive management (Oshun et al., 2021).	Climate adaptation in groundwater governance should prioritise learning systems, participatory monitoring, role-play, and iterative reflection, over static infrastructure, enabling communities to adjust practices as climate uncertainty evolves.
Cross-Context Lessons for PGWM	**Core challenge**: Transferring PGWM principles requires flexible enabling conditions rather than rigid, fixed templates. ***Knowledge Co-production***: Initiatives like Ecuador's Manglaralto recharge projects and Peru's socio-hydrology schools demonstrate that when communities and experts produce knowledge together, it builds social legitimacy. ***Polycentric Governance***: Evidence from African basin committees, Central Asian WUGs, and California's SGAs shows that having multiple, linked centers of authority is more resilient than relying on a single bureaucracy (Bruns, 2021; van Koppen, 2022). ***Equity as Climate Strategy***: Programs that specifically support marginalized users, such as California's SAFER initiative, prove that	Scale is achieved not by replication but by creating flexible frameworks that legitimise diverse actors, share information openly, and adapt design to local hydro-social realities.

ensuring fairness (distributive justice) directly strengthens overall climate adaptation.

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