

CLIMATE-RESILIENT AGRICULTURE PRACTICE, POLICY, AND PROSPECTS



The Progyan Foundation for Research and Innovation (PFRI) organized an international review workshop on ‘Climate-resilient Agriculture: Practice, Policy, and Prospects’ at IIT Madras, collaborating with CACS-IITM and South Asian Forum for Environment SAFE, with support from the Asia-Pacific Network for Global Change Research and IndusInd Bank.

Dr. Malancha Dey, Director, Research, SAFE, PFRI, presented the project overview for the ESPAR Project (Enabling Stakeholder Participation and Applied Research in Policy Comprehension to Mainstream Climate-Resilient Agro-farming Practices), highlighting that South Asia faces the highest regional Global Hunger Index with most farmland dependent on unpredictable monsoon patterns, while climate change threatens significant yield declines and could push hundreds of millions into climate hotspots by mid-century.

Highlights

Day 1

- Presentation of the ESPAR Project overview by Dr. Malancha Dey.
- Expert talks on climate adaptation strategies, carbon finance, natural resource management, and coastal resilience.
- Panel discussion on barriers to technology adoption and value chain challenges.
- Launch of the coffee table book “Harvests on the Brink: Climate, Policy & the Future of Farming in South Asia”.
- Launch of the project website www.apnespar.com.

Day 2

- Sessions on RCP-SSP climate modeling, NICRA success stories, and field case studies from drought- and flood-prone districts.
- Technical presentations on high-resolution climate projections for crop yield and water planning.
- Panel discussion on water management, AI-driven business models, and farmer behavior change.
- Launch of the project website agroclimate.in.

Distinguished speakers addressed critical dimensions of agricultural resilience: **Shri Anurag Mishra, Special Secretary for Environment and Forest Department**, outlined three prompt strategies essential for climate adaptation - water and soil health management, biodiversity and climate-resilient crops, and technology and knowledge production and dissemination. **Dr. Priyanie Amerasinghe** from the **International Water Management Institute** discussed carbon financing mechanisms and market access barriers for smallholder farmers. **Dr. Kaushal K. Garg** from **ICRISAT** demonstrated natural resource management interventions, showcasing results from Birdha village where watershed management improved groundwater levels and increased net income from 1.79 to 109.03 lakhs INR. **Dr. Dipayan Dey** from **SAFE** examined the carbon hunger dynamics within global climate finance frameworks, highlighting the tension between sustainability and resilience in NDC 3.0. **Dr. Dipnarayan Ganguly** from the **National Centre for Sustainable Coastal Management** explored coastal agricultural resilience through wetland restoration, demonstrating how restored ecosystems can increase rice yields by 15-20% while providing natural flood regulation and carbon sequestration benefits.

The interdisciplinary panel discussion revealed critical insights into technology adoption barriers, with experts emphasizing that farmers primarily adopt technologies when they directly perceive livelihood benefits, while highlighting the persistent challenges of fragmented landholdings and the complex role of middlemen in agricultural value chains.

Day 1 also launched *'Harvests on the Brink: Climate, Policy & the Future of Farming in South Asia'* and a dedicated project website www.apnespar.com

The second day focused on how climate science and modeling tools could be translated into practical interventions for agriculture, combining scientific projections with ground-level strategies to address diverse climate risks.

Dr. K. Alagusundaram, MD & CEO, TN APEX, highlighted the agricultural capacity of India through the success of the NICRA program, where 143 technology-enabled villages significantly outperformed neighboring areas using precision farming and mechanization. He emphasized that India is self-sufficient in food production, noting that the country produced over 330 million tons of food grains and more than 350 million tons of vegetables annually. His insightful speech also prompted discussions on a critical paradox – despite this production capacity, India ranked 125th in global hunger indices. **Dr. Alagusundaram** attributed this to socio-economic challenges rather than agricultural shortfalls, suggesting that while governments could implement models and provide motivation, private sector investment remained crucial for scaling solutions.



Prof. Sachin S. Gunthe, Department of Civil Engineering, IIT Madras, provided the scientific foundation for climate-informed agriculture through advanced modeling techniques. His presentation on Representative Concentration Pathways (RCP) and Shared Socioeconomic Pathways (SSP) frameworks demonstrated how Earth System Models had begun to integrate physical, chemical, and biological processes for comprehensive climate projections. He contextualized current challenges by showing how atmospheric CO₂ had surged to 422.8 ppm since industrialization, driving unprecedented climate changes that demanded adaptive agricultural strategies.



Dr. Bhaskar Deb Bhattacharya, IITM-PFRI, presented compelling field evidence from IITM-PFRI interventions in aspirational districts of India. In drought-prone Dharashiv, 20-acre agroforestry pilots engaged 5,561 farmers with measurable improvements in water security and soil conservation. In flood-vulnerable Begusarai, an innovative intervention combined float farming with indigenous millet revival and reached more than 5,600 smallholders, demonstrating how targeted strategies could address contrasting climate vulnerabilities within similar geographical contexts.



Technical presentations by **Dr. Yashwanth and Mr. Chakradhar from CACS, Department of Civil Engineering, IIT Madras,** explored Pseudo Global Warming modeling and downscaling techniques, showing how high-resolution projections could guide crop yield assessments, water demand planning, and extreme event preparedness. While acknowledging limitations in predicting events such as the 2015 floods, they emphasized ensemble modeling approaches for more robust agricultural planning.



PANEL DISCUSSION

The panel discussion, moderated by **Dr. Dipayan Dey, SAFE,** addressed critical policy-practice gaps across multiple dimensions. **Dr. Venkat Raman Srinivasan, Department of Civil Engineering, IIT Madras,** stressed that water was the determining factor for agriculture, warning that policies often facilitated resource over-extraction, with free electricity and bore well loans in Tamil Nadu cited as examples. He emphasized that "water is the new oil" and required immediate policy recalibration. **Prof. Arshinder Kaur, Department of Management Studies, IIT Madras,** focused on business model innovations, advocating for AI-driven predictive models to bridge credit access gaps and calling for entrepreneurial training among rural youth to enable collective farming operations. **Dr. Yashwanth** highlighted farmer resistance to new recommendations due to habitual practices, stressing the need for sustainability education. **Mr. Chakradhar** emphasized the trust deficit in climate forecasting, while **Dr. Priyanie Amerasinghe, IWMI, Colombo, Sri Lanka,** called for greater farmer accountability in resource use and the need to change perceptions that marketing should be handled by others.



POLICY–PRACTICE GAP ANALYSIS

The Multistakeholder Workshop on Policy–Practice Gap, held on 19 September 2025 in Kodaikanal, explored the disconnect between tourism-related policies and their ground-level implementation. Participants included representatives from the Municipality, Forest and Tourism Departments, National Highways, elected panchayat leaders, Self-Help Groups (SHGs), and researchers from IIT Madras and PFRI.

Objectives

- Build a shared understanding of “carrying capacity” in non-technical terms.
- Identify and prioritize key challenges caused by tourism pressure.
- Generate actionable solutions with clear distinctions between government and community roles.
- Foster accountability and collaboration among diverse stakeholders.

Key Discussions

The workshop began with an icebreaker where participants expressed love for Kodaikanal’s climate and landscape but voiced concerns over deforestation, waste, and traffic. The “Kodaikanal Bucket” analogy was used to illustrate how limited resources overflow when tourist inflows exceed ecological and infrastructural capacity.



Through community problem mapping and a gallery walk, three urgent priorities were identified:

- Traffic congestion and poor road infrastructure
- Inefficient waste management systems
- Water scarcity and distribution issues

Solutions Proposed

Government Actions:

- Enforce plastic bans and regulate tourist entry.
- Develop alternate routes, structured parking, and stricter sewage monitoring.
- Strengthen inter-departmental coordination.

Community Actions:

- Promote waste segregation and awareness campaigns.
- Report illegal felling, encroachment, or improper construction.
- Support eco-friendly livelihood practices.

Insights on the Policy–Practice Gap

While policies on plastic bans, waste clearance, and eco-regulation exist, implementation remains uneven due to limited capacity, poor coordination, and high tourist inflows. For instance, municipal waste cycles are overstretched, and forest–wildlife conflict management lacks timely response. The gap lies not in policy intent but in practical enforcement and accountability.

Way Forward

The workshop concluded that bridging the policy–practice gap requires:

- Integrated action across government departments.
- Community participation in monitoring and compliance.
- Digital tools (SMART framework) for real-time data collection and transparency.





MULTISTAKEHOLDER WORKSHOP ON EVALUATING TOURISM CARRYING CAPACITY IN KODAIKANAL, TAMIL NADU

The Multistakeholder Workshop on Ecological and Tourism Carrying Capacity, held on 22 September 2025 at the Mango Hill Hotel in Kodaikanal, marked a key milestone in advancing sustainable tourism management for the hill station. The event was organized by IIT Madras (CACS) and the Progyan Foundation, with participation from the Forest and Tourism Departments, Highways, PWD, Pollution Control Board, Kodaikanal Municipality, panchayat leaders, SHGs, NGOs, local guides, and community representatives.

Key Discussions

The workshop highlighted the mounting ecological challenges in Kodaikanal, including:

- Traffic congestion and road safety issues during peak tourist inflows. Stakeholders emphasized the need for new road planning and alternate routes to reduce bottlenecks and minimize wildlife accidents.
- Solid waste management crisis, with inadequate collection, segregation, and recycling despite existing policies.
- Water scarcity caused by rising seasonal demand and limited resources.
- Biodiversity stress, with habitat fragmentation, species decline, and growing human–wildlife interactions.

Participants reflected on visible changes over three decades, noting climate variability, loss of forest cover, and new environmental pressures. The IITM team presented measures to safeguard the hill station's natural beauty while sustaining livelihoods.

Objectives

- Present survey findings and ecological trends over the last 30 years, highlighting environmental challenges due to increased tourism.
- Identify tourism-induced pressures on biodiversity, water, waste, and land use.
- Develop a shared framework for community–science collaboration.
- Introduce the SMART Framework for participatory monitoring and management.



Solutions Proposed

Government Actions:

- Expand tourist facilities and create structured parking to manage visitor numbers safely.
- Strengthen traffic regulation, enforce waste management bylaws, and plan new roads with ecological sensitivity.
- Monitor sewage discharge and protect biodiversity-sensitive areas.

Community Actions:

- Engage in waste segregation and community-led awareness campaigns.
- Contribute to biodiversity monitoring with local ecological knowledge.
- Support eco-friendly livelihood practices and safeguard cultural heritage.



Insights

The workshop emphasized that while many policies exist to regulate tourism and protect Kodaikanal's ecology, implementation remains uneven due to administrative and resource constraints. The SMART Framework (Smartphones for Monitoring, Analysis, Research & Technology) was welcomed as a tool to bridge this gap, enabling real-time monitoring and integration of community knowledge with scientific approaches.

Way Forward

Participants agreed to co-develop a Carrying Capacity Action Plan for Kodaikanal. This plan will bring together government departments, scientific expertise, and community participation to ensure that tourism development remains sustainable while preserving the hill station's ecological integrity and cultural identity for future generations.



CARE- Climate Action for Resilience and Empowerment: Charting a Course for Nepal's Youth

As a global climate change hotspot, South Asia faces disproportionate environmental risks. Within this region, Nepal's unique Himalayan topography renders it exceptionally vulnerable. The country is warming at a rate of approximately 0.056°C per year, a figure significantly above the global average, leading to accelerated glacial retreat (*Shrestha et al., 2019*). This phenomenon increases the imminent threat of Glacial Lake Outburst Floods (GLOFs) (*World Bank, 2024; Ministry of Forests and Environment, 2021*) from what the International Centre for Integrated Mountain Development (ICIMOD) has identified as 47 potentially dangerous glacial lakes (*ICIMOD, 2020*). Such vulnerabilities, reflected in Nepal's 10th-place ranking on the 2021 Global Climate Risk Index (Germanwatch, 2021), national climate risk profile finds that more than 7.7 million people are highly exposed annually to extreme weather events, with rural and mountainous regions disproportionately at risk (*World Bank, 2024; UNDP, 2023*).

The livelihoods of Nepalese communities are acutely sensitive to climate disruptions. Agriculture accounts for 26% of Nepal's GDP and supports 62% of the working population. However, climate shocks contribute to 90% of annual crop losses, with droughts responsible for 40% and floods for roughly 23% of agricultural damages (*World Bank, 2024; FAO, 2024*). For Nepal's youth, who comprise over 40% of the population, susceptible to climate-related livelihood loss, skill mismatches, and unemployment (*British Council, 2024; NIDR, 2024*). The resulting instability has contributed to a significant rural-to-urban and international migration pattern, with remittances constituting 23–26% of Nepal's GDP in 2022–2024, a clear marker of the socioeconomic stress imposed by climatic pressure (*World Bank, 2024; IOM, 2024*). Climate-induced disasters and changing weather patterns could cost Nepal up to 2.2% of its annual GDP by 2050 (*ADB, 2017*). This distress-driven migration creates a significant brain drain, hindering domestic innovation and capacity building.

Despite policy commitments through the National Climate Change Policy (NCCP 2019) and Nepal's National Adaptation Plan (NAP) 2021–2050, there are persistent gaps in youth representation, climate literacy, and access to adaptation finance, especially for marginalized groups (*MoFE, 2021; CAN South Asia, 2021*). Nepal's youth are responding with unprecedented activism, leading movements that span digital advocacy and on-the-ground adaptation solutions, and linking climate justice to the advancement of Sustainable Development Goals (SDGs) and net-zero ambitions (*British Council, 2024; UNESCO, 2024*). To support adaptive solutions, a science-based framework should prioritize climate-resilient education, targeted vocational training, funding for youth-led innovation, and participatory planning for inclusive adaptation. Strengthening institutional partnerships and ensuring youth-centric implementation are vital for achieving climate resilience, social equity, and SDG fulfillment in a net-zero paradigm (*World Bank, 2024; CAN South Asia, 2021; UNDP, 2023*).

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