ACU Sponsored project

A Guidebook for Community Centric Water Management and Climate Resilience in Rural India

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VIT
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The Association of Commonwealth Universities

Preface

Water security and climate resilience are growing concerns for rural communities in India, where unpredictable weather patterns, deteriorating water quality, and limited infrastructure pose significant challenges. Addressing these issues requires community-driven, scientifically grounded solutions that integrate local knowledge with research-based strategies. This guidebook is designed to support rural communities, policymakers, and researchers in developing effective water management practices that enhance climate resilience and long-term sustainability.

This guidebook is an outcome of the Knowledge Exchange Project (KEP) conducted under the Association of Commonwealth Universities' (ACU). Through this initiative, we worked with diverse stakeholders in Nelvoi Village, Thallai, Vellore District, Tamil Nadu, to identify key water challenges, understand existing adaptation strategies, and co-create actionable solutions. By using participatory action research and citizen science approaches, this resource provides a structured framework for conducting water quality assessments, community-led monitoring, participatory mapping, and stakeholder engagement to ensure locally relevant and sustainable interventions.

More than just a technical resource, this guidebook serves as a practical roadmap for empowering communities to take charge of their water security. While rooted in insights from Nelvoi Village, its methods and principles are scalable and adaptable to other regions facing similar challenges. By fostering collaboration between local communities, governance bodies, and civil society organizations, this guidebook aims to drive lasting impact in rural water management and climate resilience efforts across India.

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01 INTRODUCTION

Water security and sustainable environmental management are critical concerns in the face of climate change. Climate change, as one of the most significant challenges of the 21st century, has intensified water-related risks, through various factors such as unpredictable weather patterns, prolonged droughts, severe flooding, and saltwater intrusion (in coastal region). These challenges are particularly severe for rural and semi-urban communities, where access to reliable water sources and sanitation services is often limited. Rural communities are highly dependent on the rainfed agriculture activities. Additionally, factors such as pollution, inefficient resource management, and socio-economic disparities further worsen the water insecurity situation, threatening public health, biodiversity in the rural parts. The limited access to scientific knowledge, lack of localized climate data, and inadequate awareness programs on it, making rural communities highly vulnerable to climate change impacts. Additionally, a lack of technical training and policy support prevents them from implementing adaptive strategies such as rainwater harvesting, efficient irrigation, or climate-resilient water governance. Bridging this gap requires education, participatory decision-making, and community-driven climate adaptation initiatives.

Recognizing the interconnected challenges in water security and climate change resilience, this **Guidebook for Community Centric Water Management and Climate Resilience in Rural India** has been developed. It provides practical guidance for village-level stakeholders, policymakers, and community representatives. It aligns with key United Nations Sustainable Development Goals (SDGs). Through a systematic methodology involving stakeholder engagement, participatory mapping, community-led water quality monitoring, and policy integration, this guidebook aims to equip local communities with the knowledge and tools necessary to develop sustainable, context-specific water security strategies.

02 ABOUT THE PROJECT

The Knowledge Exchange Project (KEP), conducted under the **ACU Climate Futures Fellowship** (2023-2025), was implemented across three low- and middle-income regions (Nigeria, India, and South Africa). The project aimed to identify water insecurity challenges through participatory action research and citizen science approaches. By engaging with local communities and stakeholders, the KEP explored climate-related water vulnerabilities, existing adaptation strategies, and potential solutions tailored to each region.

Case study

This India-specific guidebook is developed based on the case study from Nelvoi Village, Tamil Nadu (Figure 1). The study highlighted key concerns such as poor water quality, seasonal water shortages, contamination risks, and climate-driven impacts on water security. Using participatory methods, the project co-created strategies with the community, including water quality assessments, stakeholder engagement, and localized adaptation plans.

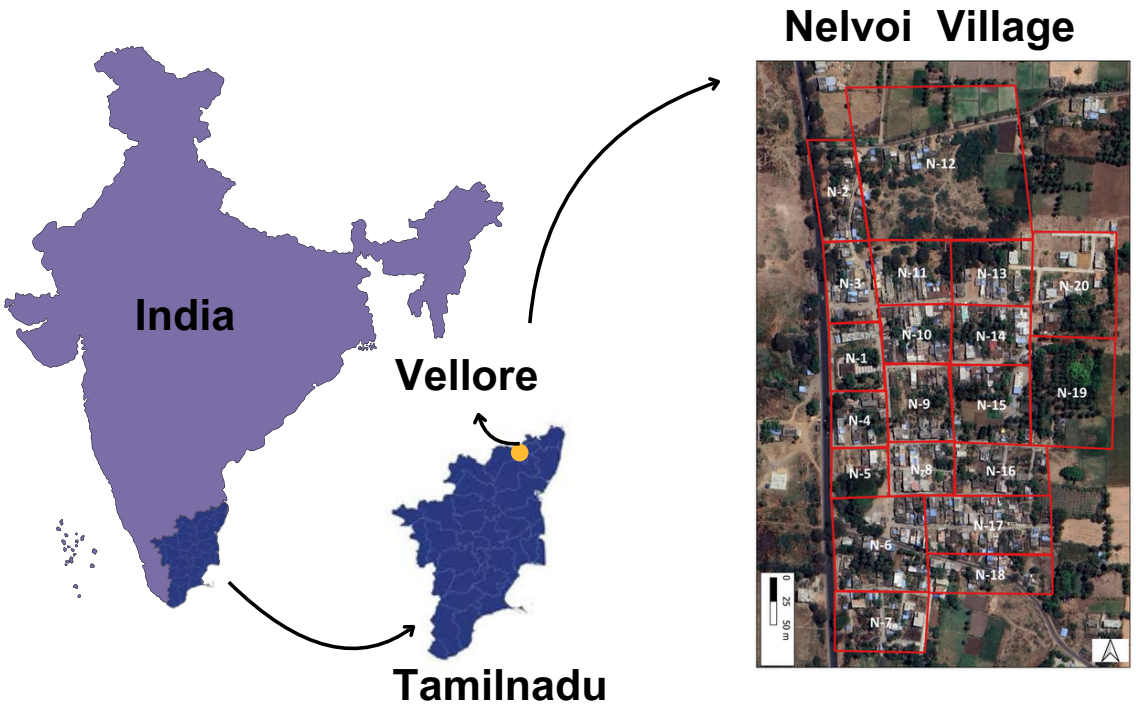


Figure 1: Map of the Nelvoi village showing the study area

03 ABOUT THE GUIDEBOOK

This **Guidebook for Community Centric Water Management and Climate Resilience in Rural India** serves as a practical guide for implementing community-driven solutions to water challenges in rural and semi-urban villages. It provides a structured, step-by-step methodology for engaging stakeholders, assessing water quality, mapping climate change impacts, and formulating evidence-based recommendations to improve water security (Figure 2). The guidebook is designed to empower local communities, policymakers, and water resource managers with strategies shaped to the specific environmental and socio-economic conditions of rural villages.

By integrating scientific research, participatory engagement, and policy dialogues, this guidebook outlines an actionable framework for addressing key water security concerns, including potable water access, contamination risks, and climate-induced stressors such as floods, droughts. It highlights how localized approaches, combined with technical assessments, can lead to sustainable, community-led water management solutions.

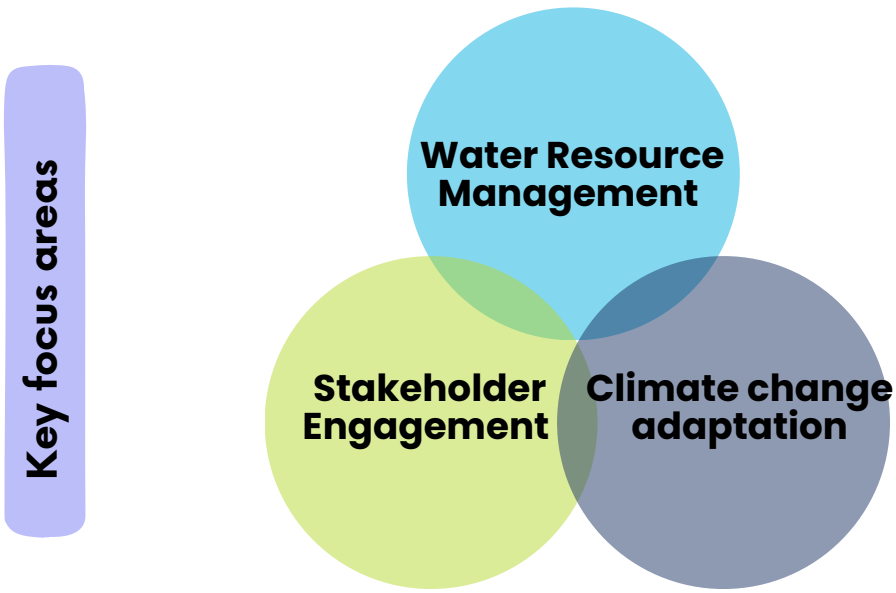


Figure 2: Key focus areas followed this guidebook

04 DEVELOPMENT OF THE GUIDEBOOK

This guidebook was developed through a collaborative and evidence-based approach to enhance water security in rural communities. It involved engaging local stakeholders, training community members in water quality monitoring, and establishing systematic data collection methods (Figure 3).

Further, participatory community mapping, expert consultations, and stakeholder discussions also helped to assess climate change impacts and identify sustainable water management strategies.

The insights gathered were used to develop community-specific recommendations and pilot interventions focused on improving water quality, infrastructure resilience, and climate adaptation.

By integrating local knowledge, scientific research, and policy-driven actions, the guidebook provides practical solutions for long-term water sustainability.

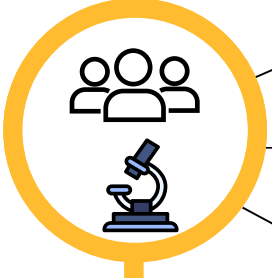
Figure 3: Flow of development of the guidebook

05 STEP-BY-STEP USER GUIDE

1 IDENTIFICATION OF WATER RELATED ISSUES

- Conduct Stakeholder Engagement & Community Consultation
- Data Collection on Water Resources & Accessibility
- Preliminary Identification of Water Quality & Climate Risks

2 ASSESSMENT SCIENTIFIC & COMMUNITY-BASED RESEARCH

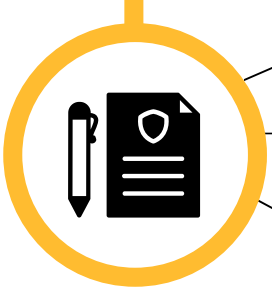


- Community-Based Water Quality Monitoring & Training
- Water and Soil Sample Analysis by Research team
- Participatory Community Mapping

3 STAKEHOLDER ENGAGEMENT & CO-CREATION

- Key Informant Interviews & Community Discussions
- Developing Co-Creation Solutions

4 ADAPTIVE IMPLEMENTATION & POLICY FORMULATION



- Translating Research into Actionable Policies
- Stakeholder Collaboration for Policy Adoption
- Community-Led Implementation & Monitoring

06 METHODOLOGY

1. Identification of water related Issues

Stakeholder Engagement & Project Inception

- Conducted an Inception Meeting with local leaders, community members, and stakeholders.
- Identified and selected community representatives to facilitate engagement and implementation.
- Assessed key water sources, water related challenges, and local concerns in the village through participatory discussions (Figure 4).

Figure 4: Collection of data on water related issues from stakeholders

Discussions during this meeting helped identify critical water-related problems, including:

- **Access to potable water**: Availability and distribution challenges
- **Water contamination concerns** : Presence of pollutants affecting drinking water
- **Climate-induced risks** :Droughts, seasonal variations, and flooding threats
- **Infrastructure deficiencies** : Inadequate storage, distribution, and management systems

Figure 5: Meeting with stakeholders in Nelvoi village

- A total of **20** representatives were selected from different community sections, ensuring inclusivity in the identification process (Figure 5).
- These individuals served as primary contacts for data collection, information dissemination, and ongoing engagement.
- A WhatsApp group was created to facilitate real-time communication and coordination.

2. Assessment Scientific & Community-Based Research

Community-Based Water Quality Monitoring & Training

- Provided training session to use low-cost water testing kits for community-led monitoring (Figure 6).
- Conduct practice drills before actual data collection to build confidence.
- Established a structured monitoring system (fortnightly or monthly testing at their house holds) and used digital platform (WhatsApp group) for real-time data sharing.

Figure 6: Training the stakeholders to use water testing kits

Water and Soil Sample Analysis by Research team

- The research team collected water samples monthly from selected households and analyzed them in the laboratory for physical, chemical, and microbial parameters.
- Additionally, soil samples near major water sources were tested for heavy metals and pollutants to identify contamination sources from agricultural runoff and industrial discharge (Figure 7).
- These tests helped establish association between soil conditions and groundwater contamination, providing essential data for mitigation strategies.

Figure 7: Augur drilling for soil sample collection

Participatory Community Mapping

A participatory community mapping initiative was conducted to assess their knowledge of water resources in the village (Figure 8).

Key Identifications:

- Locations of water sources, supply networks, and distribution points.
- Historical records of extreme rainfall and flood events induced by Climate change

Figure 8: Identification water sources by the stakeholders during Community mapping meeting

3. Stakeholder Engagement & Co-Creation

Stakeholder Consultations & Knowledge Exchange

- Organized Key Informant Interviews (KII) with policymakers, researchers, and local communities.

  Diverse group of stakeholders included - Public Welfare Workers, Village council members, Health workers, Local government officials, Engineers, Teachers, Agricultural Officers, and Community representatives such as Farmers, Women's groups

- Facilitated dialogues for co-developing solutions based on scientific and traditional knowledge.

  The dialogue focused on understanding the root causes of water insecurity and exploring solutions like education, policy interventions, and community-driven conservation.

- Developed village-specific recommendations through collaborative discussions.

  KII process effectively bridged the gap between research and ground reality, creating a collaborative platform for sustainable water management solutions. This engagement ensured that interventions were community- informed, practically viable, and aligned with local realities.

4. Adaptive Implementation & Policy Formulation

Policy & Sustainable Water Management Implementation

- Compiled findings from monitoring, mapping, and consultations into actionable strategies.
- Mechanism for the development and implementation of pilot interventions focusing on water quality, infrastructure resilience, and climate adaptation were integrated into the policy framework to ensure that emerging challenges are identified and addressed proactively.
- Ensure policy integration and long-term sustainability through stakeholder collaboration and advocacy.

07 APPLICATION

By combining scientific assessments, participatory engagement, and structured interventions, this tserves as a practical guide for strengthening water security, adapting to climate change, and building sustainable environmental management systems.

Users	Objectives
Villages & Local Communities	To improve water resource management through community-led monitoring and conservation initiatives.
Community Organizations & NGOs	To enhance climate resilience by identifying vulnerabilities and implementing nature-based solutions
Policymakers & Government Agencies	To foster stakeholder collaboration for policy integration and long-term sustainability planning.

08 HOW THIS GUIDEBOOK CAN BE USED

This **Guidebook for Community Centric Water Management and Climate Resilience in Rural India** is a comprehensive, evidence-based guide designed for rural communities, policymakers, researchers, and local stakeholders to improve water security, climate adaptation, and sustainable environmental management.

KEY FEATURES

01 Provides a structured, step-by-step approach for water quality assessments, community-led monitoring, Community mapping, and stakeholder dialogues.

02 Empowers local communities to actively manage their water resources, ensuring long-term sustainability.

03 Supports collaborative decision-making among public health professionals, agricultural officers, local governance bodies, and researchers.

04 Offers a scalable and adaptable framework that can be modified based on regional needs.

05 Bridges scientific research, local knowledge, and governance to create inclusive and effective water security solutions.

06 Encourages cross-sector partnerships between government agencies, civil society organizations, and academic institutions to enhance climate resilience and sustainable water management.

ACKNOWLEDGEMENTS

We extend our sincere gratitude to the **Association of Commonwealth Universities (ACU)** for their generous funding. Their commitment to fostering climate resilience and sustainable development has been instrumental in the successful execution of this project.

We also express our deep appreciation to **Vellore Institute of Technology (VIT)** for serving as the host institution, providing invaluable expertise, research infrastructure, and continuous support throughout this initiative.

Our heartfelt thanks go to all the stakeholders, local governance bodies, NGOs and community members of **Nelvoi Village**, Thallai, Vellore District, Tamil Nadu. Their participation, insights, and willingness to engage in this collaborative effort have been essential in identifying challenges and co-developing sustainable solutions for water security and climate resilience.

Finally, we acknowledge the dedication and hard work of the research team, whose collective efforts in data collection, fieldwork, and analysis have made this guidebook a reality. This project is a testament to the power of community-driven research, collaboration, and shared commitment to securing a sustainable water future for rural India.

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