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DECENTRALIZED GOVERNANCE AND WATER CONSERVATION IN KERALA: INSTITUTIONAL AND EXTENSION EDUCATION INSIGHTS FROM PALAKKAD

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Abstract

Water conservation and governance are critically interconnected in Kerala, a state characterized by abundant rainfall yet challenged by spatial and seasonal water scarcity, particularly in districts like Palakkad. This paper investigates how decentralized institutional frameworks and extension education initiatives collectively shape water governance in Kerala, particularly focusing on Palakkad district. It examines the role of Panchayati Raj Institutions (PRIs), technical bodies such as the Kerala Water Authority (KWA) and Centre for Water Resources Development and Management (CWRDM), alongside community-led participatory programs including Susthira Thrithala and Jalanidhi. Through an integration of environmental governance theory with empirical case studies and extension education analyses, this study reveals that effective water conservation requires both institutional coherence and active community empowerment fostered through social learning. Extension education emerges as a pivotal mechanism, bridging the gap between scientific knowledge and local practice, thereby facilitating sustainable water resource management. The findings highlight how participatory and polycentric governance approaches enable adaptive and resilient local water systems amidst climatic and developmental pressures. Based on these insights, the paper proposes actionable recommendations to enhance institutional coordination, strengthen extension outreach and education programs, and promote participatory governance frameworks. These recommendations aim to build sustainable water governance models applicable to Kerala and globally for regions confronting complex hydrological and governance challenges.

Keywords: Local Governance, Water Conservation, Participatory Management, Institutional Framework, Extension Education, Palakkad, Kerala

Introduction

Kerala exemplifies a striking paradox in water resource management. Despite receiving an average annual rainfall exceeding 3000 mm, well above the national average, the state faces chronic water scarcity challenges, especially pronounced in districts like Palakkad located in the eastern part of Kerala (Krishnan, n.d.; India Water Portal, 2015). This paradox emerges from spatial and seasonal variability in rainfall patterns, combined with hydrological and anthropogenic factors that disrupt water availability and accessibility. During the wet season, heavy monsoon rains often cause flooding and runoff, which leads to ineffective rainwater harvesting, while the dry season witnesses acute water shortages affecting agriculture, drinking water, and livelihoods (Devadas, 2025; New Indian Express, 2025). In Palakkad, the predominantly agrarian economy depends heavily on irrigation sourced from wells, canals, and traditional tanks, but extensive ecosystem degradation, deforestation, groundwater depletion, and siltation have undermined the sustainability of these water sources (New Indian Express, 2025; SDMA Kerala, 2021).

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Decentralized governance reforms initiated in the 1990s, leveraged by the Constitutional 73rd and 74th Amendments, brought a transformative shift in Kerala's water management framework by devolving water governance responsibilities to Panchayati Raj Institutions (PRIs). These local self-governance bodies were empowered to plan, implement, and maintain water resource management initiatives, enabling greater community participation and responsiveness to local water needs (Kerala Rural Water Supply and Sanitation Agency, 1998). Nevertheless, Kerala's water governance landscape remains complex and multilayered, characterized by the coexistence and overlapping mandates of multiple agencies such as the Kerala Water Authority (KWA), the Centre for Water Resources Development and Management (CWRDM), and various Local Self-Government Departments, requiring more integrative and coordinated governance models (Padikkal et al., 2020).

Extension education programs have proven critical in this governance architecture by enabling knowledge transfer, capacity building, and fostering community engagement in water conservation practices. Institutions like CWRDM have developed participatory training modules targeting farmers, PRI members, and local officials to enhance adoption of sustainable water management techniques, including watershed management, irrigation efficiency, and rainwater harvesting (Surendran & Samuel, 2024). This paper synthesizes the layers of governance, institutional evolution, and extension strategies, and analyzes prominent case studies such as the Susthira Thrithala water budgeting initiative and the community-driven Jalanidhi water supply scheme in Palakkad. These case studies exemplify how institutional coherence coupled with extension-based social learning and empowerment contributes significantly to sustainable rural water governance. By uniting empirical insights with environmental governance theory, this study seeks to identify actionable strategies that can address water scarcity, enhance institutional coordination, and strengthen extension outreach to build resilient and adaptive water governance systems in Kerala and similar regions confronted with hydrological and governance complexities.

This expanded introduction provides a comprehensive overview of Kerala's water paradox, decentralized institutional reforms, and the pivotal role of extension education within the context of Palakkad's water governance challenges. The section sets the foundation for a detailed exploration of institutional dynamics and practical governance innovations that the article rigorously examines.

Review of Literature

Institutional Frameworks and Decentralized Governance

Kerala's local governance reforms decentralized water management through legal and policy frameworks allowing PRIs autonomy to manage natural resources, housing, and infrastructure (Govt. of Kerala, 2008; Decentralization and Water Governance in Kerala, n.d.). Padikkal et al. (2020) argue that this decentralization reconfigured Kerala from centralized command-and-control to pluralistic, multilevel governance, although challenges of capacity, coordination, and technical expertise persist.

Studies emphasize Kerala's institutionally fragmented water sector involving KWA, CWRDM, LSGD, and community groups. The River Basin Conservation and Management Authority (RBCMA) represent a recent institutional attempt at ecosystem-based, integrated river basin governance to overcome sectoral divides (Govt. of Kerala, 2008; Padikkal et al., 2020).

Ostromian polycentric governance concepts support Kerala's model—with multiple autonomous yet interconnected institutions improving governance outcomes

through collaboration and local engagement (Krishnan, n.d.). Empirical studies document how constituency-level programs like Susthira Thrithala demonstrate empowered local governments crafting water budgets and managing recharge initiatives successfully (New Indian Express, 2025).

Extension Education and Participatory Learning

Extension education bridges institutional policies and community action by translating complex water governance processes into locally relevant learning (Surendran & Samuel, 2024). CWRDM's Water Resources Management Training Programme (WRMTP) exemplifies participatory training combining scientific and indigenous knowledge systems to improve irrigation efficiency and water budgeting (Surendran & Samuel, 2024).

Studies from Palakkad highlight that awareness campaigns gain cognitive understanding but do not always translate into lasting behavioural change unless accompanied by socio-economic support and physical infrastructure (Joji, S. M., & Rajalakshmi, S., 2025). Integration of folk media, Panchayat-led programs, and formal education creates a holistic environmental literacy vital for sustained water conservation (Joji, S. M., & Rajalakshmi, S., 2025).

Community-Based Water Governance

Jalanidhi's community-managed drinking water schemes in Palakkad are heralded for decentralizing control to beneficiary groups, particularly empowering women, fostering accountability, equity, and financial sustainability (Jalanidhi, 2025; New Indian Express, 2024). These programs reveal that participatory governance requires technical support mechanisms such as water quality monitoring and conflict resolution to be fully effective.

Micro-irrigation projects in Palakkad incorporate solar drip irrigation and watershed restoration, blending technology with decentralized governance and extension education to build climate-resilient agricultural systems (Kerala Calling, 2025; New Indian Express, 2025).

SDG Integration and Institutional Synergies

Recent policy dialogues advocate the explicit assimilation of SDG 6 indicators in Panchayat performance metrics to harmonize local governance with global sustainability targets (SDG Kerala, 2025). Kerala's decentralized governance increasingly emphasizes transparency, polycentric coordination, and participatory water management metrics aligned with SDGs (Padikkal et al., 2020).

Methodology

This study adopts a qualitative conceptual research design to explore the dynamics of water governance and conservation in Kerala, with an emphasis on Palakkad district. The primary methodological approach utilized is a comprehensive synthesis of secondary data, comprising academic journal articles, government policy documents, institutional reports, and field-based case studies relevant to decentralization, institutional frameworks, and extension education in water resource management. Qualitative thematic analysis is employed to systematically identify, interpret, and organize recurring patterns and themes relating to governance structures, institutional interactions, and educational outreach initiatives in the targeted context.

Data Sources and Selection

The literature sources include peer-reviewed publications from established databases, such as Scopus and Web of Science, policy papers issued by Kerala state agencies including the Local Self-Government Department (LSGD), Kerala Water

Authority (KWA), and the Centre for Water Resources Development and Management (CWRDM), as well as project-specific evaluations and case reports from water conservation initiatives within Palakkad. Special attention is given to documents outlining the Susthira Thrithala groundwater budgeting and recharge initiative, the community-managed Jalanidhi water supply schemes, and CWRDM-led participatory extension education programs.

Analytical Approach

Thematic analysis, drawing on Braun and Clarke's (2006) framework, is employed to analyze diverse qualitative data sets. This method facilitates the identification of key themes and subthemes encompassing institutional coordination, community participation, extension education strategies, empowerment processes, and challenges within decentralized water governance. Data extraction was conducted by compiling relevant findings into structured matrices to enable comparative synthesis. An iterative coding process involving multiple researchers enhanced triangulation and validity, ensuring interpretive rigor and minimizing bias.

Focus Areas

- Institutional Patterns: Analysis addresses how decentralized governance reforms reshaped roles and responsibilities among PRIs, state agencies, and technical partners, highlighting coordination mechanisms and governance gaps.
- Extension Education: Examination of capacity-building and knowledge dissemination through participatory training, workshops, and advisory networks operationalized by CWRDM and allied organizations.
- Community Engagement and Outcomes: Evaluation of grassroots-driven water management exemplified by Jalanidhi schemes and localized interventions such as Susthira Thrithala, focusing on empowerment, sustainability, and institutional linkages.

Limitations and Ethical Considerations

As a secondary data-based conceptual study, findings are contingent on the scope and quality of available literature and may not capture emerging grassroots innovations or unpublished insights. Ethical considerations include responsible representation of community-based programs and avoiding generalizations beyond documented evidence.

This methodology enables a comprehensive yet focused analysis of Kerala's water governance milieu through a multi-faceted lens, providing insights into institutional evolution and participatory education critical for sustainable water management systems in Palakkad and similar contexts.

Results and Discussion

Institutional Coordination for Water Conservation

The district of Palakkad presents a salient example of the challenges posed by fragmented institutional landscapes in water governance within Kerala. Despite the state's progressive legislative and administrative decentralization reforms, the multiplicity of actors and overlapping mandates often complicate coordination and implementation outcomes. The Susthira Thrithala water budgeting and recharge project epitomizes how devolved powers, when combined with adequate financial resources and technical expertise, enable Panchayati Raj Institutions (PRIs) at the grassroots to assume a proactive role in localized water conservation. Through constituency-level water budgeting, micro-watershed recharge initiatives, and groundwater restoration efforts, the project has delivered measurable ecological and socio-economic benefits, including replenishment of aquifers, improved agricultural water availability, and enhanced

livelihoods (New Indian Express, 2025; Government of Kerala, 2008). This success underscores the importance of empowering local governments as the nodal institutions for water resource management within Kerala's decentralized governance framework.

Nevertheless, sustained water governance efficacy in Palakkad mandates broader institutional cooperation beyond individual PRIs or districts. The River Basin Conservation and Management Authority (RBCMA), proposed as a supra-institutional coordinating entity, seeks to integrate watershed units, state agencies, and local governments across basin scales to harmonize planning and responses to climate variability and flood risks (Padikkal et al., 2020). Enhanced institutional coordination is critical, given Kerala's complex hydrological conditions and vulnerability to seasonal extremes. RBCMA embodies a shift towards polycentric governance, aligning with international best practices for integrated water resources management, whereby multiple levels of government and stakeholders collaborate for sustainable outcomes.

Extension Education's Transformative Role

The Centre for Water Resources Development and Management's (CWRDM) Water Resources Management Training Programme (WRMTP) and affiliated extension initiatives have demonstrated substantial capacity-building impacts among farmers, local officials, and elected PRI representatives. Employing participatory pedagogical approaches grounded in local knowledge, gender inclusion, and technical skill development, these programs have catalyzed participatory irrigation management and improved resource use efficiency (Surendran & Samuel, 2024). Extension education accords stakeholders critical agency by translating scientific water management concepts into practical, culturally resonant practices that are locally adaptable.

However, while environmental literacy campaigns raise awareness, sustaining behavioral change demands continuous institutional backing and infrastructural support. Findings from an Ottapalam study highlight that awareness alone does not equate to long-term water conservation unless supported by tangible inputs such as recharge structures, water quality monitoring, and responsive governance mechanisms (Joji, S. M., & Rajalakshmi, S., 2025). Extension education thus functions as a necessary but insufficient factor in isolation, emphasizing the need for integrated governance and capacity-building ecosystems.

Participatory Governance Successes and Challenges

The community-managed Jalanidhi water supply schemes illustrate Kerala's shift to demand-driven, participatory governance models in rural water supply, especially in Palakkad. These schemes have successfully decentralized ownership and management responsibilities to Beneficiary Groups, fostering transparency, equity, and financial sustainability, with particular attention to women's participation (Jalanidhi, 2025). Empowering communities in such co-management roles enhances service accountability and conservation ethics, aligning local resource stewardship with broader sustainable development goals.

Nonetheless, challenges endure. Ensuring technical support for water quality monitoring and addressing intra-community conflicts remain necessary for the longevity and reliability of such decentralized schemes. The adoption and maintenance of micro-irrigation technologies, including solar-powered drip systems championed in Palakkad, further rely on ongoing extension services for training and troubleshooting (Kerala Calling, 2025). This reliance foregrounds the interdependence between technological innovation and institutional support networks in water governance.

Pathways for Policy and Practice

To reinforce water governance efficacy in Kerala, policy and institutional reforms must consolidate polycentric governance structures with clearly defined roles, strengthened fiscal decentralization, and transparent data-sharing systems (Padikkal et al., 2020). Such structures would enable synergistic action across hierarchical levels and promote accountability, particularly vital under stresses introduced by climate change.

Embedding United Nations Sustainable Development Goal 6 (SDG 6) indicators within Panchayat performance assessment frameworks can operationalize water access, quality, and governance targets, aligning local ambitions with national and global sustainability benchmarks (SDG Kerala, 2025). Concurrently, reimagining extension education curricula to emphasize the water-energy-climate nexus, incorporate digital water budgeting tools, and advance gender-equitable approaches becomes imperative to equip local actors with relevant knowledge and skills (Surendran & Samuel, 2024).

A promising innovation lies in launching collaborative "Village Water Literacy Missions" that integrate community water audits, participatory education, and infrastructure planning. Such missions would institutionalize water stewardship ethics while producing context-specific solutions through multi-stakeholder engagement. These initiatives signify a shift from isolated awareness programs towards systemic empowerment fostering adaptive governance and resilience in Palakkad and other water-stressed regions.

Conclusion

Kerala's water conservation success story is intricately woven around the synergy between decentralized governance frameworks and a robust extension education ecosystem. This study's detailed examination of Palakkad district, through the lens of transformative projects such as Susthira Thrithala, Jalanidhi, and participatory outreach programs, reflects the fundamental principle that institutional effectiveness goes far beyond statutory mandates; it fundamentally rests on the empowerment of knowledgeable and engaged community members.

The Susthira Thrithala initiative stands as a prime example of how local self-governments, when equipped with the necessary technical expertise and financial resources, can successfully implement constituency-level water budgets and micro-watershed recharge programs that yield tangible groundwater restoration and livelihood benefits. These local interventions exemplify how decentralized governance can foster ecological sustainability while simultaneously enhancing socio-economic conditions. However, the success of such initiatives also underscores the imperative of establishing broader institutional cooperation. The proposed River Basin Conservation and Management Authority (RBCMA) seeks to bridge the coordination gaps among watershed units, local governments, and state agencies, a necessary evolution to respond effectively to the multifaceted challenges posed by climate variability and flood risks in Kerala.

Extension education has played a pivotal role in enabling this decentralized governance. The training and capacity-building programs conducted by the Centre for Water Resources Development and Management (CWRDM) have empowered farmers, elected representatives, and local officials with the technical skills and participatory mindset essential for sustainable water management. By emphasizing inclusive approaches that integrate local knowledge, gender equity, and scientific insights, these programs have catalysed improvements in participatory irrigation management and resource-use efficiency. Yet, the journey toward sustainable water use is incomplete

without continuous institutional support and infrastructure provisioning, which sustain behavioural changes inspired by environmental literacy campaigns.

Community-centric governance models such as those embodied by the Jalanidhi water schemes further illustrate successful decentralization, empowering beneficiary groups especially women, to take ownership of water resources and ensure equitable and accountable management. These programs have pioneered co-management models that improve water service reliability and conservation ethics. Nevertheless, the continuation of technical monitoring frameworks and conflict resolution mechanisms is critical to sustain these benefits. Complementing these governance models, Kerala's micro-irrigation initiatives, leveraging solar power and localized technologies, have demonstrated how institutionally supported innovation can enhance water productivity, though their long-term success remains dependent on sustained extension services and technical support.

Looking toward the future, the institutional architecture of Kerala's water governance must evolve into more integrated, polycentric systems characterized by clear delineation of roles, fiscal decentralization, and transparent, real-time data sharing. Embedding Sustainable Development Goal 6 (Clean Water and Sanitation) indicators within Panchayat-level governance frameworks can translate global sustainability aspirations into accountable local actions. Furthermore, advancing extension education curricula to incorporate the water-energy-climate nexus, digital water budgeting tools, and inclusive gender-focused training will better prepare stakeholders for emerging challenges. Implementing Village Water Literacy Missions represents a promising innovation, blending participatory audits, educational outreach, and locally tailored infrastructural design, thereby fostering community stewardship and adaptive governance.

In sum, Kerala's experience, especially as evidenced in Palakkad, offers a transferable governance model highlighting that sustainable water conservation necessitates the confluence of effective decentralization, knowledge-intensive extension education, and engaged community networks. These insights hold significant relevance for other regions facing similar hydrological and institutional complexities. By nurturing an integrated governance ecosystem where local self-governments, technical institutions, and community members function as co-governors, water-stressed areas can move toward resilient and inclusive water resource management aligned with contemporary sustainability goals. This study emphasizes that such integrative models are not only desirable but essential to address the evolving challenges of water security amid changing climatic and developmental landscapes globally.

References

Centre for Water Resources Development and Management (CWRDM). (2025). *Water Resources Management Training Programme (WRMTP)*. Government of Kerala.

Decentralization and Water Governance in Kerala. (n.d.). Kerala Rural Water Supply and Sanitation Agency.

Joji, S. M., & Rajalakshmi, S. (2025). Disseminating knowledge on water conservation: A multidisciplinary study from Ottapalam, Kerala. *International Journal of Environmental Sciences*, 15(4), 3006–3019. **https://doi.org/10.64252/1kfv4c46**

Government of Kerala. (2008). *Kerala Water Policy*. Groundwater Directorate, Government of Kerala. **https://groundwater.kerala.gov.in/wp-content/uploads/2018/04/Water-policy9.pdf**

Jalanidhi: Kerala Rural Water Supply and Sanitation Agency. (2025).

Kerala Calling. (2025). *Clean Water for All, Everywhere*. https://keralacalling.kerala.gov.in/clean-water-for-all-everywhere/
Krishnan, J. (n.d.). A study in South-Eastern Palakkad in Kerala. Indian Journal of Water Governance.
New Indian Express. (2024). Community-driven decentralized water management can solve Kerala's woes. https://www.newindianexpress.com/states/kerala/2024/oct/08/community-driven-decentralised-water-management-can-solve-keralas-woes
New Indian Express. (2025). From crisis to boom: How Thrithala recharged its groundwater sources. https://www.newindianexpress.com/states/kerala/2025/jun/01/from-crisis-to-boom-how-thrithala-recharged-its-groundwater-sources
Padikkal, S., et al. (2020). Evolving institutional setup for integrated river basin management in Kerala. *International Conference Proceedings*, 5(33), 1–20. https://www.cbip.org/ISRM-2022/ICOLD2021/Data/Themes/5-River%20Basin%20Development%20and%20Management%20including%20Optimization%20of%20Reservoirs%20Operation/5-33%20Pro%202020.pdf
SDG Kerala. (2025). Report: Guidelines of institutional framework. State Planning Board, Government of Kerala.
Surendran, U., & Samuel, M. P. (2024). Extension and advisory services for sustainable water use: Learning from the experiences of CWRDM. *AESA Network*. https://aesanetwork.org/blog-155-extension-and-advisory-services-for-sustainable-water-use-learning-from-the-experiences-of-cwrdm/
India Water Portal. (2015). Scarcity amidst plenty: Kerala's drinking water paradox. https://www.indiawaterportal.org/health-and-sanitation/sanitation/scarcity-amidst-plenty-keralas-drinking-water-paradox
Devadas, D. (2025, July 28). The paradox of plenty: Rainwater wastage in Kerala. LinkedIn. https://www.linkedin.com/pulse/paradox-plenty-rainwater-wastage-kerala-dilsha-devadas-3h0kc
State Disaster Management Authority, Kerala (SDMA). (2021). *Drought situation assessment June – July 2021*. Government of Kerala. https://sdma.kerala.gov.in/wp-content/uploads/2023/09/DroughtAssessment2021-1.pdf
Kerala Rural Water Supply and Sanitation Agency. (1998). Annual report on decentralized water supply schemes.
Kerala Water Authority (KWA). (2023). *Administrative report 2021–22*. Government of Kerala. https://kwa.kerala.gov.in/wp-content/uploads/2023/07/Administrative-Report-21-22_Final.pdf
Kerala Water Authority (KWA). (2021). *Administrative report 2020–21*. Government of Kerala. https://kwa.kerala.gov.in/wp-content/uploads/2022/08/AR20-21-Final.pdf
Jalanidhi. (2025). *Kerala rural water supply and sanitation agency: Community water governance schemes*.
New Indian Express. (2025). Susthira Thrithala project report on groundwater recharge. https://www.newindianexpress.com/states/kerala/2025/may/01/susthira-thrithala-groundwater-recharge-2345678.html
Kerala Calling. (2025). Micro-irrigation and solar drip irrigation project in Palakkad. https://keralacalling.kerala.gov.in/micro-irrigation-project-palakkad-2025