



Government of Tamil Nadu
State Planning Commission



LAND USE RESEARCH IN TAMIL NADU

15 YEARS OF TAMIL NADU STATE
LAND USE RESEARCH BOARD



Land Use Research in Tamil Nadu

**15 YEARS OF
TAMIL NADU STATE LAND
USE RESEARCH BOARD**

STATE PLANNING COMMISSION
GOVERNMENT OF TAMIL NADU

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State Land Use Research Board

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Message

It gives me immense pleasure to present the *15 Years of Land Use Research in Tamil Nadu* report, capturing the journey of the Tamil Nadu State Land Use Research Board (TNSLURB) since its inception in 2011 under the State Planning Commission. This milestone publication is being released during TNSLURB's first International Conference on Sustainable Land Governance in September 2025, symbolizing Tamil Nadu's commitment to evidence-based, climate-resilient, and inclusive land use planning.

Over the past decade and a half, TNSLURB has transformed land governance in Tamil Nadu, moving beyond traditional planning to embrace integrated geospatial technologies, climate adaptation strategies, and community-centric approaches aligned with the Sustainable Development Goals (SDGs) and Tamil Nadu Vision 2030. Through pioneering initiatives such as the Tamil Nadu Land Use Information System (TNLUIIS), Urban Heat Island Mitigation Strategy, and ecological restoration pilots, the Board has demonstrated how scientific insights can directly support policy and improve the lives of communities across urban and rural landscapes.

This report documents our journey—its challenges, learnings, and achievements—while offering a glimpse into the possibilities ahead. It reflects the collective efforts of our committed teams, research institutions, development partners, and the communities we serve. As Tamil Nadu navigates the complexities of rapid urbanization and climate change, the principles of sustainability, resilience, and equity will remain central to our planning efforts.

I congratulate the TNSLURB team, partner institutions, and all stakeholders who have contributed to this remarkable journey and to the preparation of this comprehensive report. I am confident it will serve as a valuable reference for policymakers, researchers, and practitioners across India and globally, inspiring collaborative action for sustainable land management.

Let us continue to map knowledge and navigate a future where land resources support human well-being while protecting ecological integrity for generations to come.

Dr J Jeyaranjan,

***Executive Vice Chairperson,
State Planning Commission &
Chairman, TNSLURB
Government of Tamil Nadu***





Foreword

The Tamil Nadu State Land Use Research Board (TNSLURB), since its inception in 2011 under the State Planning Commission, has become a catalyst for transforming land governance in Tamil Nadu. This *15 Years of Land Use Research* report, released at our first International Conference on Sustainable Land Governance, marks a significant milestone in this journey.

Land is the foundation of sustainable development. In a rapidly urbanizing and climate-vulnerable state like Tamil Nadu, the prudent management of land resources is critical for ensuring ecological balance, economic resilience, and social equity. TNSLURB has consistently worked to strengthen the scientific foundations of land use planning by developing integrated spatial data systems, conducting thematic research, and aligning its initiatives with the Sustainable Development Goals (SDGs).

The Board's work in deploying the Tamil Nadu Land Use Information System (TNLUIIS), facilitating urban heat mitigation strategies, and building the capacity of planning institutions across the state reflects our commitment to using technology and data for inclusive governance. These initiatives have not only advanced policy formulation but have also created pathways for collaboration across government departments, academia, and civil society.

This report is a reflection of our collective dedication to building a resilient and sustainable Tamil Nadu. It documents the achievements of TNSLURB while setting the vision for the years ahead. I extend my appreciation to the teams involved in preparing this publication and to all our partners whose support and expertise have enriched our efforts.

I am confident that the insights captured in this report will inspire further dialogue, innovation, and action in the land governance space, contributing to the creation of communities that are climate-resilient, equitable, and future-ready.

Sudha Ramen IFS

***Member Secretary,
State Planning Commission &
Member Secretary, TNSLURB
Government of Tamil Nadu***





Preface

The Tamil Nadu State Land Use Research Board (TNSLURB), established in 2011 under the State Planning Commission, has played a pivotal role in advancing sustainable, inclusive, and climate-resilient land governance in Tamil Nadu over the past fifteen years. Operating within one of India's most urbanized and climate-vulnerable states, TNSLURB has transitioned from conventional land management approaches to a model that is evidence-based, technology-driven, and aligned with the Sustainable Development Goals and Tamil Nadu Vision 2030.

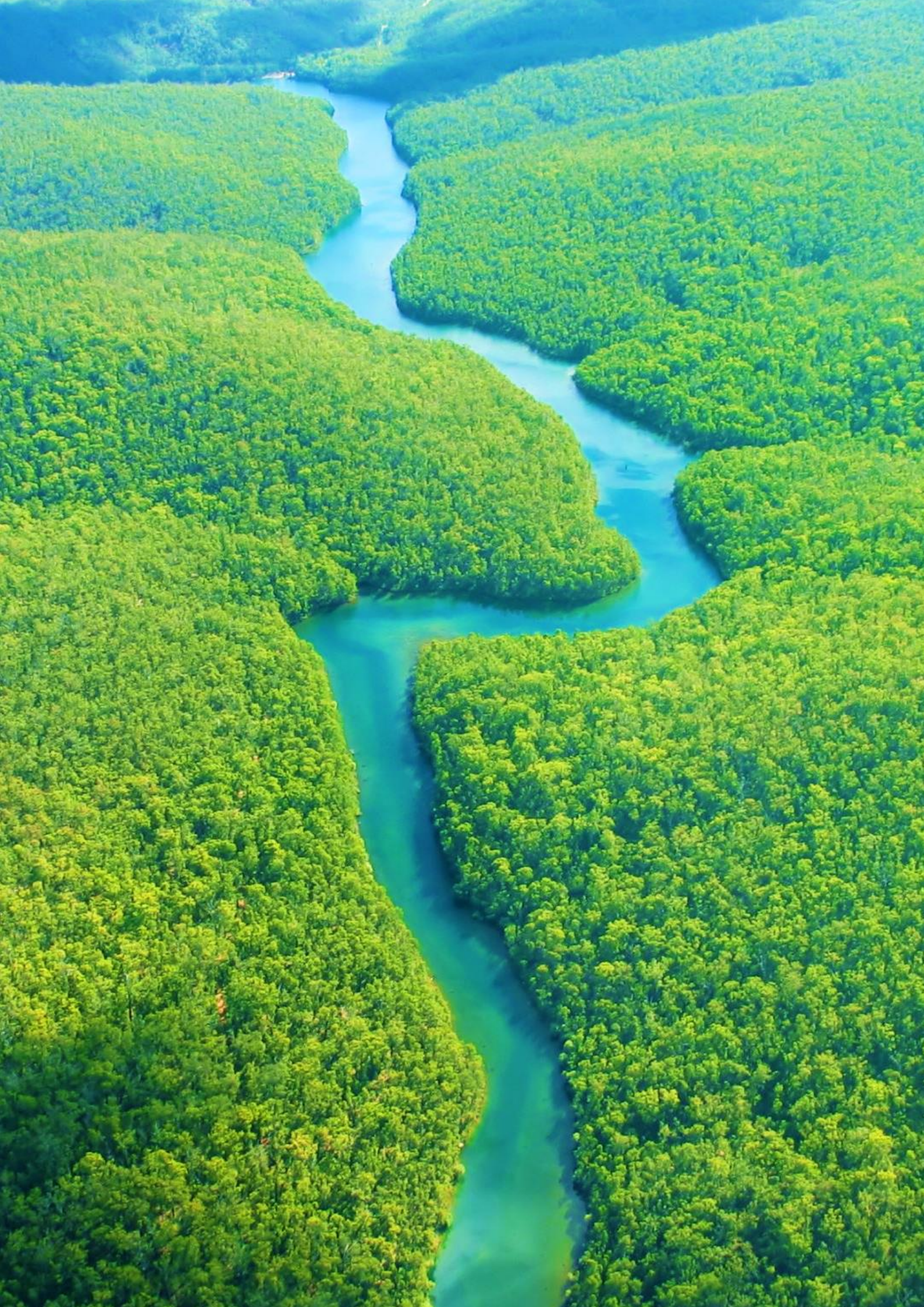
During this period, TNSLURB has undertaken a comprehensive research agenda, producing over eighty thematic and analytical studies covering critical areas such as climate resilience, peri-urban transitions, sustainable agriculture, wetland management, and biodiversity conservation. These research outputs have informed state-level policies, contributed to regulatory frameworks, and supported the design of development schemes, enabling the state to address complex land use challenges with scientific rigor.

A cornerstone of TNSLURB's work has been the development and operationalisation of the Tamil Nadu Land Use Information System (TNLUIS), a state-of-the-art geospatial platform launched in 2024 to facilitate real-time, data-driven decision-

making in planning processes. This system, along with advanced GIS-based tools, thematic land use maps, and climate vulnerability assessments, has strengthened the state's capacity for integrated and adaptive spatial planning while promoting transparency and efficiency.

TNSLURB's commitment to building institutional capacities has been demonstrated through its extensive training and capacity-building programs, which have engaged over twelve hundred planners, officials, and community stakeholders across Tamil Nadu. The Board's collaborative approach, reflected in its partnerships with leading institutions such as UNEP, IIT Madras, WRI India, and TNAU, has further enhanced its ability to deliver high-impact outcomes while ensuring alignment with international best practices.

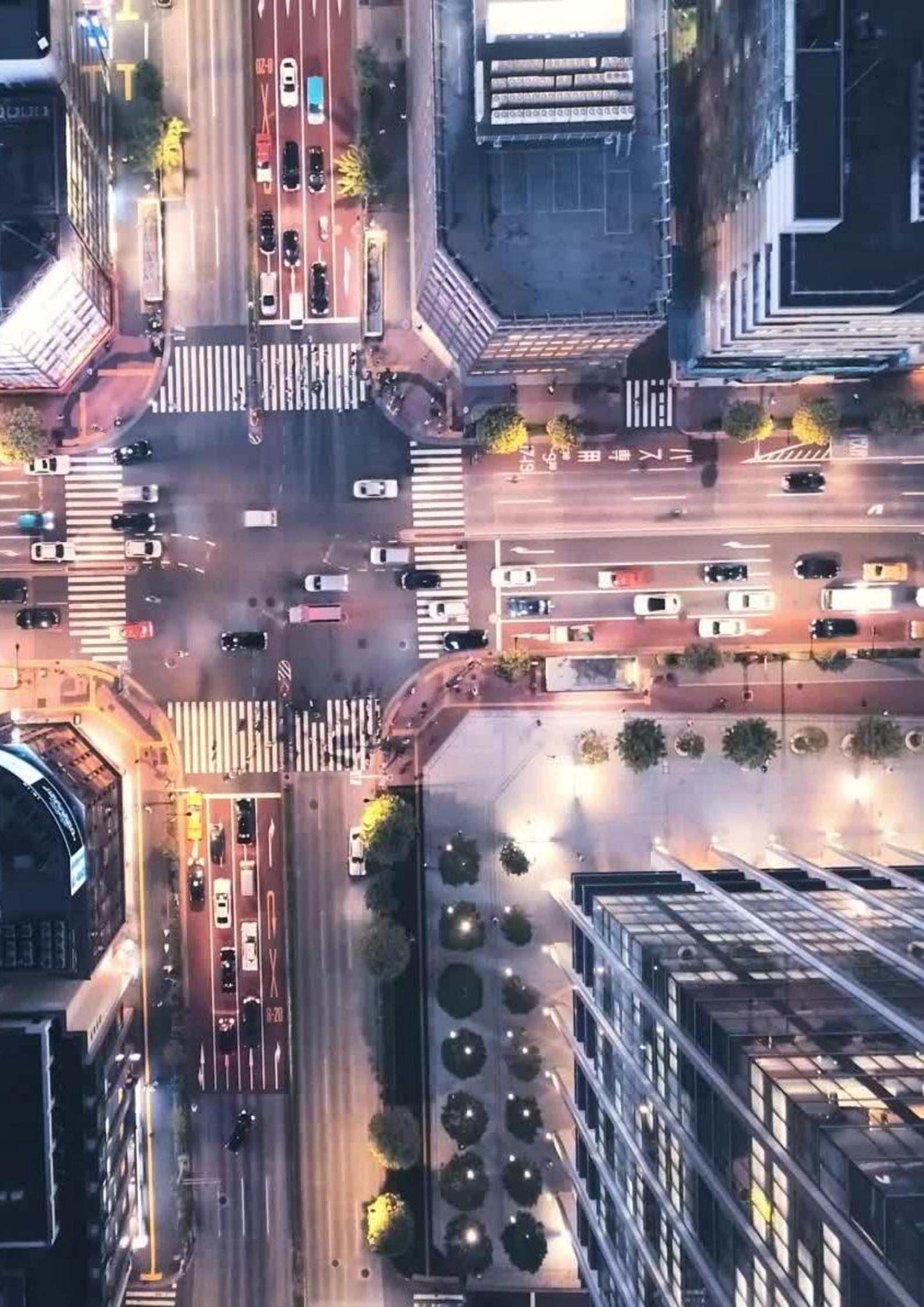
The impact of TNSLURB's work is evident in the enhanced resilience of communities, improved planning processes, and strengthened institutional frameworks for sustainable land governance across the state. As Tamil Nadu continues to address the challenges posed by rapid urbanization and climate change, TNSLURB remains committed to expanding the reach of its initiatives, deepening the integration of SDGs within land use planning, and leveraging technology and partnerships to support the state's transition towards a resilient and sustainable future.



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1. About TNSLURB

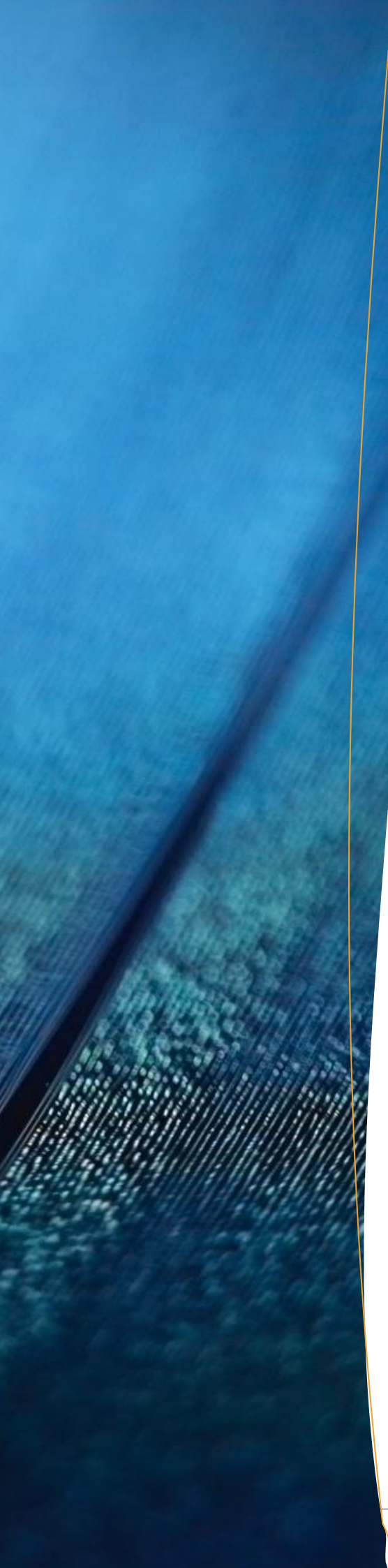
The **Tamil Nadu State Land Use Research Board (TNSLURB)** was established in 2011 under the State Planning Commission to institutionalise scientific, sustainable, and inclusive land governance across Tamil Nadu. Recognising the critical role of land resources in shaping economic development, environmental sustainability, and social equity, the Board was tasked with creating a knowledge-driven ecosystem for integrated land use planning in one of India's most dynamic states.

TNSLURB serves as the central knowledge and coordination platform for land use research and planning, bringing together geospatial data, ecological assessments, socio-economic insights, and climate risk analysis to inform state and district-level planning processes. By leveraging advanced technologies and fostering collaboration across government departments, academic institutions, and civil society, the Board ensures that land governance in Tamil Nadu remains responsive to emerging challenges while aligning with the Sustainable Development Goals and Tamil Nadu Vision 2030.

The Board's mandate includes generating high-quality, policy-relevant research, developing spatial data infrastructure, providing technical and policy advisory services, and building institutional capacities for sustainable land management. TNSLURB also anchors innovative platforms such as the **Tamil Nadu Land Use Information System (TNLUIS)**, a flagship geospatial decision-support system designed to empower planners and policymakers with real-time, evidence-based insights for zoning, infrastructure planning, and climate adaptation strategies.

Guided by the principles of transparency, scientific integrity, and inclusiveness, TNSLURB operates under the leadership of the Vice Chairperson of the State Planning Commission and the administrative coordination of the Member Secretary, with a dedicated team of experts in land use planning, environmental management, and spatial data systems. This multidisciplinary structure ensures that the Board's initiatives remain grounded in scientific rigor while being adaptable to the evolving needs of Tamil Nadu's communities and ecosystems.

Over the past fifteen years, TNSLURB has demonstrated how integrated land use planning can support climate resilience, promote sustainable livelihoods, and foster equitable growth. As Tamil Nadu looks towards a future shaped by rapid urbanisation and climate challenges, TNSLURB remains committed to building a resilient, data-driven, and community-engaged framework for land governance, ensuring that every parcel of land contributes to the well-being of people and the protection of the environment.



Vision

To create a future where land resources across Tamil Nadu are utilised sustainably and equitably, supporting both human well-being and environmental integrity, while fostering climate resilience, social inclusion, and economic prosperity.

Objectives

TNSLURB's objectives reflect its commitment to integrated, evidence-based, and sustainable land governance in Tamil Nadu:

1. Institutionalise Scientific Land Use Planning:
Facilitate the systematic application of scientific methods and geospatial intelligence in land use management.
2. Generate and Disseminate Knowledge:
Produce high-quality research and data to inform policies, planning processes, and decision-making across sectors.
3. Support Data-Driven Planning:
Provide planners and departments with real-time, actionable insights for zoning, land allocation, climate adaptation, and disaster resilience.
4. Align with Sustainable Development Goals (SDGs):
Ensure coherence between global frameworks (SDGs), state development priorities, and local actions.
5. Build Institutional and Community Capacity:
Strengthen the technical and institutional capacities of government agencies, local bodies, and stakeholders in sustainable land governance.
6. Promote Cross-Sectoral Collaboration:
Foster partnerships with academic institutions, international organisations, and technical agencies to advance research and innovations in spatial governance.

Board Composition

1. Vice-chairman, State Planning Commission	Chairman
2. Additional Chief Secretary to Government, Planning and Development Department	Member
3. Secretaries concerned / Head of Departments pertaining to the concerned subjects in Agenda	Member
4. Member-Secretary, State Planning Commission	Member Secretary
5. Principal Chief Conservator of Forests	Member
6. Engineer-in-Chief, Water Resource Department	Member
7. Chief Engineer, Agriculture Department	Member
8. Director (E-Governance)	Member
9. Commissioner of Agriculture	Member
10. Director of Town and Country Planning	Member
11. Any other Members by invitation of the Chairman	Member

Administration

The Land Use Division under the State Planning Commission (SPC) collaborates with various state government departments, academic institutions, research organizations, and other agencies to oversee the activities of TNSLURB. The division is responsible for calling for research proposals, screening them, apprising the board, organizing meetings, workshops, and conducting studies on current issues and challenges related to land use to provide recommendations to the government.

The division also undertakes internal research studies and collaborates with research institutes and academia to conduct assessments. The division organizes workshops, bringing together key stakeholders and experts, with a primary focus on analysing emerging issues in land use, land resources, and land degradation. The overarching goal is to evaluate the impact of various policies and developmental programs in these domains.

TNSLURB administration is committed to fostering effective collaboration, conducting comprehensive research, and providing strategic recommendations to enhance land use management and policy implementation in Tamil Nadu.

The composition of the division is as follows – Head of Division (in the level of Deputy Conservator of Forests), Planning officer, technical assistants and Planning Assistants. TNSLURB also has post of Senior Research Fellow to assist the Board in coordinating the research activities and to engage in in-house studies.

Strategic Actions and Core Functions

Over the past five decades, since State Land Use Board (1975) to the present Tamil Nadu State Land Use Research Board (TNSLURB), this Board has redefined how land is seen, managed, and valued in Tamil Nadu. From conserving the state's natural assets to enabling cities to adapt to heat and floods, TNSLURB's work demonstrates how land governance is not just about managing space but about shaping a resilient, equitable, and thriving society.

At the heart of this journey are five interwoven strategic actions that translate vision into tangible outcomes.

1. Generating Knowledge That Informs Action

TNSLURB's work begins with asking the right questions. What does climate resilience mean for Tamil Nadu's coastal districts? How can peri-urban growth be managed sustainably? What is the real value of wetlands for water security and livelihoods?

To answer these, the Board has undertaken over 80 targeted research studies, combining fieldwork, geospatial analysis, and policy research. These studies do not sit on shelves—they have shaped district plans, informed state climate strategies, and guided conservation and agricultural interventions across Tamil Nadu.

2. Bringing Data to the Frontlines of Planning

Data becomes powerful when it is accessible and actionable. The Board's flagship initiative, the **Tamil Nadu Land Use Information System (TNLUIS)**, made as an assembly announcement in 2024 and implemented in 2025, does precisely this. It transforms complex spatial data into intuitive, real-time decision-making tools for planners and administrators across the state.

Whether it is identifying vulnerable heat islands in Chennai, mapping wetland's zone of influence, or planning green corridors, TNLUIS aims at making it possible for land governance in Tamil Nadu to be smart, timely, and responsive.

3. Supporting Policy with Technical Expertise

TNSLURB is more than a research body; it is a trusted advisor to Tamil Nadu's planning ecosystem. The Board's technical insights have shaped the **Tamil Nadu State Action Plan on Climate Change 1.0**, the **Heat Mitigation Strategy**, and emerging frameworks for peri-urban management. By connecting ground realities with policy imperatives, the Board ensures that decisions are scientifically grounded and future ready.

4. Building Capacities, Empowering Institutions

Resilient land governance requires people who understand the power of data and the urgency of sustainability. Through over 45 capacity-building programs, TNSLURB has trained planners, engineers, municipal officers, and community representatives, enabling them to integrate climate resilience, participatory methods, and spatial planning into their work.

In a rapidly evolving planning landscape, these efforts have created a network of skilled professionals who can translate land governance into local action.

5. Driving Collaboration for Sustainable Futures

TNSLURB's success is built on partnerships. Collaborations with UNEP, IIT Madras, WRI India, TNAU, SACON, and others have allowed the Board to co-create solutions, test innovations, and align Tamil Nadu's strategies with global best practices. By

fostering a culture of shared learning, TNSLURB ensures that sustainability is not siloed but is a collective commitment across government, academia, and communities.

These strategic actions together create a foundation that allows Tamil Nadu to address urbanisation, climate change, and ecological pressures while safeguarding livelihoods and resources for future generations. For TNSLURB, land governance is a dynamic, living process. It is about weaving together data,

policies, people, and nature to create landscapes that are productive, cities that are liveable, and ecosystems that are protected. As Tamil Nadu charts its path towards 2030 and beyond, TNSLURB's commitment to science, innovation, and collaboration will continue to guide its journey towards a resilient and sustainable future.

The following chapters will explain each of these contribution in a detailed manner.

“Land is the canvas on which we build our future. Through strategic action, TNSLURB ensures that every decision about land is a step towards resilience, equity, and sustainability in Tamil Nadu.”





“From conserving farmlands and ecosystems to leveraging advanced spatial data for climate resilience, this 50-year journey reaffirms Tamil Nadu’s leadership in sustainable land governance, ensuring that every parcel of land contributes to a thriving and resilient state.”

2. Tracing a 50-Year Journey in Land Use Research (1975–2025)

The journey of the Tamil Nadu State Land Use Research Board (TNSLURB) is rooted in a five-decade commitment to advancing sustainable land governance in Tamil Nadu. From its early beginnings as the State Land Use Board in 1975 to evolving as a centre of excellence in data-driven, climate-resilient, and inclusive land use planning, this trajectory reflects Tamil Nadu’s pioneering spirit in using land as a lever for sustainable development.

Year	Milestone
1975	Establishment of the Tamil Nadu State Land Use Board (SLUB) under the Department of Agriculture to coordinate land and water management.
1981	Transfer of SLUB functions to the State Planning Commission , aligning land governance with state planning priorities.
1990	Reconstitution with inter-departmental representation for integrated planning.
2000	Adoption of Macro Management Mode to align land use with agriculture and natural resource conservation.
2009	Full state funding to address emerging needs in land management and sustainable agriculture .
2011	Establishment of the Tamil Nadu State Land Use Research Board (TNSLURB) under the State Planning Commission, formalising its research and planning mandate.
2014–2020	Launch of thematic research programmes on peri-urban governance, wetlands, climate resilience, and sustainable agriculture .
2021 onwards	Strengthened partnerships with IIT Madras, WRI India, SACON, UNEP, and TNAU for collaborative research and capacity building.



Laying the Foundation 1975–2000	Established in 1975 under the Department of Agriculture, the Tamil Nadu State Land Use Board (SLUB) focused on coordinating land and water management aligned with national and state priorities. By 1990, its reconstitution under the State Planning Commission enabled interdepartmental collaboration for integrated land use planning.
Transition to Integrated Planning 2000–2010	Tamil Nadu adopted the Macro Management Mode in 2000, expanding land governance from agriculture to soil and water conservation. By 2009, with full state funding, the Board could address emerging needs in agriculture and forestry, laying the foundation for integrated, multi-sectoral planning.
Institutionalising Research-Driven Governance 2011–2020	The establishment of TNSLURB in 2011 marked a shift to evidence-based, research-driven land governance. As a knowledge hub, the Board conducted thematic studies, stakeholder consultations, and integrated geospatial data and ecological assessments into planning processes.
Driving Innovation and Resilience 2020–2025	TNSLURB advanced technology-driven governance, launching TNLUIS in 2024 for real-time spatial data access. It contributed to the Tamil Nadu Heat Mitigation Strategy, peri-urban frameworks, and ecosystem restoration, aligning land use planning with climate action and SDG commitments.

The 50-year journey of TNSLURB is not merely a reflection of institutional evolution; it is a testament to Tamil Nadu's commitment to scientific and sustainable land governance. As the state faces the twin challenges of rapid urbanisation and climate change, TNSLURB will continue to scale its innovations, deepen SDG integration within land use planning, and empower communities to actively participate in shaping a resilient and equitable future.

3. Focus Areas of TNSLURB

TNSLURB advances sustainable land governance by prioritising **six key focus areas** that balance economic growth, environmental protection, and social well-being. These focus areas guide research, collaborations, and capacity-building efforts while ensuring that land use planning in Tamil Nadu remains responsive to emerging challenges and aligned with the Sustainable Development Goals.

1 Sustainable Urban and Industrial Development

TNSLURB supports eco-friendly urbanisation and planned industrial development that reduces environmental footprints while meeting the state's economic aspirations. The Board promotes integrated spatial planning, infrastructure prioritisation, and zoning strategies that align urban growth with ecological sustainability and climate resilience.

2 Agriculture and Rural Development

Recognising the critical role of agriculture in ensuring food security and livelihoods, TNSLURB focuses on promoting sustainable farming systems, land productivity, and integrated rural development. This includes supporting climate-resilient agricultural practices and aligning land use planning with the socio-economic needs of rural communities.

3 Water and Land Resource Management

Water and land are interdependent resources essential for sustainable development. TNSLURB works on conserving and managing these resources through watershed management, soil and water conservation practices, and land restoration initiatives, ensuring resilience against climate variability and supporting livelihoods.

4 Sustainable Tourism and Heritage

Tamil Nadu's rich natural and cultural heritage presents opportunities for sustainable tourism. TNSLURB integrates

heritage conservation into land use planning while supporting tourism models that protect ecosystems, generate local employment, and promote cultural sustainability.

5 Energy Infrastructure

Transitioning towards renewable and sustainable energy systems is central to Tamil Nadu's climate goals. TNSLURB prioritises integrating renewable energy infrastructure within land use frameworks, supporting the expansion of solar, wind, and other clean energy initiatives in alignment with ecological considerations.

6 Environment, Climate, and Natural Landscape

Conservation of natural landscapes, biodiversity, and ecosystems underpins climate resilience and sustainability. TNSLURB actively integrates environmental considerations into land use planning, promoting the conservation of wetlands, forests, and biodiversity while supporting climate adaptation and mitigation measures across the state.

Through these focus areas, TNSLURB reaffirms its commitment to ensuring that **land governance in Tamil Nadu becomes a platform for sustainable, inclusive, and climate-resilient development**. These priorities guide the Board's research, partnerships, and policy support, ensuring that Tamil Nadu's landscapes continue to sustain both its people and its environment.

“By focusing on these six strategic priorities, TNSLURB is transforming land governance into a driver of resilience, prosperity, and sustainability for Tamil Nadu.”

4. SDGs & Land Use

The **Sustainable Development Goals (SDGs)** aim to end poverty, protect the planet, and ensure prosperity by 2030. Land use is central to these goals, influencing social, economic, and environmental sustainability. Optimising land use decisions enables Tamil Nadu to address food security, water management, climate resilience, economic growth, and poverty reduction in an integrated manner.

TNSLURB aligns its planning and management practices with the SDGs, adopting a **holistic approach that balances economic development with environmental stewardship**, ensuring Tamil Nadu's progress towards Vision 2030 while safeguarding its landscapes.



How Land Use Supports SDGs in Tamil Nadu

✓ SDG 1: No Poverty

Sustainable land-use systems alleviate poverty, secure livelihoods, and ensure sustainable resource utilisation.

✓ SDG 2: Zero Hunger

Land-use optimisation enables sustainable food production and resilient agriculture, increasing productivity.

Integrated land-use planning and water management enhance equitable water access.

Land-use planning supports renewable energy promotion and GHG emission reductions.

Sustainable land-use practices create economic opportunities while promoting sustainability.

Land-use practices foster resilient infrastructure and sustainable industrial development.

Integrated land-use planning improves urban living and supports climate-resilient cities.

Land-use planning reduces emissions from deforestation and unscientific practices, contributing to climate mitigation.

Sustainable land practices reduce the impacts of land-based activities on marine ecosystems.

Sustainable land use underpins ecosystem protection and biodiversity conservation.

Through its research, technical guidance, and integrated planning frameworks, TNSLURB ensures that land governance in Tamil Nadu actively contributes to SDG targets while fostering climate resilience and ecological sustainability.

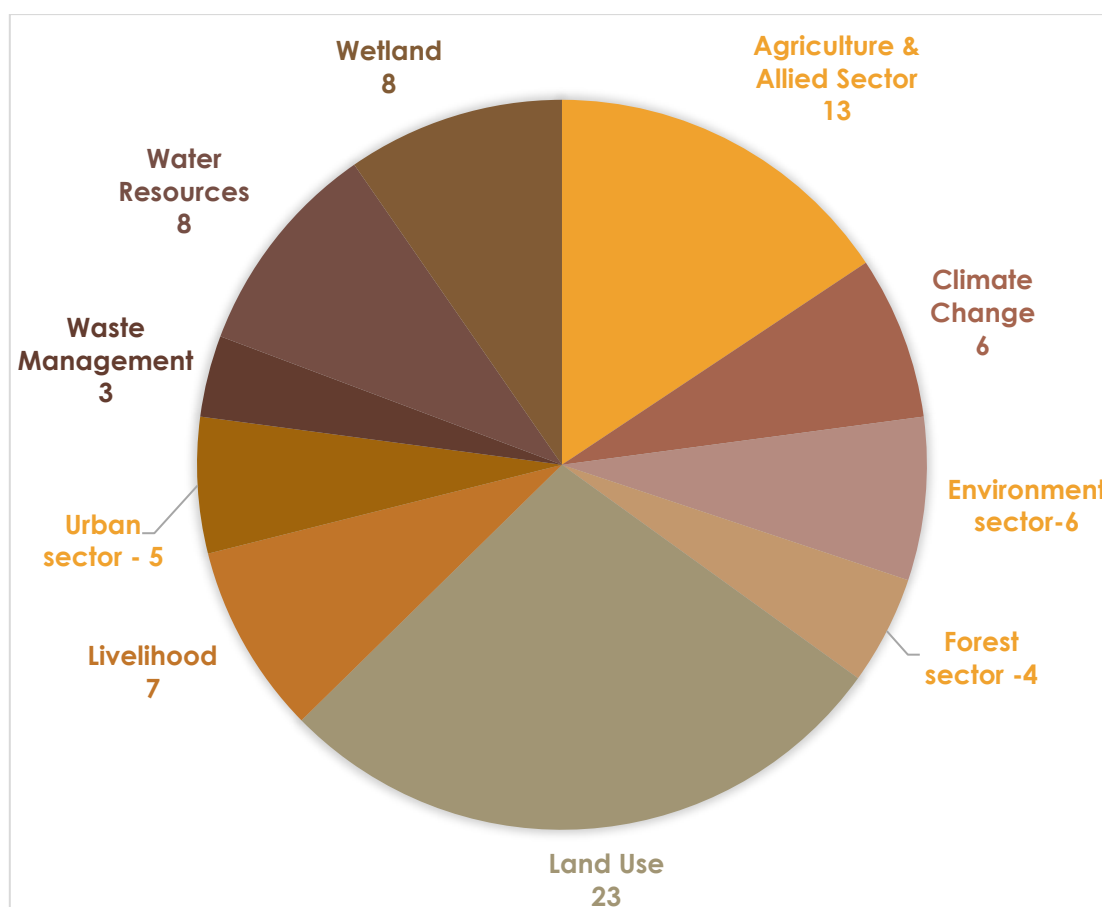


5. Research and Analytical Studies (2011–2025)

TNSLURB has positioned research as a strategic tool to advance **sustainable, climate-resilient, and inclusive land governance across Tamil Nadu**. All studies undertaken over the past 15 years have been purposefully aligned with the Board's six focus areas, ensuring direct relevance to the state's planning priorities while informing policy, supporting departments, and guiding on-ground interventions.

The rapid pace of development in Tamil Nadu, coupled with the challenges posed by climate change, population growth, and urbanization, underscores the critical need for informed decision-making and sustainable practices. Research in key areas such as land use, resource management, and environmental conservation is vital to ensuring that development progresses in a way that balances economic growth with the preservation of natural ecosystems and the well-being of communities. By focusing on these areas, research provides the necessary evidence base to develop policies and strategies that address current challenges while anticipating future needs. This proactive approach is essential for maintaining the delicate balance between exploiting natural resources and conserving them for future generations, ultimately fostering a resilient and sustainable future for the state.

The research studies conducted by TNSLURB since 2011 are categorized into ten prominent themes of current relevance.



LAND USE

TNSLURB has conducted targeted studies under its Land Use focus area to support evidence-based planning, sustainable resource management, and informed policy decisions across Tamil Nadu. These studies align with agriculture, water conservation, land degradation, and climate resilience priorities.

Land use planning can help in:

- ☒ Optimising land allocation for agriculture, housing, industry, and infrastructure while balancing ecological needs.
- ☒ Preventing land degradation and promoting restoration of fallow and marginal lands.
- ☒ Strengthening evidence-based decision-making through geospatial mapping and monitoring.
- ☒ Ensuring long-term sustainability by aligning land management with SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities), and SDG 15 (Life on Land).

Themes Covered by TNSLURB:

- ☒ Soil resource mapping for sustainable agriculture
- ☒ Watershed prioritisation for soil and water conservation
- ☒ Land degradation and wasteland identification for restoration
- ☒ Impact assessment of climate on agriculture
- ☒ Spatial land use planning for effective resource utilisation

Key Studies:

- **Identification of Potential Mine Sites for Restoration using Geospatial Information (2023-24) (Auroville Botanical Gardens)** – Identifies mine sites for ecological restoration using GIS, considering land stability and water availability.
- **Mapping of Peri-Urban Areas and Sustainable Management Framework (2023-24) (WRI India)** – Maps and analyses peri-urban areas of statutory towns to develop frameworks for balanced, climate-sensitive urban expansion.
- **Identification and Mapping of Fallow Land for Conversion to Productive Lands (2022-23) (NBSS&LUP, ICAR Bengaluru)** – Uses high-resolution satellite data to map fallow lands and factors behind non-use, aiding policies for land restoration.
- **Land Use Suitability Assessment, Kallakurichi District (2022-23) (Auroville Consultancy)** – Evaluates land for forestry, agriculture, water harvesting, renewable energy, housing, and industrial development.
- **Dynamics of Land Use and Cropping Pattern Changes in Tamil Nadu (2020-21) (Annamalai University)** – Analyses the shift from agriculture to non-agriculture and the need for robust land management.
- **Tree Farming as a Choice for Land Use in Coastal Areas (2019-20) (Annamalai University)** – Evaluates cashew and casuarina plantation viability on fallow lands for sustainable land use.

- **Causal Factors Influencing Agricultural Land Use Patterns (2018-19)**
(MSSRF, Chennai) – Studies agricultural land decline due to urbanisation and water scarcity in Karur, Pudukottai, and Tiruchirapalli.
- **Land Use Land Cover Mapping for SADP Areas (2017-18)**
(IRS, Anna University) – Uses remote sensing to track land use changes in Theni and identify water recharge zones.
- **Analysis of Land Use Changes in Agro-Climatic Zones (2016-17)**
(IFMR, Chennai) – Assesses agriculture-to-non-agriculture shifts across seven districts, recommending policy interventions.
- **Factors Shaping Land Use Change in Erode, Nagapattinam, Tirunelveli (2014-15)**
(MIDS, Chennai) – Examines drivers of agricultural land sales and conversions in rural Tamil Nadu.
- **Deciphering Land Use & Land Cover Changes near Protected Areas (2014-15)**
(Care Earth Trust, Chennai) – Analyses LULC changes around protected areas and reserved forests in Tirunelveli, Kanchipuram, Nagapattinam.
- **Review of Legal and Institutional Framework for Land Use Management (2013-14)**
(CLP&HRS, Chennai) – Reviews Tamil Nadu's legal framework to propose a model land use policy.
- **Impact of Land Use Change on Livelihoods (2012-13)** (CARDS, TNAU, Coimbatore)
– Examines land use changes in Coimbatore and Dharmapuri and their livelihood impacts.
- **Assessment of Salt-Affected Soils (2012-13)** (NBSS&LUP, Bangalore) – Maps and assesses salt-affected soils and their impact on crop productivity.
- **Fallow Lands of Tamil Nadu: Causes, Effects, and Measures (2012-13)**
(NBSS&LUP, Bangalore) – Identifies causes of fallow land increase and strategies for productive use.

ENVIRONMENT SECTOR

Environmental sustainability is central to Tamil Nadu's climate resilience and development goals. TNSLURB's environment-focused studies guide land governance towards conserving ecosystems, enhancing blue-green infrastructure, managing pollution, and addressing climate impacts, aligning with Tamil Nadu Vision 2030 and SDG commitments.

Land use planning strengthens environmental sustainability by:

- ☒ Conserving ecosystems through integrated approaches to forests, wetlands, coastal zones, and biodiversity corridors.
- ☒ Guiding pollution control and waste management strategies that protect soil, water, and air quality.
- ☒ Enhancing climate resilience by embedding blue-green infrastructure and nature-based solutions into planning.
- ☒ Supporting restoration of degraded lands and prevention of further ecological damage.

☒ Promoting cross-sectoral environmental governance aligned with SDG 6 (Clean Water), SDG 13 (Climate Action), and SDG 15 (Life on Land).

Themes Covered:

- ☒ Blue-Green infrastructure planning
- ☒ Coastal greening and conservation
- ☒ Pollution and groundwater monitoring
- ☒ Invasive species management
- ☒ District-level environmental performance assessment

Key Studies:

- **Tamil Nadu Blue-Green Infrastructure Potential Mapping and Development Framework (2023-24)** (*Auroville Consulting*)
Maps existing blue-green corridors and assesses opportunities to enhance or create new corridors using satellite image processing and geospatial analysis to support conservation and urban resilience.
- **A Constraint Analysis in Land Availability for Greening the East Coast Area (2016-17)** (*Annamalai University*)
Assessed land conversion challenges in Cuddalore and Viluppuram for coastal greening and recommended strategies including cashew and casuarina plantation, policy enforcement, and community engagement.
- **Ecological, Economic, and Sociological Impacts of Invasive Species in Tamil Nadu (2015-16)** (*Madurai Kamaraj University*)
Investigated the impacts of invasive *Pterygoplichthys* species in the Cauvery and Vaigai river basins, assessing their distribution, ecological impacts, and control strategies.
- **Land Use Changes, Groundwater Contamination, and GHG Inventories in MSW Dumpsites, Chennai (2014-15)** (*Centre for Climate Change and Disaster Management, Anna University*)
Studied the environmental impacts of rapid MSW growth in Chennai, assessing contamination and emissions from major dumpsites.
- **Environmental Sustainability Index for Districts of Tamil Nadu (2012-13)** (*Centre for Development Finance, IFMR*)
Developed a district-wise environmental performance index to guide corrective measures, fostering data-backed policy for sustainable development.
- **Monitoring of Kodungaiyur Solid Waste Dump Site – Impact on Soil and Groundwater (2012-13)** (*University of Madras, Chennai*)
Assessed pollution in soil and groundwater near the Kodungaiyur landfill using geophysical tools to inform pollution mitigation and landfill design improvements.

LIVELIHOOD

TNSLURB's livelihood-focused studies demonstrate its commitment to enhancing farmers' income security, rural employment, and community resilience through sustainable, land-based practices across Tamil Nadu. These initiatives align with Vision 2030 goals, addressing climate variability, soil health, and diversification to strengthen rural economies.

Land use planning enhances livelihoods by:

- ☑ Diversifying income sources through integrated farming, agroforestry, aquaculture, and non-timber forest produce.
- ☑ Supporting sustainable use of natural resources that improve resilience in rural and peri-urban communities.
- ☑ Creating opportunities for women, youth, and self-help groups to participate in land-based enterprises.
- ☑ Linking land management with skill development and capacity-building programmes for long-term income security.
- ☑ Strengthening rural economies by promoting value addition, eco-tourism, and market access for local products.
- ☑ Improving socio-economic security while advancing SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 13 (Climate Action).

Themes Covered by TNSLURB:

- ☑ Integrated farming systems for year-round income
- ☑ Sustainable aquaculture and polyculture models
- ☑ Bio-fertiliser and soil fertility enhancement
- ☑ Tree-based agroforestry for dryland livelihoods
- ☑ Salinity-tolerant species for degraded lands

Key Studies

- **Multiplication and Popularization of High-Density Short Rotation (HDSR) Saline/Sodicity Tolerant Casuarina junghuhniana Clones (2021-22)** (TNAU, Mettupalayam)
Promoted clonal forestry with superior planting materials in saline/alkaline areas to enhance productivity on degraded lands.
- **Cost Effective Captive Breeding Technology for Channa striata (2021-22)** (TNJFU, Ponneri)
Developed affordable breeding technology for Striped Murrel to diversify aquaculture and enhance rural livelihoods.
- **Development of Dry Land Integrated Biofloc Tank and Farm Pond Polyculture System (2021-22)** (TNJFU, Ponneri)
Created an integrated freshwater aquaculture system using biofloc tanks and farm ponds, training 194 farmers in Salem district.
- **Integrated Farming System as a Tool for Sustainable Livelihood (2019-20)** (TANUVAS, Orathanadu)
Assessed the viability of Integrated Farming Systems to sustain livelihoods and improve year-round income in the disaster-prone Cauvery Delta.
- **Exploration of Potential Beneficial Microbes and Biofertiliser Training (2015-16)** (IFGTB, Coimbatore)
Explored beneficial microbes in Kolli Hills ecosystems and trained local stakeholders in biofertiliser production and use.
- **Screening of International Germplasm of Casuarina equisetifolia (2015-16)** (IFGTB, Coimbatore)- Evaluated international germplasm to identify high-yielding Casuarina provenances for livelihood enhancement.
- **Development of Integrated Dryland Agroforestry System (2011-12)** (IFGTB, Coimbatore)- Demonstrated dryland agroforestry systems using multipurpose tree species to improve livelihoods in Ramanathapuram district.

AGRICULTURE & ALLIED SECTORS

Agriculture remains central to Tamil Nadu's food security and rural livelihoods. TNSLURB's studies under this theme focus on enhancing agricultural productivity, resource use efficiency, integrated farming, climate resilience, and soil health, ensuring sustainability in the face of climate challenges and urbanisation pressures.

Land use planning supports agriculture and allied sectors by:

- ☒ Enhancing soil health, water-use efficiency, and crop productivity through spatially informed practices.
- ☒ Promoting climate-smart and integrated farming systems that strengthen rural livelihoods.
- ☒ Guiding sustainable expansion of agriculture while balancing ecological and land restoration needs.
- ☒ Aligning agricultural development with nutrition security and SDGs such as SDG 2 (Zero Hunger) and SDG 13 (Climate Action).

Themes Covered by TNSLURB:

- ☒ Soil health and nutrient management
- ☒ Climate-smart and integrated farming systems
- ☒ Water-use efficiency and micro-irrigation
- ☒ Sustainable fodder and livestock productivity
- ☒ Medicinal and high-value crop productivity
- ☒ Urban and peri-urban agriculture innovations

Key Studies

- **Development of Immune Booster from Fruits, Vegetables, and Herbs (2020-21)**
(TNAU, Periyakulam)
Developed a novel immune-boosting food supplement using fruits and herbs, with potential for commercialisation.
- **Upscaling of Homestead-Based Multitier Model Post COVID-19 (2021-22)**
(TANUVAS, Kattupakkam)
Promoted homestead-based integrated models for small farmers, ensuring food and fodder security using organic practices.
- **Augmenting Virtual Space by Vertical Vegetable Farming (2020-21)** (TNAU, Trichy)
Explored vertical farming systems to optimise vegetable production in urban and peri-urban settings.
- **Formulation of Immune Boosting Micronutrient-Rich Soup Cubes (2020-21)**
(TNAU, Madurai)
Developed instant soup cubes with functional ingredients like moringa and chekkurmanis to improve nutrition.
- **Micro Irrigation in Tamil Nadu – Issues, Potentials, and Strategies (2020-21)**
(TNAU, Coimbatore)
Assessed micro-irrigation adoption, benefits, and policy interventions to enhance water-use efficiency.
- **Developing Bio-organo Mineral Nutri Pellets for Red Gram Productivity (2020-21)**
(TNAU, Madurai)

Developed nutrient-rich pellets to enhance red gram productivity and close yield gaps.

- **Mapping Factors for Viable Agriculture in the Cauvery Delta (2019-20)** (MSSRF, Chennai)
Analysed factors for retaining agricultural land and ensuring food security in the Cauvery delta region.
- **Identification and Management of Nutrient Deficiencies (2019-20)** (TNAU, Coimbatore)
Focused on balanced fertilisation and farmer awareness to enhance crop yields and soil health.
- **Climate Smart Integrated Farming in Semiarid Wastelands (2019-20)** (TANUVAS, Kattupakkam)
Established silvipastures integrated with livestock to improve fodder availability and livestock productivity in Kancheepuram.
- **Enhancing Productivity of Medicinal Plants – Salacia oblonga and Hemidesmus indicus (2015-16)** (IFGTB, Coimbatore)
Enhanced productivity of medicinal plants to support the National AYUSH Mission and conserve endangered species.
- **Soil and Mineral Mapping to Improve Biomass and Livestock Productivity (2012-13)** (TANUVAS, Chennai)
Used soil testing for nutrient management to enhance fodder biomass and livestock productivity.
- **Resource Use Efficiency of Cumbu Napier Hybrid Grass Under Drip Irrigation (2012-13)** (MVC, TANUVAS, Chennai)
Studied high-biomass fodder cultivation under drip irrigation for water and nutrient use efficiency.
- **Soil Health Management Behaviour of Farmers (2012-13)** (CARDS, TNAU, Coimbatore)
Documented soil health management practices across agro-climatic zones to inform future interventions.

WASTE MANAGEMENT

Effective waste management is critical for environmental health, soil restoration, and climate action. TNSLURB's studies under this theme focus on repurposing waste as a resource, restoring contaminated lands, promoting sanitation-linked resource utilisation, and carbon sequestration, aligning with Tamil Nadu's sustainability goals and SDGs.

Land use planning helps in strengthening waste management by:

- ☒ Transforming waste into a resource through safe zones for composting, recycling, and energy recovery.
- ☒ Restoring degraded and contaminated lands using nature-based and bioremediation approaches.
- ☒ Reducing environmental risks by integrating landfill siting, monitoring, and closure into spatial planning.
- ☒ Supporting circular economy models that connect sanitation, agriculture, and climate mitigation in line with SDG 6, SDG 12, and SDG 13.

Themes Covered by TNSLURB:

- ☒ Waste repurposing for agriculture
- ☒ Land restoration using biological methods
- ☒ Carbon sequestration for climate mitigation
- ☒ Sanitation-linked circular resource use

Key Studies

- **Vetiver Grass Technology (VGT) for Restoring Tannery Effluent Contaminated Areas and Carbon Sequestration (2020-21)** (TNAU, Coimbatore)
Assessed Vetiver grass technology for rehabilitating tannery-contaminated soils while promoting carbon sequestration and farmer adoption.
- **Sustainable Management of Human Waste for Sanitation and Agriculture (2019-20)** (TNAU, Coimbatore)
Explored strategies to convert human waste into a valuable agricultural resource, enhancing sanitation while improving soil fertility sustainably.
- **Evaluation of Bovine Digesta from Slaughterhouse Waste as Organic Fertiliser (2015-16)** (TANUVAS, Chennai)
Assessed the use of slaughterhouse bovine digesta as an organic fertiliser for bioremediating pesticide and tannery effluent-polluted soils.

CLIMATE CHANGE

Climate change poses significant challenges to Tamil Nadu's ecosystems, agriculture, and urban systems. TNSLURB's climate-focused studies enable evidence-based climate adaptation, risk reduction, and sustainable development, aligning with Tamil Nadu SAPCC, Vision 2030, and SDG commitments.

Land Use Planning in the Climate Change Sector

- ☒ Provides a framework for assessing climate risks and integrating adaptation strategies into development planning.
- ☒ Facilitates low-emission growth by aligning renewable energy, transport, and land use choices.
- ☒ Enhances resilience of vulnerable communities through climate-smart agriculture, water management, and green infrastructure.
- ☒ Positions Tamil Nadu to mobilise climate finance and advance commitments under SDG 13 (Climate Action).

Themes Covered by TNSLURB:

- ☒ Climate risk assessment and adaptation frameworks
- ☒ Financing climate actions and resource mobilisation
- ☒ Flood and sea-level rise impact assessments
- ☒ Climate-smart agriculture and water management

Key Studies

- **Developing a Passive Cooling Strategy with Web Tool (2024-25)** (UNEP)
Developing a state-wide passive cooling strategy and an accessible web tool to reduce heat stress and enhance thermal comfort sustainably.

- **Financing Climate Actions: Resource Mobilisation Strategy (2024-25) (WRI India)**
Formulating a resource mobilisation strategy to secure climate financing for Tamil Nadu's adaptation and mitigation projects.
- **Climate Risk Reduction and Adaptation Framework for Districts (2023-24) (WRI India)**
Collaborating with district administrations to prioritise and integrate climate adaptation actions into district policies.
- **Impacts of Climate Change on Fluvial and Pluvial Flooding in Chennai (2015-16) (Centre for Climate Change and Disaster Management, Anna University)**
Assessed future climate impacts on flooding in Velachery and Mudichur using climate scenarios and drainage network models.
- **Future Sea Level Rise: Loss and Damage Assessment in Chennai (2015-16) (IIT Madras)**
Analysed risks and economic losses from projected sea-level rise along Chennai's coast, providing data for climate-conscious planning.
- **Climate Variability and Tank Irrigation Management in Tamil Nadu (2012-13) (CARDS, TNAU, Coimbatore)**
Investigated climate variability impacts on tank irrigation, suggesting adaptive strategies to enhance resilience across six districts.

WETLANDS

Wetlands are vital ecosystems providing water purification, flood regulation, biodiversity support, and climate mitigation. TNSLURB's wetland-focused studies advance evidence-based conservation, economic valuation, and restoration efforts, ensuring sustainable wetland management in Tamil Nadu aligned with Vision 2030 and SDG commitments.

Land use planning can support in:

- ☒ Conserving biodiversity and sustaining ecosystem services such as water purification, groundwater recharge, and flood regulation.
- ☒ Guiding wetland prioritisation, monitoring, and restoration through geospatial mapping and scientific assessment.
- ☒ Integrating wetlands into urban planning and climate adaptation frameworks to reduce flood and heat risks.
- ☒ Promoting sustainable livelihoods and community stewardship while aligning with SDG 6 (Clean Water), SDG 13 (Climate Action), and SDG 15 (Life on Land).

Themes Covered:

- ☒ Economic valuation of wetland ecosystem services
- ☒ Wetland prioritisation and monitoring frameworks
- ☒ Restoration through nature-based solutions
- ☒ Climate resilience in wetland management
- ☒ Biodiversity assessment and habitat protection

Key Studies

- **Economic Valuation of Ecosystem Services of 61 Prioritised Wetlands (2023-24) (MIDS, Chennai)**
Estimating the economic value of ecosystem services in 61 prioritised wetlands

using a Total Economic Valuation (TEV) framework to inform conservation strategies.

- **Development and Deployment of Rhizophora Hybrids for Tackling Hypersalinity (2019-20) (IFGTB, Coimbatore)**

Developing climate-resilient mangrove hybrids for afforestation, enhancing productivity and resilience in hypersaline wetland environments.

- **Assessing Migratory Bird Patterns in Vaduvor Bird Sanctuary (2021-22) (SACON, Coimbatore)**

Assessed bird populations, water quality, and biodiversity to inform effective conservation management of Vaduvor Bird Sanctuary.

- **Eco-Restoration of Coimbatore Lakes with Floating Wetlands (2021-22) (TNAU)**

Evaluated floating wetlands as a low-cost, sustainable method for water purification and biodiversity enhancement in Coimbatore's lakes.

- **Economic Valuation of Ecosystem Services in 80 Wetlands (2018-19) (Tamil Nadu State Wetland Authority)**

Estimated the non-market economic benefits of 80 prioritised wetlands, supporting evidence-based conservation policies.

- **Delineation of Zone of Influence of Three Selected Wetlands (2018-19) (Tamil Nadu State Wetland Authority)**

Demarcated boundaries, assessed land use and stakeholder dependencies, and proposed management strategies for Vadamaneri, Valathy, and Tenneri wetlands.

- **Criteria for Wetland Prioritisation and Monitoring Framework (2017-18) (SACON, Coimbatore)**

Developed prioritisation criteria and monitoring frameworks in compliance with Wetland Conservation Rules for effective wetland management.

- **Estimating the TEV of Pallikaranai Marsh, Chennai (2012-13) (MIDS, Chennai)**

Assessed the total economic value of Pallikaranai Marsh to highlight its ecosystem services and inform urban wetland conservation.

URBAN SECTOR

As Tamil Nadu rapidly urbanises, inclusive, child-friendly, and sustainable urban planning is essential for building liveable cities. TNSLURB's urban studies address affordable housing, child-friendly urban commons, integrated governance, and slum redevelopment, aligning with Tamil Nadu Vision 2030 and SDGs.

Land use planning in Urban sector can,

- ☒ Strengthen climate resilience of cities through blue-green infrastructure, sustainable cooling, and heat mitigation strategies.
- ☒ Enable evidence-based zoning, land allocation, and infrastructure planning with geospatial intelligence.
- ☒ Advance inclusive urban growth by integrating affordable housing, child-friendly spaces, and equitable access to commons.
- ☒ Accelerate progress towards SDG 11 (Sustainable Cities), SDG 13 (Climate Action), and SDG 3 (Health) by aligning urban planning with sustainability goals.

Themes Covered by TNSLURB:

- ☒ Child-friendly urban spaces and blue-green commons

- ☒ Climate-responsive urban and peri-urban planning
- ☒ Affordable housing policy and inclusive urban development
- ☒ Integrated urban governance frameworks

Key Studies:

- **Veyilodu Vilayadi – Unstructured Independent Play in Chennai's Commons (2024-25) (Care Earth Trust, Chennai)**
Examines unstructured outdoor play among children in Chennai's blue-green commons, aiming to inform child-friendly, sustainable urban planning and policy recommendations.
- **Peri-cene Tamil Nadu – Growth Management and Climate Adaptation in Peri-Urban Madurai and Coimbatore (2023-24) (IIT Madras)**
Analysing peri-urbanisation dynamics and proposing targeted interventions for growth management under climate change contexts.
- **Dynamics and Determinants of Affordable Housing in Chennai (2018-19) (MIDS, Chennai)**
Analysed affordable housing demand, policy gaps, and the roles of state and private actors, providing recommendations for inclusive housing strategies.
- **Integrated Urban Governance in Metropolitan Chennai (2017-18) (CUBE, IIT Madras)**
Developed participatory simulations and scenario planning with stakeholders to inform integrated governance in water, land, and waste management.
- **Review of Innovations in Slum Clearance with a Focus on Chennai (2012-13) (MIDS, Chennai)**
Reviewed slum clearance practices in Indian and international cities to develop a framework for assessing Chennai's slum rehabilitation policies.

FOREST SECTOR

Forests are critical for biodiversity conservation, climate resilience, and sustainable land management. TNSLURB's forest-related studies advance green infrastructure, carbon sequestration, and forest fire mitigation, integrating ecological assets into Tamil Nadu's planning and climate strategies.

Impact of land use planning in Forest sector includes,

- ☒ Strengthened ecosystem services by linking forests with water security, carbon storage, and biodiversity corridors.
- ☒ Enabled spatial monitoring and mapping of vulnerabilities, guiding targeted restoration and conservation efforts.
- ☒ Supported livelihood resilience through community forestry, agroforestry integration, and sustainable resource use.
- ☒ Positions forests as critical assets in climate adaptation and urban–rural planning, reinforcing SDG commitments (SDG 13, SDG 15, SDG 11).

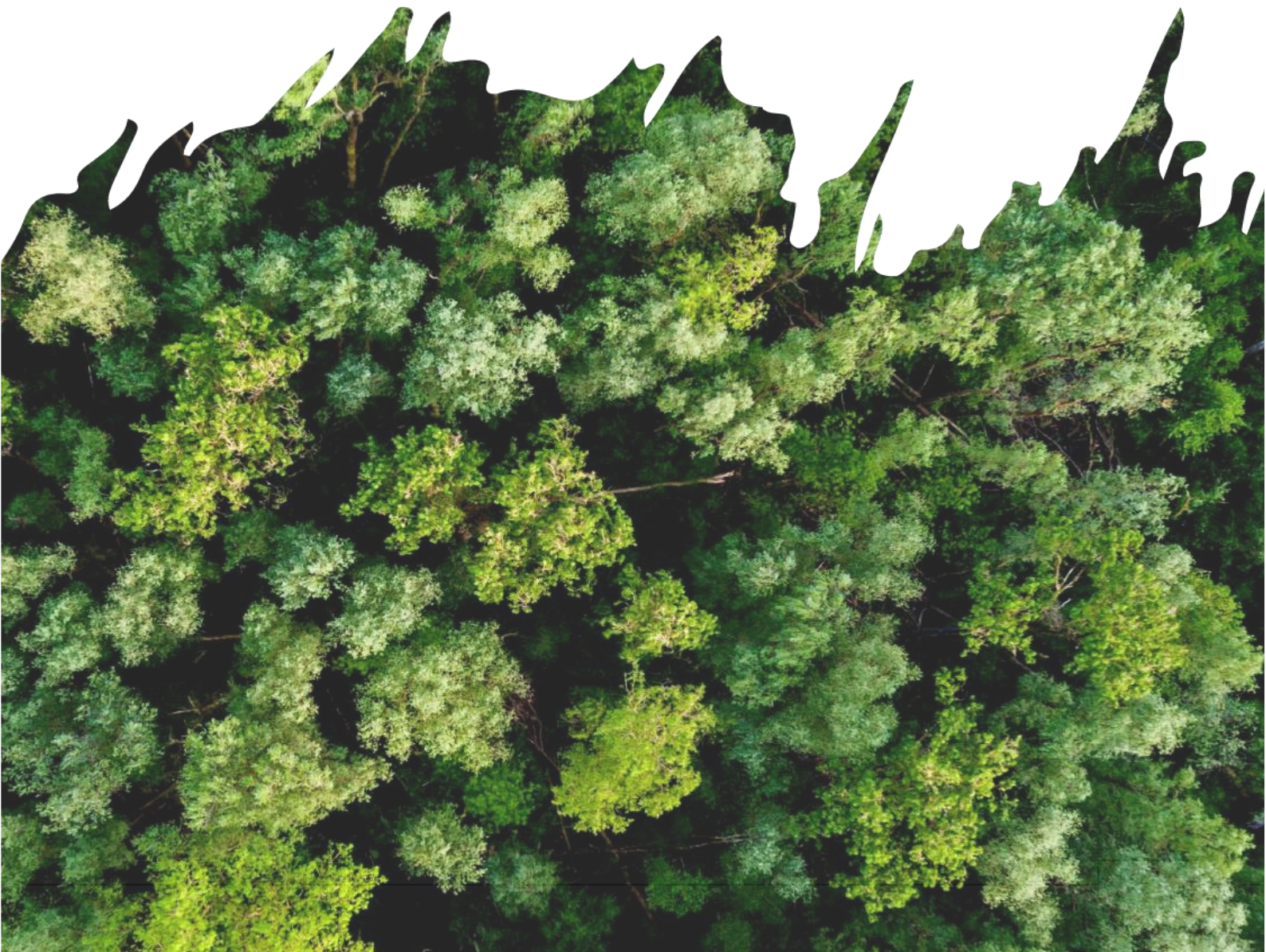
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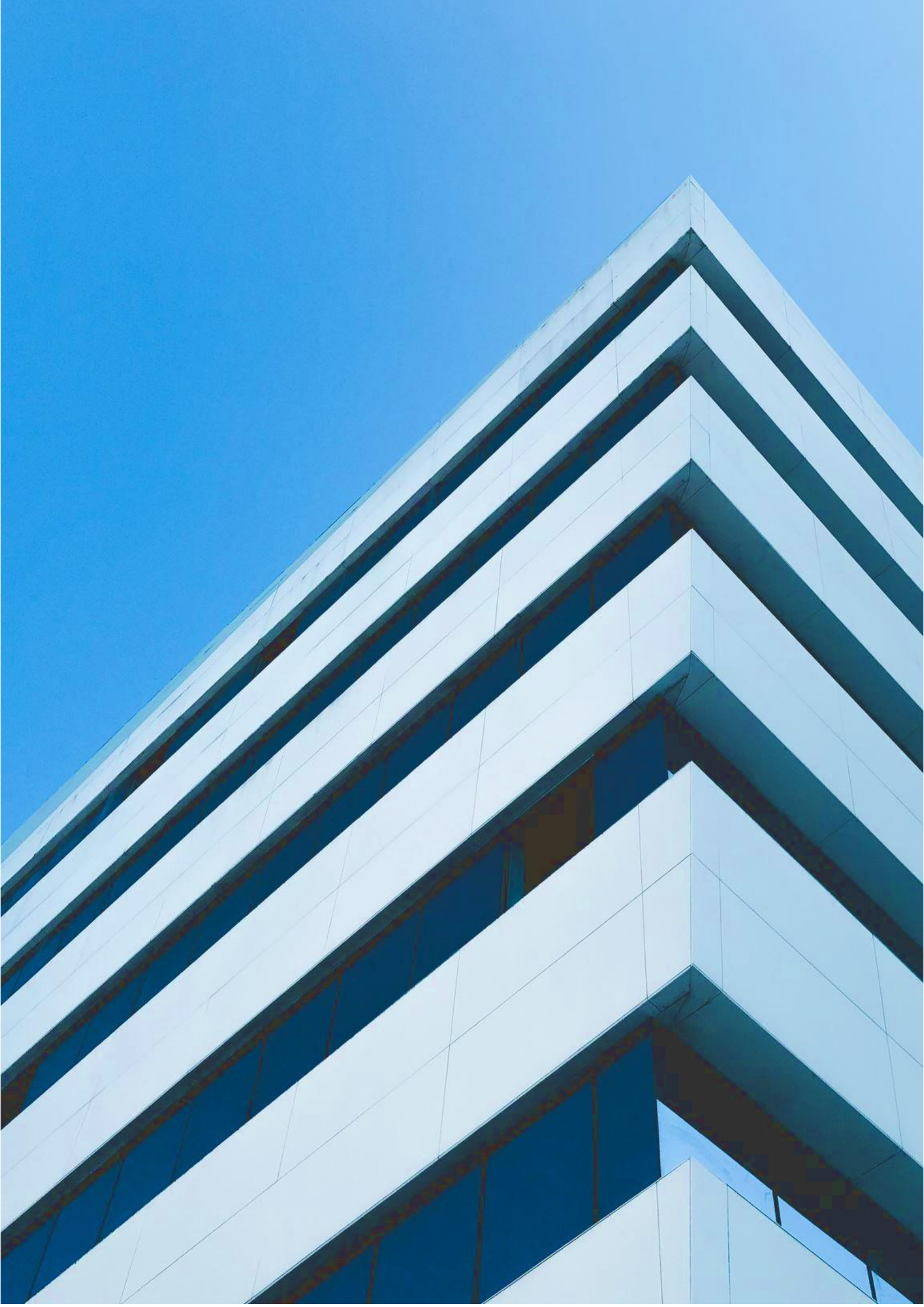
- ☒ Sacred groves mapping and biodiversity documentation
- ☒ Tree plantation programme impact assessment

- ☒ Forest fire vulnerability mapping
- ☒ Urban vegetation cover assessment

Key Studies:

- **Creation of Geospatial Database and Biodiversity Documentation of Sacred Groves in Tamil Nadu (2021-22) (Forest Department, Tamil Nadu)**
Maps and documents sacred groves to conserve biodiversity, promote climate resilience, and integrate ecological assets into land use and climate adaptation frameworks.
- **Evaluation of Massive Tree Planting Programme in Cuddalore (2016-17) (Forest Department, Chennai)**
Assessed the impact of the plantation programme using field surveys and satellite imagery, noting a 26.5% seedling survival rate and a 66 sq. km increase in green cover.
- **GIS-Based Multi-Variable Analysis to Assess Forest Vulnerability to Fire (2016-17) (Forest Department, Chennai)**
Mapped forest fire vulnerability across Tamil Nadu, identifying high-risk zones to support forest fire mitigation planning.
- **Satellite Image-Based Vegetation Cover Study in Urban Areas (2016-17) (Forest Department, Chennai)**
Used satellite imagery to evaluate and monitor vegetation cover in five urban corporations, informing urban green cover enhancement strategies.





6. Capacity Building Programmes and Workshops

TNSLURB recognises that effective land governance is not solely about data and frameworks but about **people who understand, apply, and lead sustainable practices**. Over the past fifteen years, TNSLURB has systematically invested in **capacity building and public engagement**, strengthening institutional capabilities and community awareness to drive sustainable land and resource management across Tamil Nadu.

TNSLURB recognises that **capacity building is critical for translating research into action**. Through high-impact workshops, consultations, and skill-sharing platforms, TNSLURB has strengthened institutional capacities, empowered communities, and fostered multi-stakeholder collaboration to advance **sustainable land use, climate resilience, and inclusive development** across Tamil Nadu.

Approach

TNSLURB's approach to capacity building is structured around:

- ◆ **Multi-Stakeholder Engagement:** Engaging government departments, academic institutions, civil society organisations, and international partners to ensure diverse perspectives and expertise.
- ◆ **Hands-On Learning:** Designing workshops with practical demonstrations, field sessions, and use of live case studies for direct applicability.
- ◆ **Policy–Action Integration:** Aligning workshops with Tamil Nadu Vision 2030 and SDGs, ensuring outputs translate into policy recommendations and actionable plans.
- ◆ **Decentralised Outreach:** Taking workshops to districts and rural areas to reach farmers, field officials, and local institutions, ensuring last-mile impact.
- ◆ **Focus on Emerging Priorities:** Addressing themes like climate resilience, sustainable livelihoods, heat mitigation, and low-emission planning to prepare stakeholders for future challenges.

Summary of Thematic Workshops

1. Climate Resilience and Heat Mitigation

Capacity Building Workshop on Heat Mitigation and Sustainable Cooling (2025)

Organised by the Tamil Nadu State Planning Commission through TNSLURB in collaboration with SDMA, TNGCC, and UNEP, this workshop brought together government departments, academics, NGOs, and international agencies to co-create actionable strategies for managing heat risks in Tamil Nadu.

The workshop highlighted Tamil Nadu's pioneering step in recognising heatwaves as a state-specific disaster and its proactive formulation of the State Heat Mitigation Strategy and city-level Heat Action Plans (HAPs). Technical sessions covered urban heat mapping, passive cooling techniques in architecture, nature-based solutions like blue-green infrastructure, and advanced interventions including district cooling systems.

Innovations such as women-led thermal comfort initiatives and parametric insurance for heat impacts were showcased, reflecting community-driven adaptation models. The

event emphasized using geospatial tools for heat vulnerability mapping, fostering inter-departmental coordination, and promoting grassroots solutions for scalable climate action.

Key initiatives discussed included the Cool Roof Programme, expanding agroforestry, promoting climate-resilient crops, and green urban planning under TNGCC's mission-led approach, establishing Tamil Nadu as a leader in holistic heat resilience planning in India.



Urban Heat Island Hotspot Analysis and Mitigation Strategies (2024)

This flagship workshop, conducted with UNEP and CEPT University, addressed Tamil Nadu's rising Urban Heat Island Effect (UHIE), which exacerbates heat stress in cities due to rapid urbanisation, reduced green cover, and heat-retaining built environments. Using advanced geospatial heat mapping, participants identified high-risk hotspots in Chennai, Coimbatore, and Madurai and evaluated passive and active cooling interventions. Discussions included tree canopy expansion, cool roofs, reflective pavements, and zoning strategies, with emphasis on integrating UHIE considerations into urban planning, disaster risk management, and climate adaptation frameworks. The workshop facilitated knowledge sharing among urban planners, municipal engineers, and climate researchers, laying the groundwork for targeted heat mitigation strategies.



Tamil Nadu Heat Mitigation Strategy (2024)

In partnership with WRI India and the Deputy British High Commission, this workshop supported the operationalisation of Tamil Nadu's comprehensive heat mitigation strategy. It addressed the socioeconomic impacts of extreme heat on vulnerable populations, including outdoor workers, children, and the elderly, and discussed systemic solutions such as creating climate-responsive urban designs, improving thermal comfort in informal settlements, and integrating heat action into health and infrastructure policies. Sessions showcased cross-sectoral coordination mechanisms, enabling departments to align interventions and resource mobilisation for effective heat management. The workshop concluded with actionable roadmaps for district-level implementation of the heat mitigation strategy.



Workshops on Revisiting TN State Action Plan on Climate Change

Sectoral workshops to review and refine the Tamil Nadu SAPCC, aligning sectoral policies with evolving climate vulnerabilities and adaptation strategies.



Enhancing Green Cover and Carbon Sequestration (2022)

Aligned with the Green India Mission, this workshop trained forest officers in carbon stock estimation and soil carbon enhancement to strengthen Tamil Nadu's forest carbon sinks. It detailed practical methodologies for monitoring carbon stocks and integrating soil carbon enrichment practices, linking local actions with national and international climate commitments for emission reduction.

Training for Forest Range Officers at Guindy National Park Field



Food and Global Warming (2015)

This workshop connected the dots between food processing and climate mitigation, discussing energy-efficient processing technologies, eco-friendly packaging, and bioplastics use to reduce food sector emissions. The role of food irradiation for safety and shelf-life enhancement, water recycling, and waste reduction were highlighted as key measures to enhance the sustainability of Tamil Nadu's food processing sector while contributing to climate goals.

2. Sustainable Urban Planning and Emission Reduction

Sustainable Peri-Urban Growth and Climate Resilience in Tamil Nadu (2025)

This workshop, organised by TNSLURB with WRII, addressed the complex challenges of rapid, often unplanned peri-urban growth in Tamil Nadu and its climate vulnerabilities. Participants included government officials, planners, and researchers who collectively explored strategies for integrating climate resilience into peri-urban governance.

Key presentations covered peri-urban mapping and risk assessments, leveraging studies from Madurai and Coimbatore by IIT Madras and WRII to frame adaptive planning models. Technical discussions included decentralised infrastructure, the use of geospatial tools for monitoring peri-urban expansion, and the integration of climate adaptation measures into local planning.

Panel sessions highlighted barriers such as fragmented governance, inadequate real-time data, and financing gaps. Recommendations focused on establishing a dedicated peri-urban planning authority, promoting green infrastructure, developing district-level climate adaptation frameworks, leveraging public-private partnerships for financing, and engaging communities for informed governance.

This workshop laid the groundwork for sustainable, climate-resilient development in peri-urban areas, aligning with Tamil Nadu's broader urban sustainability goals.



Low Emission Zoning: A Toolkit for Chennai (2023)

Developed under the UK PACT programme with CENEX UK, this workshop introduced Chennai to Low Emission Zone (LEZ) strategies to improve air quality and contribute to net-zero ambitions. Drawing on best practices from London, Bristol, and Oxford, the workshop covered the design of LEZs, emission standard frameworks (Euro VI), camera-based monitoring using ANPR, and public engagement strategies. It also included simulations of vehicular emission reductions under different LEZ scenarios for Chennai. Key stakeholders explored financial, legal, and infrastructural considerations for

implementing LEZs, empowering city authorities with a clear, actionable pathway to reduce pollution and align with Tamil Nadu's clean air goals.



Toolkit for Open and Sustainable City Planning and Analysis (TOSCA)

In partnership with GIZ, this workshop trained planners on using the TOSCA toolkit, providing software, datasets, and methodologies to support evidence-based sustainable urban development decisions.



3. Sustainable Livelihood and Resource Management

Sustainable Seaweed Farming – Way Forward (2023)

Seaweed cultivation offers ecological and economic opportunities for Tamil Nadu's coastal communities, supporting livelihoods while enhancing marine biodiversity and carbon sequestration. This workshop, organised with Dr. J. Jayalalithaa Fisheries University, brought together scientists, policymakers, and fisher communities to explore best practices in sustainable seaweed farming, seed bank establishment, and scalable post-harvest processing methods. Sessions highlighted the economic potential of seaweed in pharmaceuticals, biofuels, and food sectors while emphasizing ecological safeguards to protect marine ecosystems. The workshop produced policy recommendations for a comprehensive seaweed farming policy for Tamil Nadu.



Integrated Farming System for Sustainable Farming (2013)

Focusing on resource-poor farmers, this training programme highlighted Integrated Farming Systems (IFS) to diversify income sources, ensure year-round food security, and improve soil health. Sessions covered composting, organic residue recycling, intercropping, and mixed livestock-crop models tailored to Tamil Nadu's agro-climatic zones. The workshop demonstrated how IFS can enhance climate resilience, reduce input costs, and promote self-sufficiency among smallholder farmers.

4. Forests and Biodiversity Conservation

Management of Forest Invasive Species (2023)

This workshop, with TNAU's Forest College & Research Institute, focused on the threat of invasive species such as *Lantana camara* and *Prosopis juliflora* to Tamil Nadu's forest ecosystems. Participants learned advanced methods for invasive species mapping using drones and satellite imagery, ecological restoration techniques, and community-led monitoring models. Legal frameworks, SOPs for removal, and biosecurity protocols were discussed, alongside leveraging schemes like MGNREGA for labour-intensive removal in high-infestation zones. Case studies from Karnataka and Gujarat informed adaptive strategies for Tamil Nadu, fostering a structured approach to managing forest invasives.



Effective Management of *Prosopis juliflora* (2023)

As *Prosopis juliflora* spreads across Tamil Nadu, displacing native flora and impacting groundwater, this workshop facilitated dialogue on effective management while acknowledging its livelihood role in rural energy and fodder systems. Experts presented ecological impacts, socio-economic dependencies, and restoration strategies, including phased removal, soil rehabilitation, and replanting native species. Value-added product opportunities such as biochar, fodder blocks, and fuel were discussed to convert challenges into economic opportunities. The Tamil Nadu Biodiversity Board's role as a nodal coordinating agency was emphasized, ensuring cohesive management of this complex invasive issue.



5. Livestock and Fodder Systems

Water Footprint and Conservation for Livestock Farmers

Conducted with TANUVAS to educate farmers on water-efficient livestock management, water footprint analysis, and conservation techniques tailored to Tamil Nadu's conditions.

Intensive Fodder Production for Livestock (2013)

Recognizing the shortage of green fodder in Tamil Nadu, this workshop equipped farmers with knowledge on cultivating high-yield fodder varieties, establishing fodder seed banks, and pasture development on underutilized lands.

Participants were trained in scientific practices to produce consistent, quality fodder to support livestock productivity, reduce feed costs, and improve milk yields, ensuring economic sustainability in livestock-based livelihoods.



6. Water and Waste Management

Water Conclave 2025: Roadmap for Tamil Nadu's Water Future (2025)

The Water Conclave 2025, organised by the Tamil Nadu State Planning Commission through the Centre for Innovation in Governance and TNSLURB in collaboration with CGWB, IWA, and WELL Labs, convened experts, policymakers, and practitioners to deliberate on strategies for sustainable water governance in Tamil Nadu.

The conclave addressed critical challenges such as groundwater depletion, urban flooding, and inefficient wastewater management. Discussions underscored the urgency of integrated water management approaches that combine traditional water wisdom with modern scientific and technological interventions, advocating for a circular, decentralised water economy.

Technical sessions highlighted urban flood risk mapping, groundwater recharge models, and wastewater reuse, with practical case studies including Chennai Mathematical Institute's decentralised wastewater treatment, Rajapalayam's GIS-based water master planning, and greywater reuse initiatives from Bengaluru.

Panel discussions emphasised the need for blue-green-grey water frameworks to ensure water security while protecting ecosystems. Participants called for strengthened inter-agency collaboration, policy reforms for water governance, and citizen participation to foster a culture of water stewardship. The conclave set a clear agenda for Tamil Nadu's water future, aligning water management with climate resilience and sustainable urban development goals.



Water Footprint and Water Conservation in Livestock Farming (2015)

This workshop sensitized livestock farmers, extension officers, and policy planners to the critical importance of water management in livestock farming systems, which consume significant water

resources in Tamil Nadu. Practical sessions demonstrated rainwater harvesting structures, efficient water use practices, and the integration of crop-livestock systems to recycle nutrients and enhance soil moisture. Strategies to reduce water wastage while increasing productivity in livestock operations were discussed, addressing the state's water stress challenges in agriculture.



Watershed Management: Lessons and Issues (2013)

Conducted with the Centre for Water Resources, Anna University, this workshop reviewed Tamil Nadu's watershed development initiatives. Emphasising ridge-to-valley planning, the workshop underlined the necessity for updated demarcation using SGSW data, functional sub-committees for activity oversight, and community participation in planning and monitoring. NGOs' facilitative roles and integration of social indicators into performance tracking were highlighted, fostering an integrated approach for soil and water conservation.

Waste Dumpsites of Chennai: Present Scenario and Future Planning

Organised to address the environmental impacts of solid waste disposal, this workshop examined leachate contamination risks and explored new scientific methods for managing Chennai's waste challenges.

Outcomes and Impact of these programmes

TNSLURB's capacity building and workshops over the past 15 years have advanced sustainable, climate-ready, and data-driven land management across Tamil Nadu, aligning with Vision 2030 and SDGs 2, 6, 11, 13, and 15.

1. Institutional Strengthening

TNSLURB has equipped government departments and planners to use data and technology for better decisions:

- Trained 1,200+ officials from planning, agriculture, environment, and municipal bodies, improving data literacy and practical GIS skills.
- Organised 40+ training programmes on GIS, land data analysis, and integrated land use planning, enabling evidence-based decision-making.
- Conducted hands-on TNLUIS workshops, allowing planners to use real-time spatial data for monitoring and planning projects.
- Facilitated exposure visits to learn from successful watershed and peri-urban management sites, fostering cross-department collaboration for integrated land planning.

2. Community and Stakeholder Engagement

Recognising that communities are central to effective land management, TNSLURB has ensured local participation and ownership:

- Held district-level consultations for peri-urban studies and climate risk assessments, ensuring planning reflects local realities.
- Conducted farmer awareness programmes on climate-resilient and sustainable agriculture, increasing understanding and uptake of best practices.
- Involved local communities in wetland monitoring and water conservation efforts, building practical skills at the grassroots.
- Partnered with women's groups and youth networks for restoration activities and water-saving projects, empowering local climate action.

These efforts have improved community awareness and built strong local participation in sustainable land and water management.

3. Knowledge Sharing and Learning

TNSLURB has promoted a culture of continuous learning and sharing practical knowledge:

- Organised and co-hosted workshops on Urban Heat Island mitigation, wetland management, and land restoration, providing practical solutions to climate challenges.
- Shared Tamil Nadu's approaches on integrated land use planning on national platforms, encouraging collaboration and learning across states.
- Produced guides, user manuals, and policy briefs on TNLUIS use, peri-urban management, wetlands, and heat resilience for field-level application.
- Developed training modules and e-learning resources, ensuring ongoing capacity building even beyond workshops.

These initiatives have enabled officials and communities to access clear, practical knowledge for everyday implementation.

Limestone, magnesite mines easy to restore owing to terrain, size'

TIMES NEWS NETWORK

Chennai: A recent study by the Tamil Nadu planning commission has found that limestone and magnesite mines in the state have the highest potential for restoration due to their terrain and size, while granite and rough stone mines present more challenges.

In the study done using geospatial technologies, satellite imagery, and ground-truthing, the commission outlined five key restoration objectives. These include biodiversity, water security, agroforestry, recreation, and solar power generation. These objectives can be pursued individually or in combination, depending on the specific characteristics of each site, said the study, which



GRANITE QUARRY

was submitted to chief minister MK Stalin on Monday.

Titled "Mapping Mines in Tamil Nadu: Assessing Their Restoration Potential," the study, a joint effort of Botanical Services, A Tamil Nadu State search Board, 1 environmental liabilities ass

abandoned mining sites. It selected 37 out of 3,198 mines for in-depth assessment. The report identified Salem and Ariyalur districts as high potential for restoration.

The study also noted the potential of former hard rock mines, many of which naturally collect rainwater and runoff, for creating reliable water bodies.

Planning commission vice-chairman J Jeyaranjan stressed the importance of water conservation and said the inspiration for this study came from the successful restoration of the Pandalgudi mine site.

Study aims to deter-

State Planning Commission brings out a toolkit for Low-Emission Zones in Chennai

The toolkit, developed by a UK-based organisation, offers guidance on the introduction of such zones; though the focus is on getting rid of polluting vehicles, such zones also help in accelerating the transition to EVs, and implementing measures to mitigate other sources of pollution, says report

Sanjay Vijayakumar
Sangeetha Kandavel
CHENNAI

Tamil Nadu's State Planning Commission, in collaboration with the British Deputy High Commission, Chennai, through the UK PACT programme, has come out with a report on 'Low Emission Zoning - A Toolkit for Chennai'.

The toolkit has been developed by Genex, a UK-based not-for-profit organisation specialising in decarbonising transport and energy systems. Based on learnings from the U.K., it offers guidance on the introduction of Low Emission Zones (LEZs) in the city. An LEZ is an area where use of more polluting vehicles are restricted by way of having in place vehicle standards and levying charges for non-compliance.

Green goals

Some of the key highlights of the T.N. State Planning Commission's report, 'Low Emission Zoning - A Toolkit for Chennai'

- Low Emission Zone (LEZ) is an area where use of more polluting vehicles is restricted by way of having in place vehicle standards and levying charges for non-compliance
- Implementing an LEZ is usually the most cost-effective and efficient way to reduce emissions from the most polluting vehicles in areas having a high population density



- LEZs, by levying a charge for non-compliant vehicles, would achieve statutory limit values in the shortest possible time.
- LEZs should remove the most polluting vehicles, target areas where pollution was at its worst and the risk to public health was high

- Chennai is a rapidly growing city, and action be taken to mitigate air pollution
- In the short term, in Chennai, promotion and development of alternatives to personal transport should be explored
- A long-term vision would be to introduce LEZs once alternative transport modes become efficient and reliable

population of around nine million. The city is expanding rapidly, with some peripheral areas seeing an annual population increase of around 50%. This expansion and increasing affluence are leading to a rapid uptick in transport demand, including private car ownership, it said. Across all sectors, Chennai has implemented actions such as deployment of vehicles for mechanical road sweeping, monitoring air quality, use of EVs for solid waste collection, issuing directives to reduce industrial emissions, and regular checking of vehicle emissions supported by Pollution Under Control (PUC) certificates, the report noted.

The report proposes implementation of an LEZ strategy in Chennai in two phases, with short-term and long-term actions. In the short term, Chennai municipality can look at setting up a low traffic neighbourhood (LTN). LTNs seek to reduce traffic

volumes by limiting use of residential roads for vehicles passing through to reach another area, while still allowing access for citizens, the report said.

Work on improvements of the quality and availability of public transport, promotion of EV charging stations, creating awareness of low emission policies, and non-motorised transport options are the other short-term actions suggested. In the long term, it said that Chennai would need to demonstrate how the LEZ addresses a defined pollution problem in the area, and how it would improve local air quality. Any planned LEZ should include a review to ensure that there is a robust supportive legal framework in place, the report said. The LEZ should be embedded in relevant city- and State-level strategies, and plans. Ideally it should be covered in the forthcoming Chennai Mobility Plan, it added.

State Planning Commission details focus areas for improving the forest cover in Tamil Nadu

The Commission has released the Status of Forests in Tamil Nadu, mainly based on the information from the India State of Forest Reports prepared by the Forest Survey of India between 2001 and 2021. Tamil Nadu suffered severe degradation in its growing stock between 2001 and 2021, with a loss of 52,134 m cum in the recorded forest areas

Sangeetha Kandavel
B. Aravind Kumar

The picturesque Nilgiris, known as the Queen of Hills, was once rich in forest density. Alarming, the Nilgiris now tops the table with a loss of 226 sq. km between 2003 and 2011 of dense forests between sq. km of moderately dense forests between 2001-2021. The State Planning Commission has identified policy focus areas to improve the forest cover in Tamil Nadu after analysing 20 years of data. The India State of Forest Reports (ISFR), prepared by the Forest Survey of India between 2001 and 2021, have been used as a major source of information for carrying out the analysis for the report, titled Status of Forests in Tamil Nadu. It has been brought out by the Tamil Nadu State Land Use Research Board of the State Planning Commission.

Identifying priority districts, the report says the policy focus should be on districts that have very less forest cover in terms of area: Chennai, Tiruvallur, Karur, Nagapattinam, and Perambalur. These five districts account for only 1.89% of the State's forest cover. It also underscores the need to identify the reason for the loss of forest cover in districts like Sivaganga where the cover came down by 20.47% in the last two decades, Vilupuram (3.85%), and Kancheepuram (3.03%). The report has also highlighted the districts that require attention with respect to the dense, moderately dense, and open forest categories. Apart from the Nilgiris, Erode needs attention as it has lost dense as well as moderately dense forests. Dharmapuri has lost 409 sq. km of open forests. A study has to be initiated immediately to identify the factors that have led to the loss, it says.

Tree cover decreases

The report also notes the steady decrease of tree cover in the State from 2001 to 2021 to an extent of 1,630 sq. km. This may be due to reasons such as urbanisation, increasing development activities, cyclones, drought, and linear development. The government has to closely monitor the small green patches outside the forest area. The share of Tamil Nadu in the national mangrove cover in the State than the very less extent of mangrove in the State has recorded an increase in the mangrove cover from 23 sq. km in 2001 to 49 sq. km in 2021. But the State had lost 4 sq. km of the mangroves between 2017 and 2021. The ISFR states that Tamil Nadu suffered severe degradation in its growing stock between 2001 and 2021, with a loss of growing stock of 52,134 m cum in the recorded forest areas. It is a



Severe loss: The Nilgiris was once rich in forest density. It lost 226 sq. km of dense forests and 348 sq. km of moderately dense forests between 2003 and 2011. H. SATHANARAYAN

The Status of Forests in Tamil Nadu says the focus should be on districts that have very less forest cover in terms of area: Chennai, Tiruvallur, Karur, Nagapattinam, and Perambalur

cause for great concern and should be addressed scientifically and practical solutions should be adopted.

Action points

After analysing the data, the Planning Commission has come up with a list of action points to strengthen the forest cover across the districts and segments. Stressing the importance of agro-forestry, the Commission has said it is of high time that the consistent efforts were made to increase the tree cover on the farmland and built a robust database on the farmers and the growing stock in their land. This will also help the tree-growing farmers by enhancing their livelihood opportunities. Recommending restoration of the degraded forestland for improving the growing stock and carbon sequestration potential in the natural forests, the Commission has said measures should be taken

to improve the remaining areas of the open degraded forest and scrubland through dedicated schemes and focused approach. Forest Land Restoration (FLR), with the participation of the indigenous and local communities, has to be given priority. The report also suggests a mission like Haritha Haram, a programme initiated by the Telangana government to increase the green cover. Stating government to increase the green cover, Stating that Green Tamil Nadu Mission is expected to cater to this need, the Commission suggests periodical monitoring and evaluation to identify the gaps and address them at the initial stage itself. It also suggests planting of fast-growing native trees, giving preference to the species that have greater carbon sequestration potential.

Ecological restoration of Eastern Ghats
The ecological restoration of the Eastern Ghats in particular should be given more attention. As these tracts of forests are not in a contiguous range, there is a high threat of degradation due to development pressure and the effect of climate change. The Eastern Ghats are rich in forest and natural resources and a source of a few other natural resources and semi-perennial streams. Furthermore, allowing degraded natural forests to re-grow is more effective than planting trees in

non-forest areas. Protection of the natural forests and recovery of the degraded forests should get more priority, besides planting of trees.

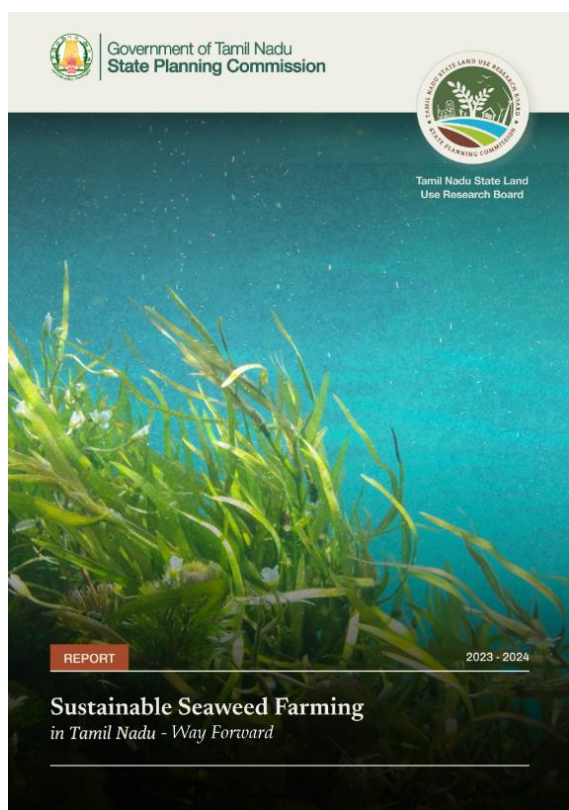
A great threat

The invasive species pose a threat to the forest biodiversity, a problem that requires an immediate scientific intervention. There are some success stories at Kodakanal and Mudumalai which can be used to arrive at workable solutions for other forested areas, the report says. Protecting the forests from encroachment, fires, and other forms of human interference is essential for increasing the forest cover. Notification of unclassified land will also help in increasing the forest cover as the land will get legal protection.

Identification of potential habitats with a good wildlife population, community reserves and conservation reserves are another way to increase the forest cover. In this respect, the government has been proactive in notifying potential forests as protected areas, says the report prepared by Sudha S., IFS, Member-Secretary and Head of Division for Land Use, State Planning Commission; G. Benita Tresa, research associate; and V. Nishalini, senior research fellow.

7. Key Reports Published by TNSLURB

1. Sustainable Seaweed Farming in Tamil Nadu – Way Forward



This report explores seaweed cultivation as a sustainable livelihood option for Tamil Nadu's coastal fishing communities. It captures insights from a January 2023 workshop organised by TNSLURB and Dr. J. Jayalalithaa Fisheries University, which brought together experts, policymakers, farmers, and industry stakeholders.

- Species diversification and ecosystem impacts in the Gulf of Mannar and Palk Bay.
- Industrial and nutritional potential of seaweed, post-harvest processing, and value addition.
- Infrastructure needs and livelihood opportunities for coastal communities.

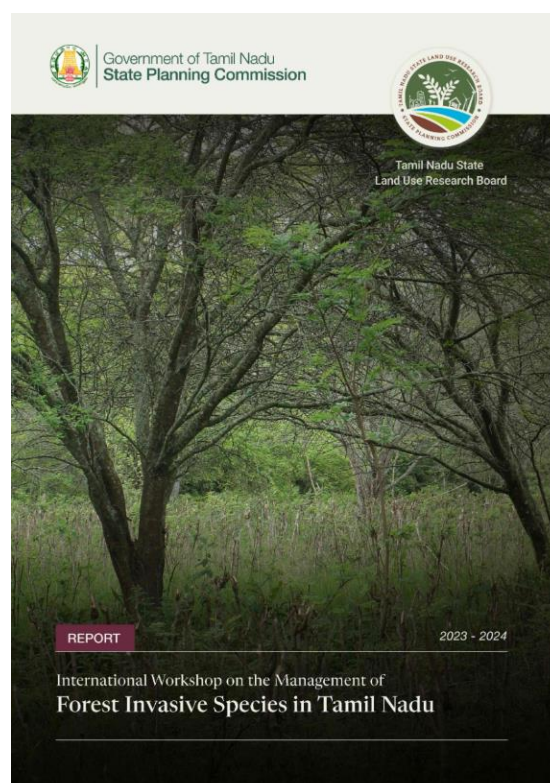
The report serves as a practical resource for policymakers, researchers, and industry stakeholders to advance seaweed cultivation in Tamil Nadu, providing a roadmap to harness its ecological and economic potential sustainably.

2. Management of Forest Invasive species

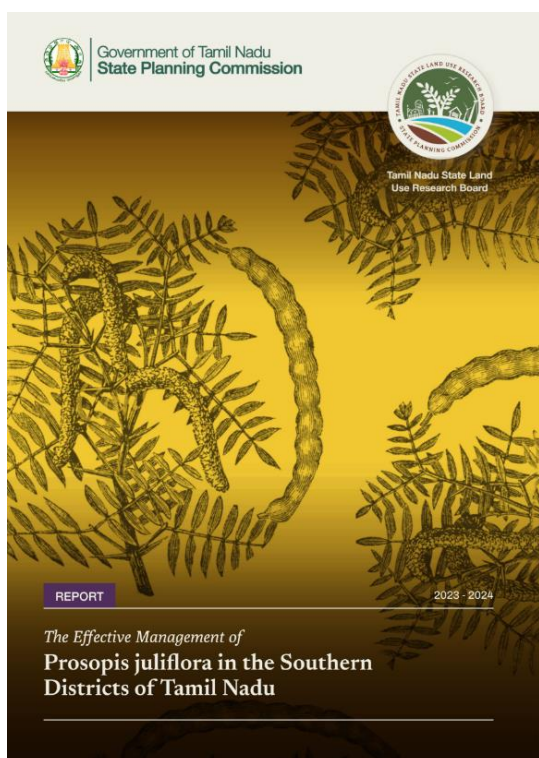
This report focuses on the threats posed by invasive alien species to forests, biodiversity, and livelihoods in Tamil Nadu. The report,

- Highlights challenges of invasive plant species and the need for ecological restoration.
- Shares best practices and management strategies, including prevention, detection, and control methods. Explores opportunities for value addition and livelihood improvement through responsible management.
- Presents the *Tamil Nadu Policy on Invasive Plants and Ecological Restoration* for comprehensive action.

This report supports Tamil Nadu's efforts to manage invasive species while promoting ecological balance and sustainable forest management.



3. Effective Management of *Prosopis juliflora* in Tamil Nadu



This report focuses on addressing the spread and management of *Prosopis juliflora*, an invasive species occupying 40% of India's land and impacting biodiversity, agriculture, and water resources across Tamil Nadu.

- The current status and ecological impacts of *P. juliflora*.
- Livelihood opportunities and industrial demand linked to the species.
- Community and civic perspectives.
- Strategies for effective management and phased eradication.

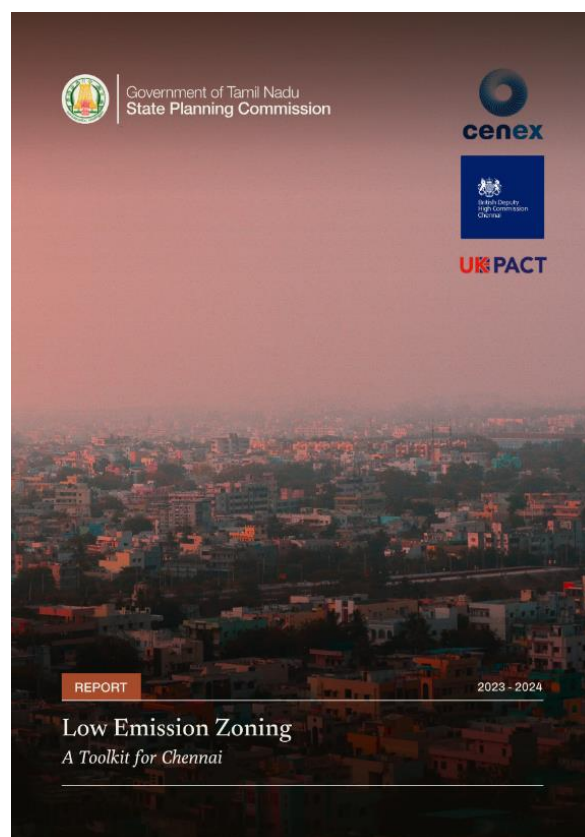
It consolidates research insights, field experiences, and policy measures to support informed decision-making, sustainable management, and ecological restoration while considering the socio-economic dimensions of managing *Prosopis juliflora* in Tamil Nadu.

4. Low Emission Zone – a toolkit for Chennai

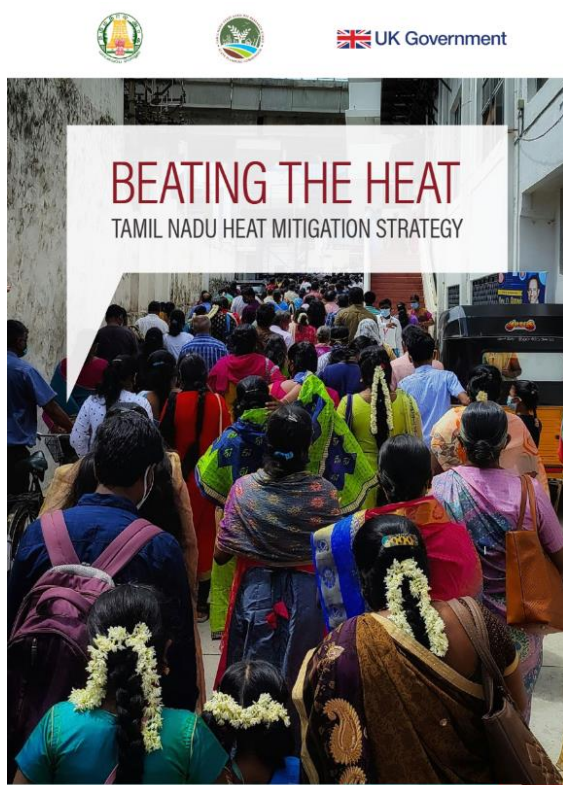
This report, developed by TNSLURB and in collaboration with CENEX and the British Deputy High Commission under the UK PACT programme, presents a clear pathway for implementing Low Emission Zones (LEZ) in Chennai. The report:

- Draws on UK best practices, explaining legal frameworks, vehicle standards, emissions control, and community engagement strategies.
- Provides a tailored roadmap for Chennai, addressing local needs, policy contexts, and stakeholder roles.
- Analyses costs, benefits, and operational steps needed for effective LEZ rollout to improve air quality and reduce urban emissions.

The toolkit aims to guide Chennai in adopting LEZ as part of its sustainable urban development goals, aligning with climate commitments and public health improvements while engaging local businesses and communities.



5. Tamil Nadu Heat Mitigation Strategy



This report addresses the rising challenge of extreme heat in Tamil Nadu, where 74% of the population faces temperatures above 35°C, affecting health, livelihoods, and ecosystems. It outlines the urgency of building heat resilience as climate-driven heat intensifies, impacting productivity, increasing disease prevalence, and deepening social inequalities. The strategy:

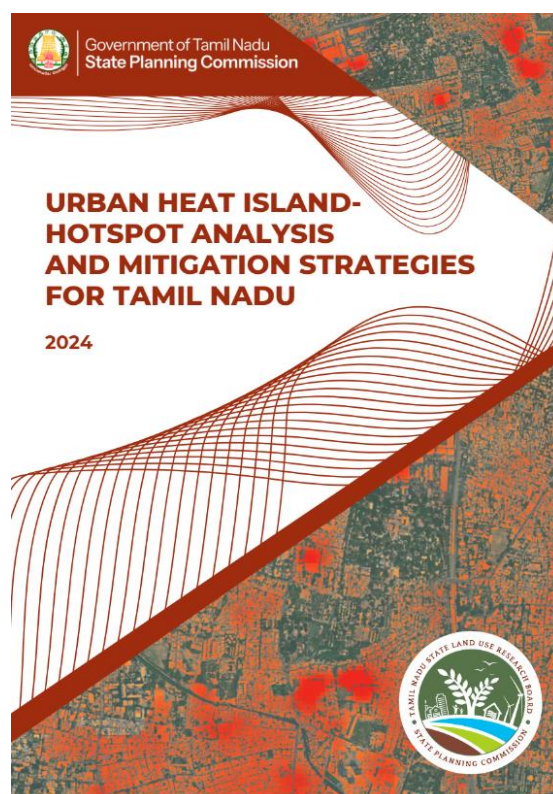
- Highlights cooling solutions, nature-based interventions, and policy reforms to manage heat risks.
- Emphasises health, socio-ecological systems, livelihoods, and the built environment for comprehensive heat action.

Draws from stakeholder consultations, expert inputs, and global learnings to align Tamil Nadu's response with climate realities. The report provides a clear framework for integrating heat resilience into planning and development, ensuring Tamil Nadu is better prepared for rising temperatures while promoting sustainable and equitable outcomes.

6. Urban Heat Island Hotspot Analysis and Mitigation Strategies for Tamil Nadu

This report analyses Urban Heat Island (UHI) impacts across Tamil Nadu, highlighting rising night-time temperatures, particularly in cities like Chennai, Madurai, and Thoothukudi, due to rapid urbanisation and reduced green cover. Developed by TNSLURB with UNEP and CEPT University, it:

- Maps state and city-level heat zones using geospatial analysis.
- Recommends nature-based solutions, cool roofs, reflective pavements, green corridors, and climate-sensitive design to reduce heat stress.
- Guides Tamil Nadu's urban planning towards climate resilience and sustainable development.



7. Mapping Mines in Tamil Nadu: Assessing their Restoration Potential

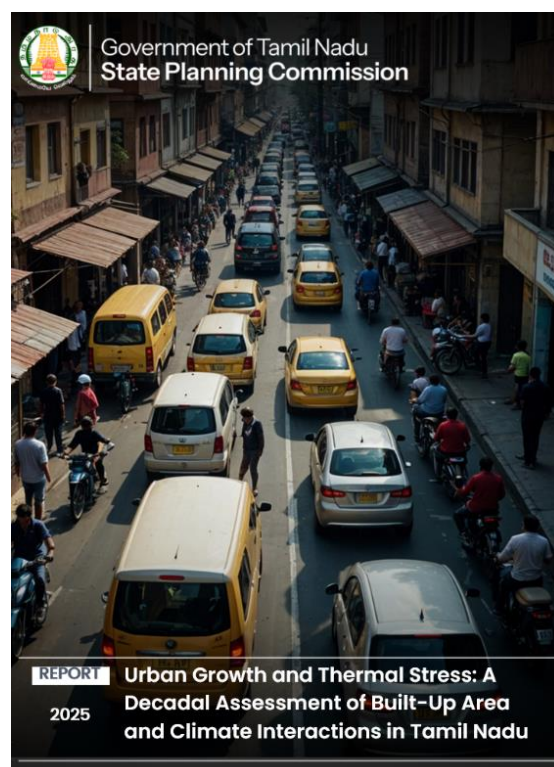


This report, prepared by TNSLUB in collaboration with Botanical Services, Auroville, maps potential mine sites for restoration across Tamil Nadu using geospatial analysis. It identifies abandoned and underutilized mines (limestone, granite, magnesite, etc.) suitable for ecological recovery, considering factors like soil, vegetation, topography, and proximity to sensitive areas.

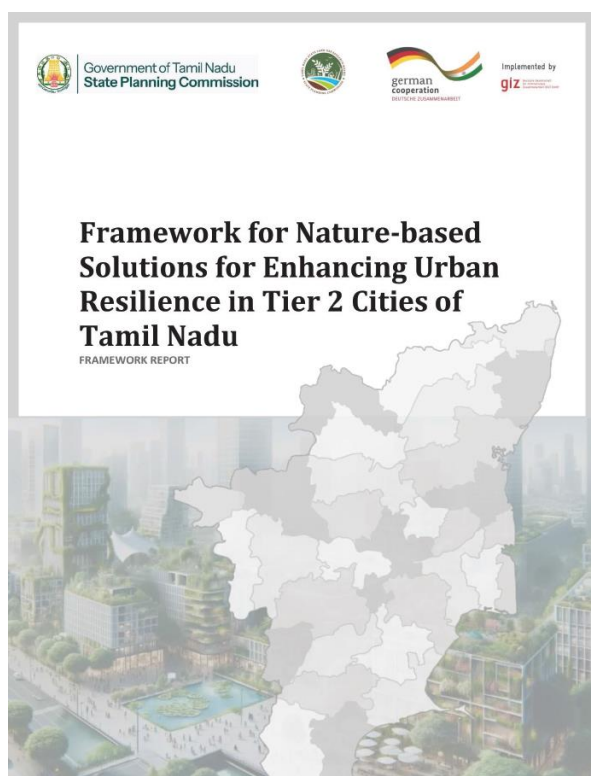
By integrating GIS, satellite imagery, and mining data, the study provides a data-driven framework for prioritizing restoration sites, supporting sustainable land management and biodiversity enhancement. It aims to guide government planners and stakeholders to transform degraded mining lands into productive, ecologically sound environments, aligning with Tamil Nadu's goals for resilience and green development.

8. Urban Growth and Thermal Stress: A Decadal Assessment of Built-Up Area and Climate Interactions in Tamil Nadu

This report, prepared by the Tamil Nadu State Land Use Research Board, analyses heat exposure across Tamil Nadu using high-resolution, block-level spatial and climatic data. It examines how land use change, forest loss, and rapid urban expansion are intensifying heat stress and Urban Heat Island effects in the state. Highlighting the need to integrate heat indicators into land use and infrastructure planning, it proposes strategies such as enhancing green cover, climate-sensitive building regulations, and targeted heat mitigation to improve resilience, health, and sustainability in Tamil Nadu's development.



9. Framework for Nature based solutions for Enhancing urban resilience in Tier 2 cities of Tamil Nadu



The “Framework for Nature-based Solutions for Enhancing Urban Resilience in Tier 2 Cities of Tamil Nadu” outlines a practical roadmap for integrating nature-based solutions (NbS) into urban planning to strengthen climate resilience in fast-growing Tier 2 cities. It focuses on applying ecosystem-based approaches for managing floods, reducing heat, conserving biodiversity, and improving water management while supporting inclusive urban growth. The framework identifies actionable pathways, policy guidelines, and financing options to embed NbS within master plans and city-level governance.

This report was prepared by the TNSLURB in collaboration with GIZ India (German Cooperation) and the Centre for Urbanization, Buildings and Environment (CUBE), aligning with Tamil Nadu's climate and sustainability goals.

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Key reports
published by
TNSLURB were
released by
Hon'ble Chief
Minister of
Tamil Nadu



8. Collaborations and Institutional Partnerships

The Tamil Nadu State Land Use Research Board (TNSLURB) recognises that advancing sustainable and climate-resilient land governance requires meaningful collaboration across sectors, institutions, and communities. Since its establishment as a permanent body within the State Planning Commission in 2011, TNSLURB has prioritised partnerships to enrich research, build capacities, and scale the impact of its initiatives across Tamil Nadu.

These collaborations ensure that land and water governance in Tamil Nadu remains evidence-based, locally relevant, and globally informed.

1 Technical and Academic Collaborations

TNSLURB has partnered with leading technical and academic institutions to bring scientific rigour and technological innovation into land use research, monitoring, and policy frameworks. These partnerships have advanced projects on climate resilience, sustainable agriculture, biodiversity conservation, and geospatial planning.

Key partners include:

- IIT Madras: Climate modelling, peri-urban resilience studies.
- World Resources Institute (WRI) India: Urban resilience frameworks and heat mitigation strategy development.
- Tamil Nadu Agricultural University (TNAU): Research on soil health, crop suitability, integrated farming, and sustainable agriculture.
- Salim Ali Centre for Ornithology and Natural History (SACON): Wetland prioritisation and biodiversity integration in land planning.
- Anna University (CWR, IRS, Centre for Climate Change): Water budgeting, aquifer mapping, and climate adaptation studies.
- MS Swaminathan Research Foundation (MSSRF), Auroville Botanical Gardens, Care Earth Trust, IFMR, MIDS, and others: Supporting specialised studies on wetlands, waste management, ecological restoration, and food systems.

2 Partnerships with State Departments and Agencies

TNSLURB works closely with state departments to align research with Tamil Nadu's development priorities and integrate findings into planning systems.

Key collaborations include:

- Chennai Metropolitan Development Authority (CMDA): Integration of land use data into master planning.
- Department of Environment and Climate Change: Climate vulnerability mapping and SAPCC alignment.
- Department of Agriculture: Soil conservation and sustainable agriculture initiatives.

- Tamil Nadu e-Governance Agency (TNeGA): Development of TNLUIS and cross-departmental data sharing.
- Department of Forests and WRD: Watershed management, fire vulnerability assessment, sacred groves mapping, green cover monitoring.
- Tamil Nadu State Wetland Authority: Wetland documentation, ecosystem evaluation and conservation planning.

These partnerships enable effective implementation of state-led land, water, climate, and ecological strategies. Through research, TNSLRUB supports government departments in evidence-based planning and decision making.

3 Community and Local Body Engagement

TNSLRUB recognises that communities are key to sustainable land governance. It actively engages with local bodies, farmer groups, and community-based organisations to ensure co-ownership of interventions.

Highlights include:

- Establishment of Heat Action Network which includes civil society organisations and NPOs
- Partnering with urban local bodies for wetland monitoring, waterbody rejuvenation, and peri-urban land management pilots.
- Collaborating with panchayats and farmer groups on soil health, sustainable agriculture, and climate-resilient farming.
- Engaging women's Self-Help Groups (SHGs) and youth volunteers in land restoration awareness and monitoring activities.

4 Knowledge Sharing Platforms

TNSLRUB actively participates in national and international knowledge networks to share learnings, adopt best practices, and contribute to broader discussions on sustainable land management.

Key initiatives:

- Participation in SDG forums, climate adaptation workshops, and natural resource management conclaves.
- Sharing Tamil Nadu's experiences in GIS-based planning and integrated land governance at national workshops.
- Engaging with national and international geospatial and climate data networks to standardise data practices

5 International Collaborations and Associations

TNSLRUB recognises that addressing land governance and climate challenges requires learning from global best practices and participating in international knowledge networks. The Board has actively engaged with global organisations, technical partners, and multilateral agencies to strengthen Tamil Nadu's capabilities in sustainable and climate-resilient land use planning.

Key highlights include:

- **Partnership with GIZ (Germany)** through the **TOSCA tool initiative**, enabling the development of participatory, people-friendly data models for inclusive land use planning.

The Tamil Nadu State Land Use Research Board (TNSLURB) has utilised the TOSCA tool as a pilot model to develop people-friendly, data-driven approaches to land use planning in Tamil Nadu. By leveraging TOSCA's visual and analytical capabilities, TNSLURB has enabled citizens, planners, and local bodies to easily understand complex land use data, fostering informed discussions around urban growth, climate resilience, and resource management. This approach aligns with TNSLURB's commitment to participatory planning, helping communities and decision-makers visualise land use scenarios, assess impacts, and co-create sustainable solutions. Using TOSCA, TNSLURB demonstrates how open-source, modular tools can strengthen inclusive, evidence-based land governance in Tamil Nadu.

- Collaboration with the **United Nations Environment Programme (UNEP)** for advancing **heat mitigation strategies and sustainable cooling solutions**.
- **Letter of Intent with the British Deputy High Commission:** During the **Global Investors Meet**, TNSLURB exchanged a Letter of Intent with the British Deputy High Commission to support the development of **Tamil Nadu's Heat Mitigation Strategy**, bringing global expertise to state-level climate action.



- **Collaboration with CENEX (UK):** Worked on **Low Emission Zoning (LEZ)** guidance for Chennai under the UK PACT programme, crafting a practical roadmap to reduce vehicular emissions while improving air quality.

- **Engagement with Energy Systems Catapult (UK):** Maintains regular contact with this entity under the **UK Research and Innovation Network** to explore advanced climate adaptation, sustainable cooling, and emissions reduction strategies aligned with Tamil Nadu's goals.
- Engagement with the **World Resources Institute (WRI) India** under globally aligned frameworks for **urban resilience, peri-urban planning, and climate adaptation**.
- Participation in **international workshops and forums on SDGs, climate adaptation, and sustainable land governance**, bringing Tamil Nadu's experiences to global platforms while adopting proven approaches.
- Collaboration with **global climate and GIS data networks** to enhance geospatial applications for planning, monitoring, and sustainable management.

These **international partnerships have helped TNSLURB bring advanced tools, frameworks, and perspectives to Tamil Nadu**, building the capacity of institutions and stakeholders to align with global sustainability goals while addressing local realities.

Outcomes of Collaborations

- ✓ Enhanced quality and relevance of research outputs through technical expertise and scientific validation.
- ✓ Strengthened state planning processes by embedding robust data, GIS systems, and decision-support tools.
- ✓ Inclusive and sustainable interventions by involving communities and local bodies.
- ✓ Positioned Tamil Nadu as a national leader in integrated, evidence-based land and water governance.

Through these collaborations, TNSLURB has been able to pursue complex, cross-sectoral initiatives, ensuring that planning and management in Tamil Nadu are data-driven, climate-resilient, and people-centric. The Board remains committed to expanding its partnerships, leveraging collective capacities to build a resilient, sustainable future for Tamil Nadu.

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Collaboration is the cornerstone of effective land governance. Through partnerships, TNSLURB transforms knowledge into action, ensuring Tamil Nadu's landscapes sustain people, ecosystems, and the economy.



9. Research to Impact: TN's Heat Governance Model

Rapid urbanisation combined with climate variability has intensified heat stress across the state, with rising temperatures, high humidity, and diminishing green cover increasing risks to public health, productivity, and environmental stability. Vulnerable groups—including the elderly, outdoor workers, women, and residents of informal settlements—bear the brunt of these impacts, deepening socio-economic inequalities.

Amidst this challenge, a shift was made from reactive, fragmented measures to a structured, data-informed, and participatory approach to managing heat as a development and climate risk. This transformation led to the state becoming the first in India to formally recognise heatwaves as a state-specific disaster, enabling proactive planning, targeted interventions, and institutional accountability within its broader climate adaptation framework.

This chapter outlines the state's journey in evolving a model of heat governance, detailing how research and technical assessments were translated into policy and action to build systemic resilience against rising temperatures in a warming world.

Background: Framing the Challenge

Escalating heat stress across the state has been shaped by rapid land use changes, dense urban expansion, and climate variability. Expanding built environments and declining vegetation have amplified the Urban Heat Island Effect (UHIE), leading to higher night-time temperatures and reduced thermal comfort, particularly in cities and peri-urban zones.

Prolonged heatwaves in agricultural regions have further impacted labour productivity and water security, intensifying the vulnerability of semi-arid districts. Despite the growing evidence from localised studies and global climate projections, heat risks had not been systematically integrated into disaster preparedness, urban planning, or climate adaptation frameworks, resulting in fragmented and short-term responses.

Recognising the need for a paradigm shift, efforts were directed towards repositioning heat within the broader agenda of sustainable development and climate resilience, aligning actions with the National Action Plan on Climate Change (NAPCC), the State Action Plan on Climate Change (SAPCC), and the Sustainable Development Goals (SDGs). This created the foundation for transitioning from reactive advisories to structured, anticipatory interventions addressing heat as both a climate and development challenge.

Approach

The transition towards structured heat governance evolved through four interlinked pathways that moved beyond fragmented interventions, focusing on systems thinking and data-driven decision-making.

1. Institutional Recognition and Policy Alignment

Recognising heat as a state-specific disaster was a pivotal step that enabled proactive planning, prioritisation within disaster management frameworks, and dedicated resource allocation. This policy innovation created institutional accountability while embedding heat mitigation within broader climate action and resilience agendas.

2. Science-Based Decision-Making

Robust technical studies were initiated to guide targeted interventions:

- Urban Heat Island Effect (UHIE) assessments were conducted using multi-decadal satellite and ground-based temperature data.
- Heat vulnerability mapping combined exposure, socio-economic sensitivity, and adaptive capacity indicators across districts to identify priority hotspots.
- Integrated analyses examined intersections between climate variability, urban expansion, and heat stress patterns, offering predictive insights for adaptive planning.

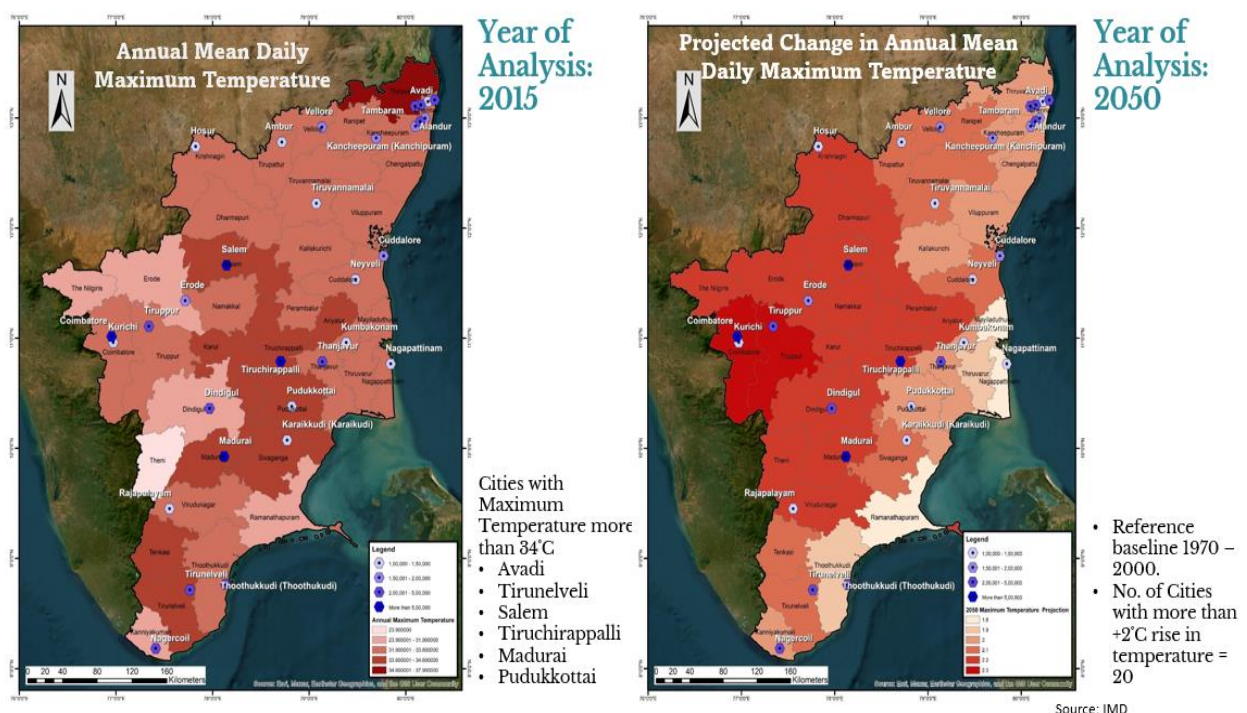
These efforts ensured that heat mitigation was anchored in evidence-based governance, enabling systematic prioritisation of districts and vulnerable populations.

3. Nature-Based and Passive Cooling Solutions

The role of ecosystems and building design in managing heat was emphasised through the development of Nature-Based Solutions (NbS) frameworks and Blue-Green Infrastructure (BGI) strategies. Passive cooling measures, including cool roofs, green corridors, and ventilation-responsive urban layouts, were advanced alongside studies exploring district cooling for energy-efficient urban cooling pathways.

4. Multi-Level Institutional and Community Engagement

Heat resilience was operationalised by fostering collaboration across departments, local bodies, research institutions, and community groups. This approach ensured that mitigation efforts were integrated within urban planning, health systems, water management, and local development initiatives, building sustained ownership and facilitating community-led action.



Key Actions, Studies, and Frameworks

1 Understanding and Analysing the Heat Challenge

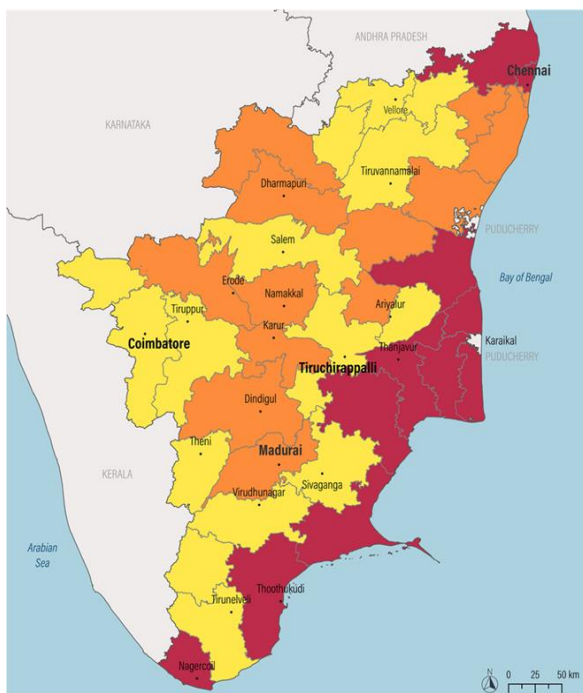
Development of the Tamil Nadu Heat Mitigation Strategy (HMS)

A critical milestone in advancing heat governance in Tamil Nadu was the formulation of the Tamil Nadu Heat Mitigation Strategy (HMS), the first comprehensive sub-national heat strategy in India. Recognising that heatwaves were emerging as a critical climate and development challenge, the HMS was developed to transition the state's response from fragmented, reactive measures to a structured, proactive approach.

The HMS was prepared through multi-stakeholder consultations, drawing expertise from technical institutions, urban planners, health experts, and climate scientists to ensure a science-driven yet contextually grounded framework. The process integrated Urban Heat Island Effect (UHIE) mapping, vulnerability assessments, climate projections, and demographic exposure data, enabling the identification of spatial priorities for intervention.

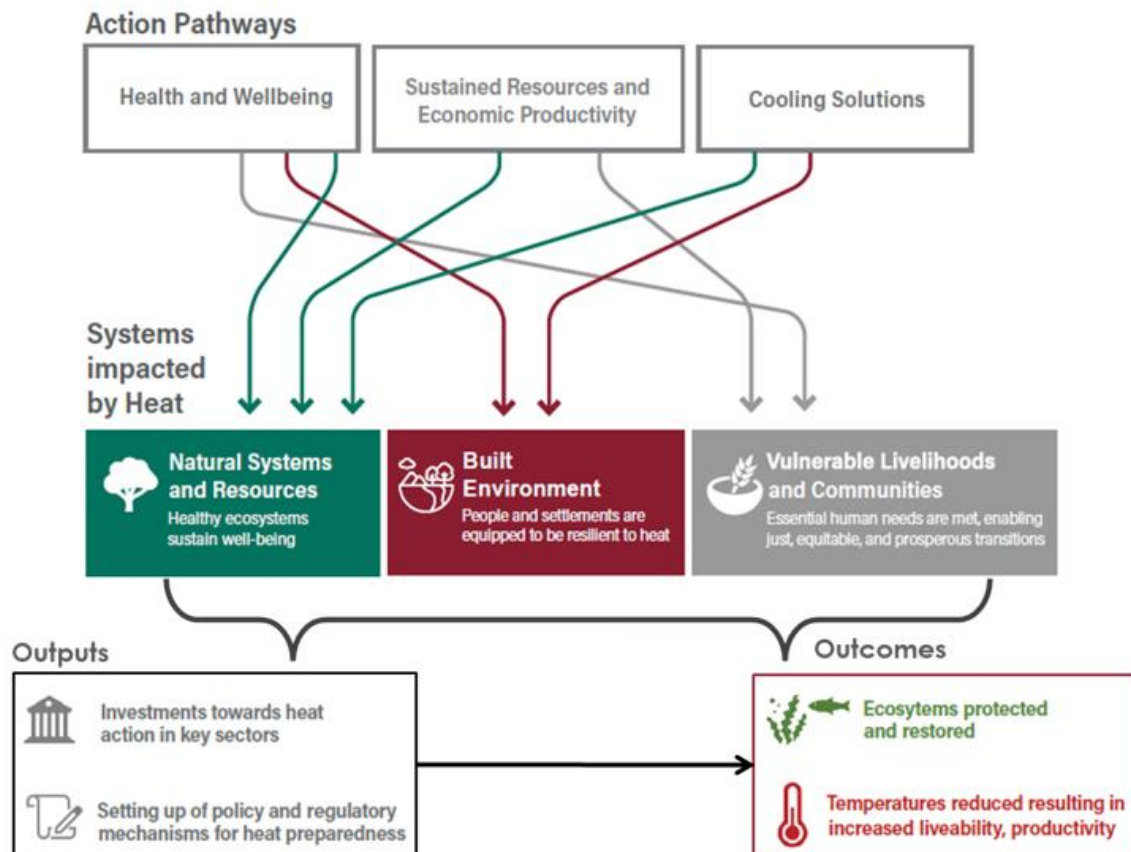
Key elements of the HMS included:

- Embedding Nature-based Solutions (NbS): Urban greening, restoration of blue-green networks, and enhancing permeable surfaces were prioritised to reduce heat load in cities and towns.
- Building and Urban Design Strategies: The HMS advocated for passive cooling approaches, cool roof programs, and integration of shading and ventilation principles within building codes and urban guidelines.
- Piloting District Cooling: Recognising the potential for energy-efficient, low-emission cooling, the strategy proposed piloting district cooling systems in dense urban clusters, aligned with sustainable urbanisation goals.
- Sectoral Roadmaps: Policy interventions were mapped across sectors including health, agriculture, water management, and urban planning, recognising the cross-sectoral nature of heat risks.



- Integration with Climate Projections: Climate model data was used to align interventions with anticipated temperature and humidity trends, ensuring the longevity and adaptability of planned measures.

A significant outcome of the HMS was its role in enabling the Government of Tamil Nadu to declare heatwaves as a state-specific disaster in 2024, the first state in India to do so. This declaration unlocked systematic planning and funding pathways for heat resilience, elevating heat mitigation within the broader disaster management and climate adaptation agenda.



Source: TN Heat Mitigation Strategy, 2024

Establishing the Heat Action Network

To operationalise the HMS and translate its recommendations into effective action, a Tamil Nadu Heat Action Network (HAN) was established, creating a whole-of-government and whole-of-society platform for heat resilience. This network brought together:

- Government departments (health, environment, agriculture, urban development, disaster management)
- Urban local bodies and district administrations
- Research institutions and technical agencies
- Civil society organisations and community groups

The HAN facilitated the sharing of technical knowledge, enabled capacity-building for local officials on urban heat mapping and planning, and supported the preparation of city and district-level Heat Action Plans. Community engagement initiatives under the HAN promoted tree planting, rooftop greening, and awareness campaigns on local heat mitigation measures.

Through the HMS and HAN, Tamil Nadu established a structured, globally relevant model for sub-national heat governance, ensuring that scientific data, community priorities, and systemic planning converge to address the intensifying challenge of heat stress in a rapidly urbanising and climate-vulnerable landscape.

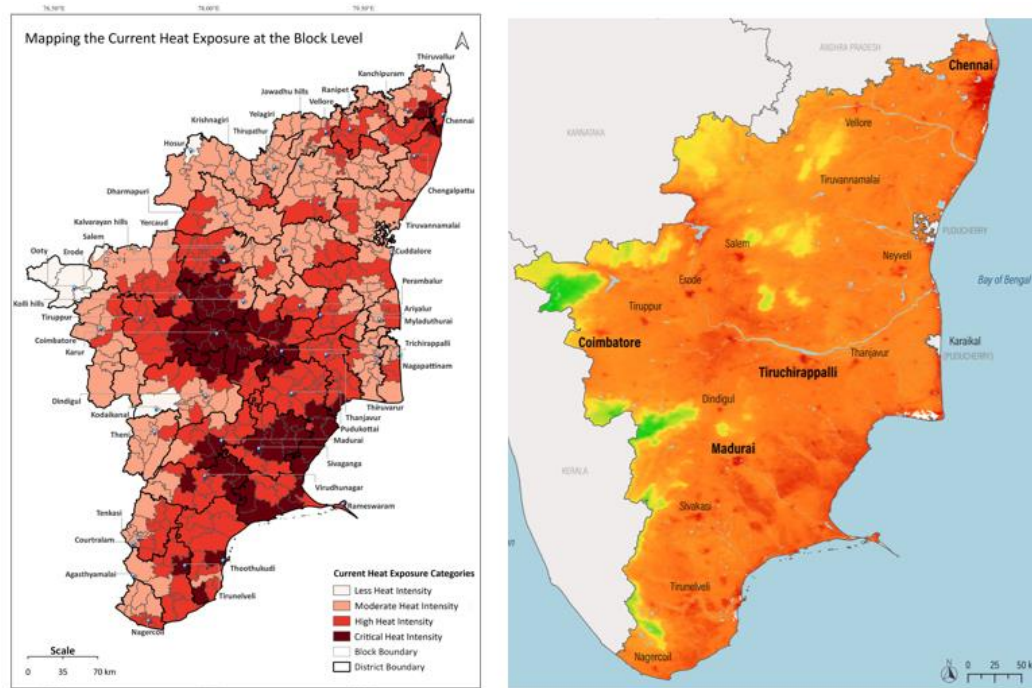
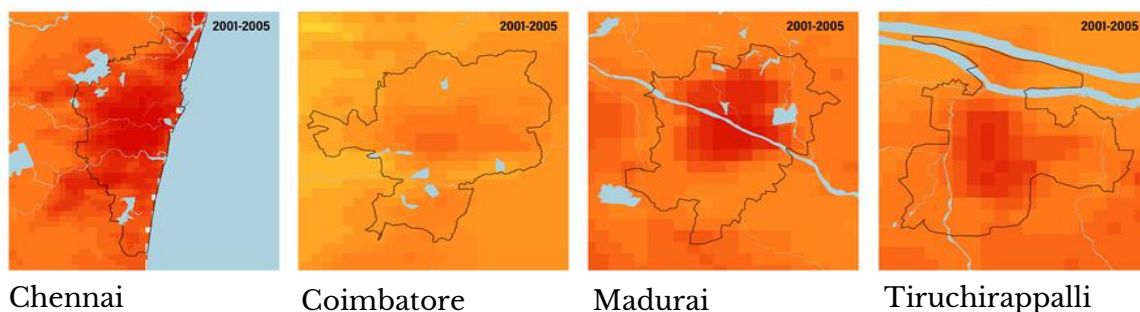
UHIE assessments, Decadal Urban Growth and Thermal Stress Analysis

Tamil Nadu's escalating heat exposure is intrinsically linked to rapid urbanisation and green cover loss, with built-up areas expanding by 90% over 15 years alongside the loss of 3,025 sq. km of forests, intensifying heat retention across urban and peri-urban zones. Cities such as Chennai record night-time temperatures 1.5–2°C higher than surrounding rural areas, exacerbating public health, productivity, and environmental challenges.

In response, systematic geospatial and climate data analyses were applied to inform heat mitigation efforts. Using MODIS Terra LST, ERA5, Copernicus datasets, and ground observations, assessments captured diurnal and seasonal heat patterns while quantifying the Urban Heat Island Effect (UHIE) across diverse landscapes.

Analyses revealed that over 41.7 million people are exposed to high heat intensity, with more than 100 taluks recording temperature increases of $\geq 2^{\circ}\text{C}$ between 2010 and 2020. Mapping exercises identified 94 heat-vulnerable blocks, including 25 prioritised as dual-vulnerable due to the intersection of high heat exposure with dense, at-risk populations.

Decadal thermal stress assessments further demonstrated that heat pockets frequently aligned with high-density informal settlements, while correlations between reduced green cover, land degradation, and rising urban heat became evident. Multi-temporal evaluations enabled the monitoring of microclimatic variations and the development of predictive insights critical for heat stress management under climate change and urban expansion.



2 Advancing Solutions for Heat Governance

Declaration of Heat wave as a State specific disaster

Having analysed and mapped heat vulnerability hotspots across Tamil Nadu, it became evident that addressing heat as a disaster required a shift from reactive response to systematic mitigation. The next logical step was to explore practical measures for reducing heat exposure, enhancing thermal comfort, and building resilience, especially in high-risk districts and urban centres.

The culmination of these efforts enabled Tamil Nadu to **officially declare heatwaves as a state-specific disaster in 2024**, the first state in India to do so. This declaration activated the **State Disaster Relief Fund**, facilitated structured fund utilisation, and triggered systemic preparedness across departments and districts, embedding heat mitigation within disaster risk reduction frameworks.

To translate insights into action, efforts were undertaken to assess the scope of various solutions, identify appropriate interventions, and determine the most suitable locations for implementation. This phase of work aimed to ensure that interventions were evidence-driven, locally relevant, and scalable, paving the way for Tamil Nadu's holistic approach to heat governance.

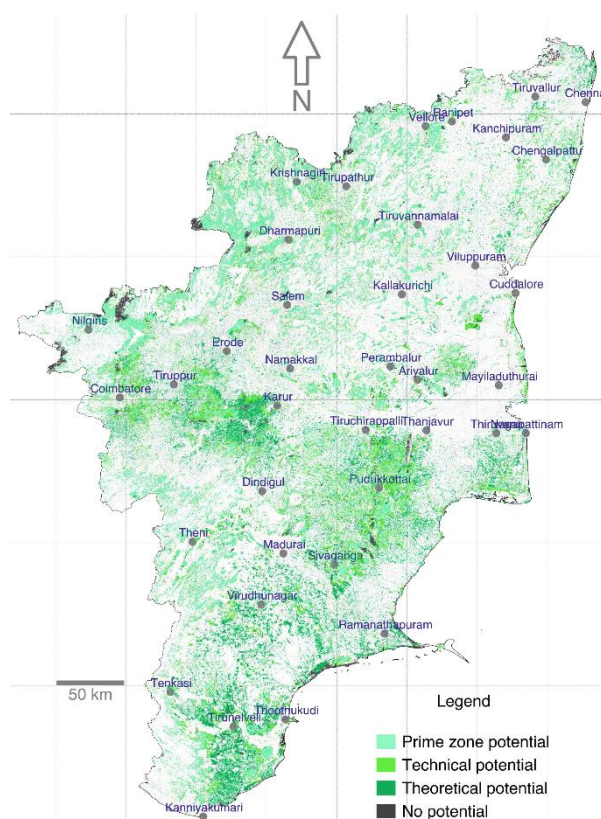
Mapping Blue-Green Infrastructure Networks

Blue-Green Infrastructure (BGI) was prioritised as a nature-based strategy to mitigate urban heat, while enhancing biodiversity, groundwater recharge, and urban liveability. A comprehensive exercise was undertaken to map 667 Blue-Green Network (BGN) sites across Tamil Nadu, overlaying them on heat vulnerability and urban expansion layers to identify intervention zones.

The assessment revealed fragmented and insufficient green spaces in many expanding urban zones, limiting their cooling potential. It also identified opportunities to connect riparian buffers, peri-urban wetlands, and urban green spaces, creating corridors that can enhance local microclimates while restoring ecological linkages.

Most BGN sites were found in peri-urban and rural landscapes, with a clear gap within densely built urban cores, underscoring the need for targeted greening interventions in high-heat, low-green-cover districts. The mapping enabled prioritisation of districts and local bodies where enhancing BGI would deliver significant heat mitigation co-benefits.

These findings fed into the development of Nature-based Solutions (NbS) frameworks, including urban tree planting, permeable surfaces, green corridors, and mangrove



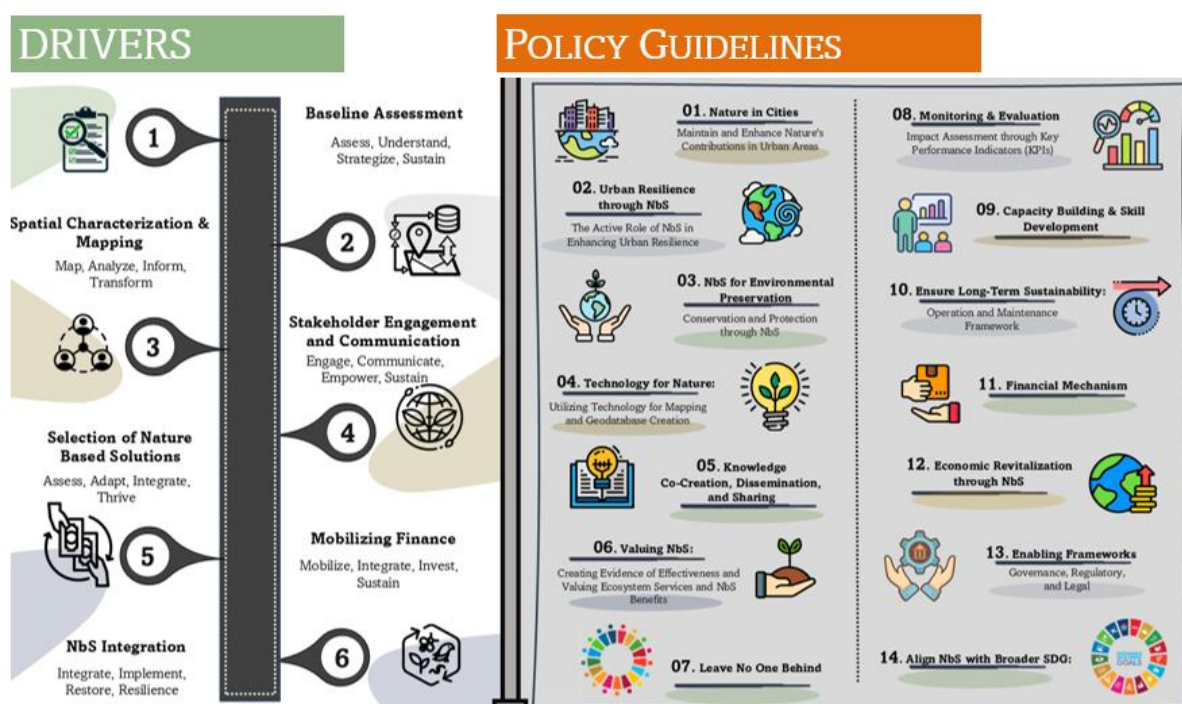
restoration efforts. Aligned with the Green Tamil Nadu Mission and Tamil Nadu Wetlands Mission, these initiatives support the plantation of 265 crore seedlings over a decade, with a targeted increase of 12,076 sq. km in forest and tree cover, directly contributing to reducing urban heat while enhancing climate and water resilience.

By integrating BGI into urban planning and climate action strategies, this work demonstrated how nature-based interventions could operationalise climate adaptation, reduce heat stress, and create co-benefits for communities and ecosystems, advancing Tamil Nadu's commitment to sustainable and climate-resilient development.

Nature-Based Solutions Framework for Urban Resilience

Nature-Based Solutions (NbS) were prioritised as a practical pathway to reduce urban heat while enhancing biodiversity, groundwater recharge, and liveability across Tamil Nadu's growing cities. Building on prior hotspot mapping and BGI assessments, a structured NbS framework was developed for Tier 2 and Tier 3 cities, aligning urban cooling with ecosystem restoration.

Pilot interventions demonstrated the potential of NbS in heat mitigation and climate resilience. Urban forests were established on vacant lands, rooftop gardens were piloted on government buildings, and degraded urban water bodies were restored, serving as localised cooling hubs while improving biodiversity and water management. These initiatives were designed to complement urban expansion patterns while maximising co-benefits for air quality and community health.

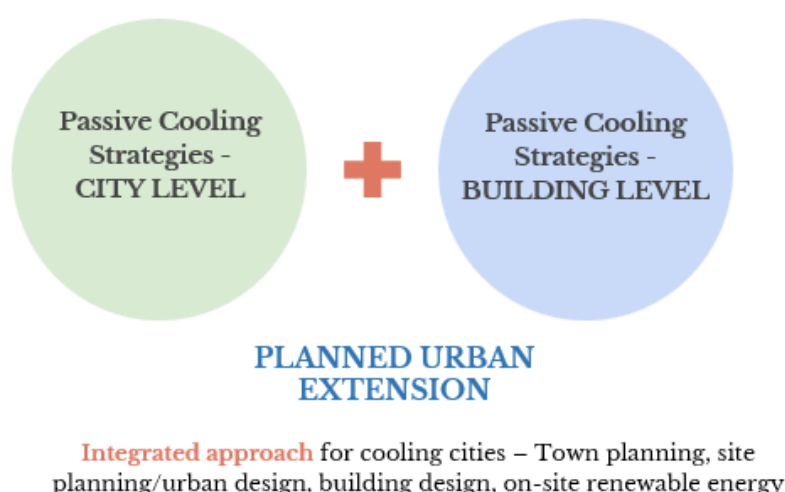


Aligned with the Green Tamil Nadu Mission, these efforts contribute towards the state's goal of planting 265 crore seedlings and expanding forest and tree cover by 12,076 sq. km within a decade, directly addressing urban heat while strengthening ecological networks.

In parallel, passive cooling measures were advanced as part of the NbS framework, focusing on cool roofs, green roofing systems, shaded street designs, and urban ventilation corridors. A demonstration project at the Perumbakkam Light House Habitat

achieved a 9–12°C reduction in roof surface temperatures and 1.5–3°C indoor temperature reductions, enhancing thermal comfort from 65% to 85% while reducing energy use by 12%. These measurable impacts demonstrated the scalability of passive cooling strategies for low-income housing and heat-vulnerable urban areas.

By embedding NbS within urban planning and climate action frameworks, these efforts operationalised climate adaptation, demonstrating how nature-based interventions can deliver co-benefits for heat resilience, community well-being, and sustainable urban development.



District Cooling Systems: Future-Ready Cooling Strategies

As Tamil Nadu anticipates a doubling of urban cooling demand by 2050, innovative approaches to low-emission, efficient cooling have become critical to managing heat stress while mitigating carbon footprints. To address this, feasibility studies on District Cooling Systems (DCS) were initiated to evaluate the viability of centralised, energy-efficient cooling solutions in urban clusters.

A pilot concept was developed for Fintech City, Chennai, to assess DCS potential under Tamil Nadu's climate and urban conditions. The study evaluated:

- Comparative energy savings against conventional air-conditioning systems.
- Integration opportunities with renewable energy sources for decarbonised cooling.
- Institutional frameworks and financial models necessary for city-scale DCS adoption.

This exploration demonstrated how DCS could provide future-ready, low-carbon cooling solutions, aligning with climate action goals while addressing the growing heat-related energy demands in Tamil Nadu's rapidly urbanising landscape.

Demonstration Project: Cool Roofs for Low-Income Housing

Taking lead in recognising the disproportionate impact of heat stress on vulnerable communities, a demonstration project was implemented by Department of Environment, Forest and Climate Change supported by UNEP and RMI at Perumbakkam Light House Habitat, one of Asia's largest affordable housing developments. The intervention applied reflective cool roof coatings and green roofing systems, systematically measuring thermal and energy performance under local conditions. The project achieved:

- 9–12°C reductions in roof surface temperatures.
- 1.5–3°C reductions in indoor temperatures, improving thermal comfort during peak heat periods.
- An increase in thermal comfort hours from 65% to 85%.
- Up to 12% reduction in energy consumption for cooling.

These results underscored the viability of cool roof technology as a cost-effective, scalable intervention to enhance thermal comfort and reduce energy costs in low-income, heat-vulnerable housing, providing a replicable model for other Indian cities facing similar challenges.

Heat Action Plans: Translating Strategy into Local Action

Building on the Tamil Nadu Heat Mitigation Strategy, Heat Action Plans (HAPs) were developed for major urban centres including Chennai, Coimbatore, Madurai, and Salem, embedding heat resilience within city planning frameworks.

These HAPs integrated:

- Heat vulnerability maps and UHIE assessments to prioritise interventions.
- Passive cooling measures within building and street design guidelines.
- Targets for increasing urban green cover and protecting water bodies.
- Protocols for monitoring heat stress and issuing early warnings.

By mandating the inclusion of heat mitigation measures within city master plans and local governance processes, the HAPs provided a structured pathway to operationalise heat resilience, enabling targeted interventions that directly reduce heat exposure while strengthening community preparedness.

The HAPs aim to reduce urban heat by up to 4°C in hotspot areas and decrease heat-related illnesses by 15–30%, demonstrating how macro-level policy can translate into locally actionable climate adaptation measures.

Capacity Building for Long-Term Resilience

Sustaining heat resilience requires embedding knowledge and practice across institutions, local governments, and communities. Recognising this, capacity building was prioritised as a cornerstone of Tamil Nadu's heat governance approach, ensuring that policy frameworks and technical studies translate into tangible on-ground action.

A structured programme of workshops and technical trainings was implemented, equipping urban planners, municipal engineers, and state department officials with practical skills in:

- **Urban heat monitoring and geospatial analysis**, enabling identification and prioritisation of heat hotspots.
- **Climate-responsive building design and passive cooling strategies**, including the application of cool roofs and reflective surfaces.
- **Integration of Nature-Based Solutions (NbS)** within urban layouts, linking heat mitigation with biodiversity enhancement and water management.

To support institutional adoption, local bodies received guidance on embedding heat resilience measures into **urban planning processes, building bye-laws, and master plans**, aligning with the Heat Action Plans and the broader climate action agenda of the state.

Toolkits, technical guidelines, and open-data systems were developed and disseminated, ensuring that stakeholders—from local engineers to district-level planners—could independently apply heat mitigation frameworks within their contexts. This approach fostered a culture of climate-responsive governance, ensuring heat resilience was not a standalone project but an integrated, continuously evolving part of Tamil Nadu's urban and climate strategy.

Through this layered capacity-building effort, Tamil Nadu strengthened its ability to manage rising heat risks while fostering **local ownership and technical confidence** across all governance levels, positioning itself as a model for sub-national heat action globally.

Policy Influence and Global Recognition

Tamil Nadu's structured, science-backed approach to heat governance has transformed local resilience planning while positioning the state as a global leader in subnational climate adaptation. By aligning climate action with development priorities and public health preparedness, Tamil Nadu has shown how heat risks can be systematically addressed through evidence-based governance.

This leadership was showcased at the Global Cooling pledge signatories' focal points meeting at Bonn, Germany, where Tamil Nadu's integrated model for addressing heat as a climate and development challenge was presented as a replicable framework for other regions facing escalating heat stress. The initiatives underscored the co-benefits of climate action for sustainable urban development while ensuring preparedness for heat-related risks in a warming world.

Tamil Nadu became India's first state to develop a comprehensive Heat Mitigation Strategy, embedding heat resilience within its climate action and disaster management frameworks. The declaration of heatwaves as a state-specific disaster unlocked dedicated funding and prioritisation, ensuring systematic preparedness and embedding heat mitigation within disaster risk reduction planning.

The Heat Action Plans prepared for cities like Chennai, Coimbatore, Madurai, and Salem translated macro-level policy into localised interventions, demonstrating measurable pathways to reduce urban heat by up to 4°C and decrease heat-related illnesses by 15–30% in identified hotspots. The use of innovative tools, including TOSCA, enabled community-led planning while enhancing transparency and local participation in heat mitigation efforts.



Transition to Impact: A Replicable Framework

Tamil Nadu's journey from fragmented, reactive heat management to a structured, data-driven, and community-centred heat governance model demonstrates how research can be effectively translated into policy and action. By prioritising vulnerability mapping and technical assessments, interventions were targeted to support the most at-risk communities with context-specific solutions.

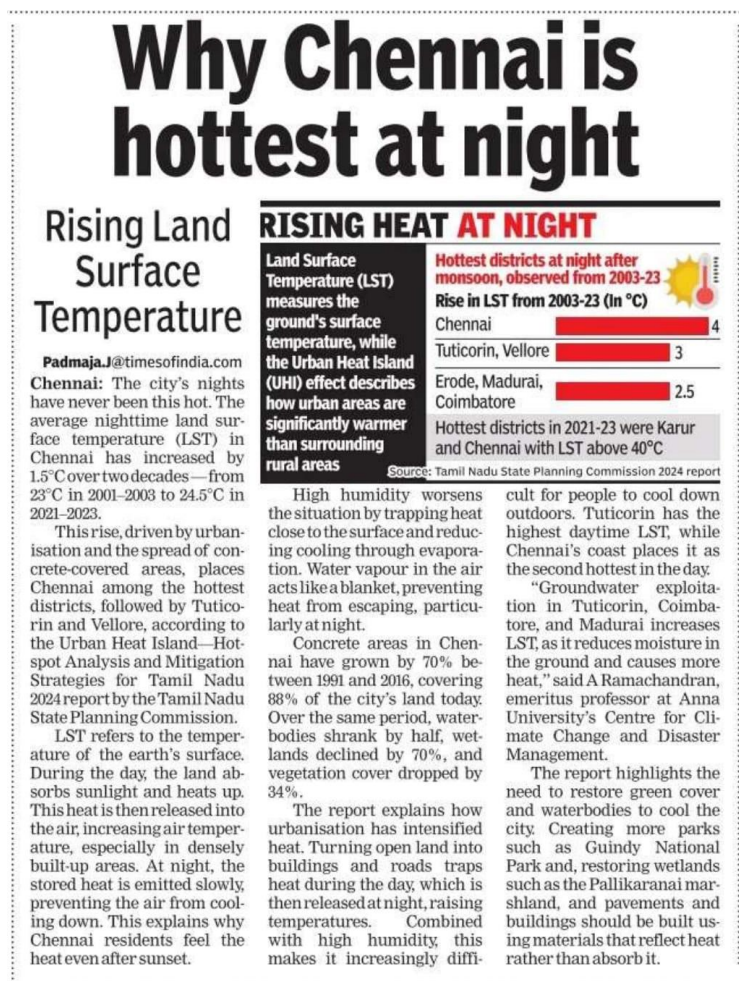
The state's integrated approach—blending passive and district cooling strategies, cool roof demonstrations, and nature-based interventions across urban and peri-urban landscapes—aligned climate adaptation and development objectives, reducing vulnerability while improving liveability.

The creation of the Heat Action Network (HAN) fostered multi-stakeholder engagement, ensuring coordinated action across sectors including health, urban development, water management, and agriculture. Capacity-building programmes strengthened local institutions, enabling effective implementation of heat mitigation strategies across planning and governance systems.

Looking Ahead: Scaling Heat Resilience

Tamil Nadu's experience illustrates that addressing heat as a disaster and development challenge requires institutional commitment, scientific rigour, and community engagement. Building on this, the state is committed to scaling Heat Action Plans to additional districts, expanding nature-based cooling interventions, and integrating heat resilience within its broader climate adaptation and SDG frameworks.

Collaborations with global partners will continue, bringing advanced cooling technologies and innovative solutions while ensuring implementation aligns with local contexts and capacities. The commitment to climate-responsive governance reaffirms that local action can drive meaningful global solutions, demonstrating how vulnerabilities can be transformed into opportunities for sustainable and inclusive development.



TN's block-level heat stress mapping rings alarm bells

Decadal study finds 25 blocks in 10 districts falling under 'extremely heat-stressed' category



SV KRISHNA CHAITANYA @Chennai

TAMIL Nadu released the state's first-ever block-level spatial analysis of heat exposure on Monday. The decadal study, conducted by the Tamil Nadu State Land Use Research Board and State Planning Commission, confirms that rising urbanisation and loss of

"These blocks are of particular concern as they represent areas where temperatures have both increased significantly over time and are currently above the state average, indicating persistent and intensifying thermal stress," the report states. "The findings draw a direct link between land use change — espe-

WORRYING TREND

- 1 **Increase in built-up footprint:** The findings draw a direct link between land use change, especially built-up area expansion, and temperature rise.
- 2 **Intensifying thermal stress:** Between 2000-2005 and 2018-2023, night-time land surface

time land surface temperatures (LST) — a metric linked to heat retention and human discomfort. Between 2000-2005 and 2018-2023, night-time LST rose by nearly 4 degree Celsius in major urban centres like Chennai, Salem, Coimbatore and Tiruchy. Across the state, average night-time LST increased by 2 degree Celsius, indicating widespread thermal stress.

The combined effect of reduced vegetation and increased impervious surfaces like concrete has amplified the urban heat island (UHI) effect, particularly in fast-expanding zones and ecologically sensitive hilly terrain. With thermal discomfort days projected to increase from 107 to 150 days per year by 2050, the report warns that urban heat is becoming a major public health and infrastructure risk. "This is not a future problem — it's happening now. And unless we adapt at the micro level, block

T.N. heatwave policy is only a start

Government's policy provides short-term relief but lacks long-term measures

STATE OF PLAY

Yasudevan Mukundh
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In October, the Tamil Nadu government notified extreme heat as a State-specific disaster. As things stand, the decision is good because it allows those at risk of heat-related morbidity or mortality to avail institutional mechanisms and recompense in the event of a deadly heatwave. This expands the State's responsibility to guarantee public welfare to the new and unique threats posed by climate change. But there are also reasons to wait and watch.

First, the gazette notification provides "medical care including supply of oral rehydration solution packets" and "drinking water in water kiosks". These are incentives in the policy, but there are no sanctions should the State fail to act appropriately or in the event that these measures are deemed insufficient.

The next paragraph in the notification is more illuminating: that a heat-related death is diagnosed "based on a history of exposure to high ambient temperature and the reasonable exclusion of other causes of hyperthermia". Further, "diagnosis shall be established from the circumstance surrounding the death, investigative reports concerning environmental temperature, and/or measured antemortem body temperature at the time of collapse".

Estimates of a heatwave's deadliness are typically based on the extent to which the ambient temperature deviates from the historical average at a specific location and the number of lives lost during and because of the heatwave. This is



Tamil Nadu

a tricky, even devious, combination as illustrated by the accompanying rider: "to the reasonable exclusion of other causes of hyperthermia".

A heatwave injures and/or kills by first pushing more vulnerable people over the edge; the less vulnerable are further down the line. The new policy is presumably designed to help the State catch those whose risk exposure the State has not been able to mitigate in time. However, the goal should be to altogether reduce the number of people requiring such catching. The policy lacks the instruments to guide the State toward this outcome.

This detail serves as a crucial reminder: this is well begun, and well begun is half done. But bearing in mind governments' penchant for taking isolationist views of how climate change affects the people, there is value in keeping what remains pending in sight.

As a second example, the policy skirts the State's responsibility by limiting itself to the consequences of a heatwave or a heatwave declaration and does not mitigate the deadliness of high heat in advance and in contexts beyond climate change. Such inaction could potentially facilitate a disaster, risking people's lives even before the ambient temperature has crossed legally recognised thresholds. For example, if a doctor concludes a

person died of a heat-related injury because they could not ventilate themselves, yet the weather department has not declared a heatwave, the person's family will not qualify to receive the *ex gratia* solatium in the new policy. That is, the policy will not help catch in advance the same people who are likelier than others to be injured or killed during a heatwave.

On a related note, if a person dies during a (declared) heatwave, the ambient heat itself will be less responsible for stressing an individual than the heat interacting with pre-existing vulnerabilities and comorbidities. At the least, the Tamil Nadu health department should clarify the interaction between high heat and comorbidities and which of the latter might disqualify families from receiving the solatium.

Finally, the Tamil Nadu government has adopted a climate change mission that could address some of the anthropogenic components responsible for aggravating heatwaves. But actions to mitigate climate change and to adapt to a future with it are long-term, whereas keeping a heatwave from being deadlier has many short-term solutions such as better urban planning, improving access to green spaces, better enforcement of working conditions in the informal sector, etc.

For now, the gratuitous relief is effectively a self-imposed penalty on the State's failure to lower its people's vulnerability to heat injury during a declared heatwave, expense of the State Disaster Response Fund. Tamil Nadu will miss the forest for the trees if it does not expand the policy in the future to include its implicit long-term responsibilities.

Planning panel moots District Cooling System to promote energy efficiency

DCS could help Tamil Nadu sustainably manage water through effective reuse, lowering heat island effects, providing sustainable cooling for all, and reducing emissions from power plants, says a report by the State Planning Commission

Sangeetha Kandavel
CHENNAI

To minimise the burden on electricity grids and promote energy conservation, a District Cooling System (DCS) is being strongly considered as an alternative environment-friendly cooling solution, according to an analysis by the State Planning Commission (SPC).

The panel's report said DCS could help Tamil Nadu sustainably manage water through effective reuse, lowering heat island effects, providing sustainable cooling for all, and reducing emissions from power plants.

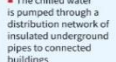
DCS is a centralised cooling system that distributes chilled water to multiple buildings through network of underground insulated pipes. The buildings use chilled water for air conditioning or industrial process cooling. SPC Vice-Chairman Jeyarajan said that water cooling was essential human comfort and health, industrial process and food preservation, higher electricity demand could boost greenhouse gas emissions. "The challenge is to develop efficient cooling technologies to minimise the burden on electricity grids and promote energy conservation. District cooling is being strongly considered as an alternative environment

Keeping it cool

A look at how the District Cooling System works, and what its benefits are.



- A central Chilled Water Plant generates chilled water using energy-efficient technologies and, where available, renewable energy.
- The chilled water is pumped through a distribution network of insulated underground pipes to connected buildings.



- Buildings have Energy Transfer Optimalisation Incentives.



HIGHLIGHTS OF UN REPORT

A United Nations Environment Programme (UNEP) report published in association with Energy Efficiency Services Limited (EESL) on March 16, 2021, focusing on 'National District Cooling Potential Study for India', explains the benefits of a District Cooling System for cities and industries.



- Reducing greenhouse gas emissions.



- Reducing peak power demand.



- Reducing consumer costs for cooling.

that sets clear standards for private developers, including tariff regulations, performance benchmarks, and energy efficiency goals. The government could offer tax incentives, streamlined land acquisition processes and other measures to attract investment. Tangedco or municipal corporations such as the Chennai Metropolitan Development Authority could own and manage these systems. This would allow the State to maintain low tariffs, support public infrastructure, and integrate cooling systems into overall energy management. District cooling providers such as Tabreed, ENGIE or Danfoss may di-

Planning panel lays out heat mitigation road map

Sanjay Vijayakumar
Sangeetha Kandavel
CHENNAI

Tamil Nadu would be severely impacted by heat, says a State Planning Commission report that has flagged several issues and called for mitigation measures.

Global reports indicate that India will lose up to 5% of its Gross Domestic Product by 2030 to rising temperatures. Tamil Nadu, the southernmost State in India, with its warm tropical weather, is projected to be severely impacted by heat, State Planning Commission Vice-Chairman J. Jeyarajan said in the report, 'Beating The Heat-Tamil Nadu Heat Mitigation Strategy'.

In the changing global scenario, heat is emerging

A rising threat

Key highlights of the State Planning Commission's report on Heat Mitigation Strategy



Working in tandem: The State Planning Commission is anchoring the heat mitigation strategy, with support from the British High Commission.

■ Tamil Nadu with its warm tropical weather is projected to be severely impacted by heat

- At present, nearly 74% of the State's population is exposed to air temperature of over 35° C
- There is an urgent need to develop heat resilience in the State as climate change-driven heat is only expected to intensify
- Concerns over health and well-being should be addressed through short- and long-term mitigation measures
- Facilities including access to cool, shaded spaces; drinking water; and

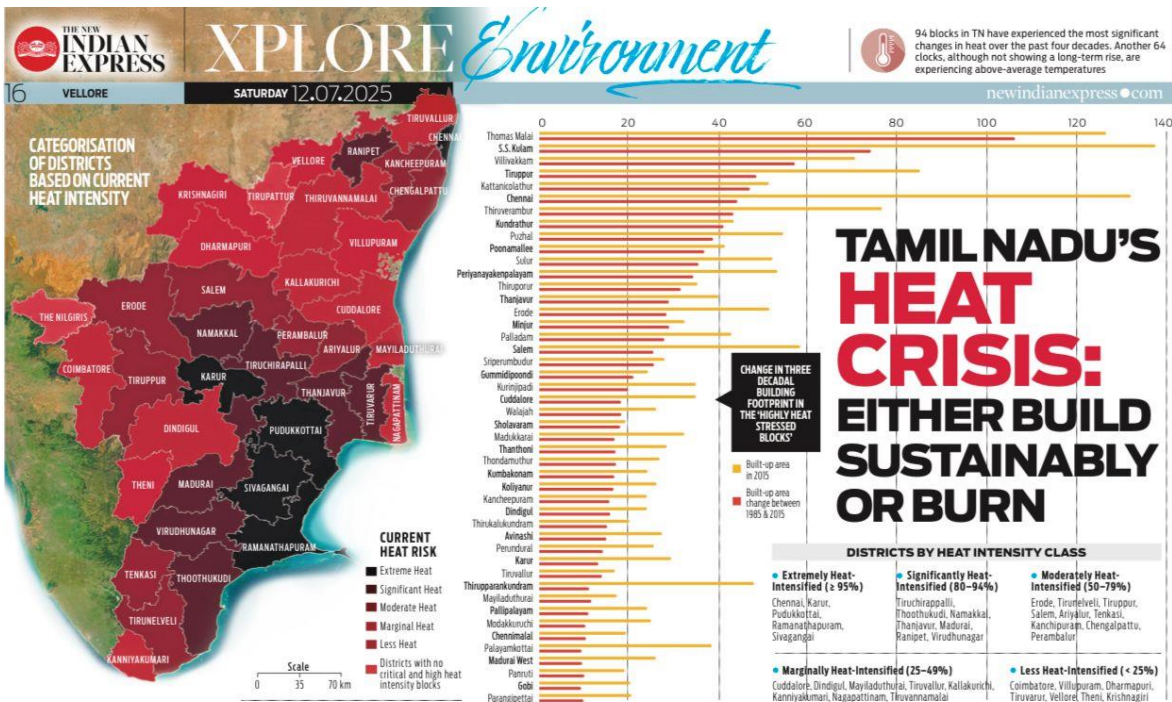
rehydration solutions are to be made available to vulnerable groups on priority

- Preventive veterinary interventions such as provision of rehydration solutions to individuals/communities practising animal husbandry; zoos; and other animal care centres, are needed
- Under the Tamil Nadu Government Pregnancy Scheme, heat risk can be added as a key criterion at the time of screening during health check-ups
- Specific language to ensure the thermal comfort of workers in indoor and outdoor environments can be integrated into the Occupational Safety, Health, and Working Conditions (Tamil Nadu) Rules, 2022

port pointed out.

Planning, policy, building guidelines and ecosystem restoration to reduce heat exposure through monitoring could be the possible longer-term measures, the report said.

The Tamil Nadu Government Pregnancy Scheme (which has been implemented in various forms since 1987) is an innovative initiative to promote the health and well-being of pregnant women and ensure the healthy development of infants. Adding heat risk as a key criterion to screen during health check-ups and awareness drives can be a simple intervention to improve the adaptive capacity of pregnant women to take care of their health during extreme heat conditions, the report suggests.



TN faces compounding challenges: recurring droughts, erratic rainfall, cyclones, floods, sea level rise, and increasingly, heat waves. The IMD recorded 591 disastrous heatwave days across TN's districts between 1969 and 2021, where at least one heat-related fatality was reported per day. As per Anna University's Centre for Climate Change and Disaster Management, thermal discomfort days are projected to rise from 107 days per year (1985-2014) to 150 days per year by 2050

4

THE HINDU

Tamil Nadu

Planning panel highlights impact of heatwave across sectors, calls for action

In its report, *Beating The Heat-Tamil Nadu Heat Mitigation Strategy*, the State Planning Commission highlights occupational and operational impacts and makes several recommendations to mitigate the effects of heatwave. It also raises concern over gig workers being exposed to heat

Sanjay Vijayakumar
Sangeetha Kandavel
CHENNAI

The State Planning Commission (SPC) has looked at the impact of heatwave across sectors, including occupational effects, and provided key recommendations.

Rising temperatures are heavily altering and putting a strain on economies across sectors and supply chains. Heat stress is repeatedly disrupting ecological and economic systems, the SPC report, *Beating The Heat-Tamil Nadu Heat Mitigation Strategy*, pointed out.

Occupational and operational risks of heatwave include the loss of labour (shortage of working hours/human capital), loss of work efficiency (output during working hours), and fire hazards/machinery failures, the Commission said.

The first and most important recommendation was to improve the state of resources and productivity in Tamil Nadu, and undertake a scientific research on human, animal, and plant capacities, and their responses to various meteorological conditions.

Countering heat stress

Key highlights and recommendations of the Planning panel's report on sector-wise impact of heat

■ Rising temperatures are heavily altering and putting a strain on economies across sectors and supply chains

■ Based on consultations with the Tamil Nadu Heat Action Network, the report has identified key sectors and resources such as agriculture, animal husbandry, fisheries, forests and mangroves, tourism, water, energy, and air, and analysed the challenges

■ Meteorologically induced hazardous drought-like conditions pose a challenge to agriculture. Drought-risk profiling across geographical scales (States, districts, villages, blocks) would assist localised action

■ Increased risk of mortality, reduced reproduction, and productivity losses are the key challenges to livestock. There is a need for an effective management of heat stress

■ Heat has been adversely affecting tourism, hospitality, and related industries. Heat contingency plans are necessary

■ Disturbed salt-nutrient balance in coastal regions degrades habitats of transitional ecosystems, and impacts distribution of mangroves

■ Outdoor, informal, and gig workers are exposed to mechanical or indoor heat

■ There is an increased risk to gig economy owing to supply chain disruptions and logistical challenges

■ There is a need to implement workplace safety, and provide health insurance to workers during extreme heat conditions

■ Electricity demand may increase due to extreme heat. Energy efficiency programmes and promotion of renewable energy investments are necessary



The report flagged the issue of outdoor, informal, and gig workers being exposed to mechanical/indoor heat, and said that heat-induced stress would reduce work efficiency and

productivity. There was an increased risk to the gig economy due to supply chain disruptions and logistical challenges, and there might be disruptions in delivery schedules and

logistical operations, resulting in wage loss, owing to extreme weather conditions.

Implementing workplace safety protocols, such as providing regular

breaks in shaded or cool areas, adequate rest periods, access to potable water, facilitating changes in working schedules, optimal clothing guidelines, and having rotation of tasks for workers to minimise their exposure to heat, were among the other recommendations.

Besides, having in place mechanisms to monitor heat stress levels in workplaces through wearable sensors or weather monitoring systems; to identify high-risk areas and implement targeted interventions; and developing emergency response plans for heat-related incidents, including protocols for first aid, accessing medical care, and evacuating workers, would greatly help.

The report said that electricity demand was likely to rise in extreme heat conditions. The State's dependence on non-renewable energy sources was at about 58% (as of 2023), and an increase in energy demand could hamper its decarbonising goals, the report said.

It said that residential, commercial, and industrial sectors could be targeted to reduce electricity de-

mand for refrigeration. The efforts can include providing incentives for passive cooling solutions such as energy-efficient appliances, building retrofits (BEE-rated) and holding consumer awareness campaigns on energy saving practices.

Shifting rainfall patterns and extreme heat disturb the overall water balance and increase demand, putting a strain on resources. Heat-linked air quality degradation is another risk, according to the report.

Developing assessment and monitoring methods to establish a relation between high heat events and air quality degradation, and taking steps to conserve water are among the key recommendations.

Heatwave would adversely affect tourism, hospitality, and related industries, it added. Implementation of heatwave contingency plans in tourist destinations, including emergency response measures, heat shelters, water coolers and oral rehydration solution (ORS) booths, could be carried out.

The report also mentioned the challenges to forests and mangroves.



10. Research to Impact: TN's Wetland Management

Tamil Nadu, endowed with a rich mosaic of inland and coastal wetlands, recognises these ecosystems as critical for water security, climate resilience, and biodiversity conservation. However, rapid urbanisation, land use change, and climate variability have placed immense stress on these wetlands, leading to fragmentation, encroachment, and declining ecological functionality.

In this context, the Tamil Nadu State Land Use Research Board (TNSLURB), under the State Planning Commission, prioritised wetland conservation and management as a critical component of its mandate, ensuring that wetlands are integrated within the state's development, climate, and water management frameworks. This chapter details Tamil Nadu's pioneering efforts in wetland mapping, prioritisation, and governance, establishing itself as a national leader with the highest number of Ramsar sites in India.

Background

Wetlands in Tamil Nadu perform essential ecological functions—groundwater recharge, flood regulation, microclimate moderation, and livelihood support—while serving as critical habitats for migratory and resident biodiversity. Despite their importance, these ecosystems have been under increasing threat from urban sprawl, pollution, hydrological modifications, and encroachments.

Prior to structured interventions, wetlands were often viewed in isolation, with fragmented efforts by various departments lacking systematic mapping, prioritisation, and community participation in management. Recognising this, TNSLURB positioned wetlands within the broader landscape of integrated land and water governance, aligning with the Sustainable Development Goals (SDGs), India's National Wetland Conservation Programme, and the State Climate Action Plan.

Approach

To address the escalating pressures of urbanisation, land-use change, and climate variability on wetlands, Tamil Nadu adopted a systematic, science-based governance framework to integrate wetlands into climate adaptation, water security, and sustainable development pathways.

With the data provided by Tamil Nadu State Wetlands Authority (TNWA), TNSLURB initiated the approach to commence multiple research studies in the subject of wetland management. The baseline assessment of wetlands done by TNWA enabled evaluations of wetland extent, ecological condition, landscape connectivity, and functional significance for biodiversity and hydrological stability.

To prioritise wetlands for conservation, criteria-based frameworks aligned with the *Wetlands (Conservation and Management) Rules, 2017* were developed by the government. These frameworks incorporated ecological parameters, threat assessments, and socio-economic dependencies, systematically identifying wetlands requiring immediate intervention for conservation and sustainable management.

Economic valuation frameworks were integrated to quantify the provisioning, regulating, and cultural services provided by wetlands, linking conservation to measurable socio-

economic benefits and policy justifications. The Madras Institute of Development Studies (MIDS) supported this effort through pioneering methodologies for economic valuation, facilitating integration with Payment for Ecosystem Services (PES) models and natural resource accounting systems for conservation financing.

Delineation of zones of influence for select wetlands was undertaken using remote sensing, digital elevation models, and land use analyses to inform catchment-level planning, defining regulated and permissible activities to safeguard ecological functions while sustaining local livelihoods.

The Salim Ali Centre for Ornithology and Natural History (SACON) played a key role in supporting biodiversity assessments, migratory bird monitoring, and the development of prioritisation frameworks to guide effective management actions.

Stakeholder engagement was embedded across this approach, employing community-based participatory methods to integrate local knowledge, build stewardship, and align conservation actions with the needs of dependent communities, enhancing long-term sustainability.

Positioning wetlands as nature-based solutions for climate resilience, the approach aligned restoration and conservation actions with broader goals of biodiversity conservation, flood mitigation, water purification, and climate adaptation.

This multi-layered, evidence-driven methodology, supported by the TN Wetlands Authority, SACON, TNAU, IFGTB and MIDS, ensured that wetland governance in Tamil Nadu evolved from fragmented initiatives to a structured, adaptive, and scalable model, enabling wetlands to be effectively integrated within climate action, disaster risk reduction, and sustainable development frameworks in the state.

Key Studies: Advancing Evidence-Based Wetland Governance

Driving Evidence-Based Policy Formulation

The pioneering Total Economic Valuation (TEV) studies, first piloted for Pallikaranai Marsh and subsequently scaled to 80 prioritised wetlands (2018–19) and 61 additional wetlands (2023–24), provided a quantitative assessment of the non-market ecosystem services wetlands provide. These studies demonstrated a combined ecosystem service value exceeding ₹4,386 crores annually, emphasising the economic rationale for conservation while linking wetland health to water security, climate mitigation, and community livelihoods. The details of these key studies are given below,

- **Total Economic Valuation (TEV) of Pallikaranai Marsh**

Recognising the need to quantify the ecological and economic significance of urban wetlands, TNSLURB, in collaboration with the Tamil Nadu State Wetlands Authority, commissioned the Madras Institute of Development Studies (MIDS) to undertake a pioneering *Total Economic Valuation (TEV)* of the Pallikaranai Marsh in Chennai. This study applied Contingent Valuation Methods (CVM) and *Choice Experiments* to capture public willingness-to-pay and preferences for ecosystem services, including flood mitigation, water purification, carbon sequestration, recreation, and biodiversity conservation.

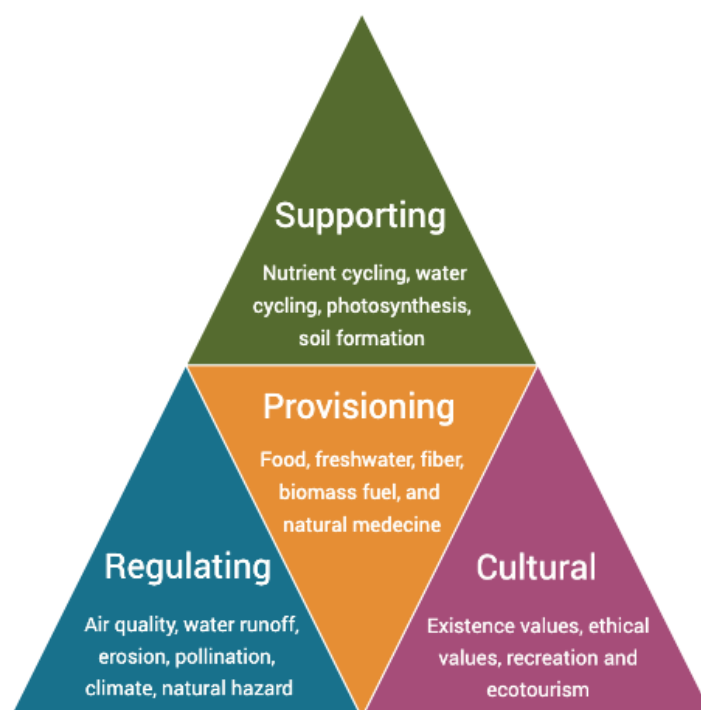
Through rigorous stakeholder consultations, pilot surveys, and scenario analyses, the study demonstrated the substantial non-market contributions of Pallikaranai Marsh to

Chennai's urban resilience and socio-economic well-being, providing a replicable methodology for integrating ecological valuation into urban wetland management frameworks.

- **Economic Valuation of Ecosystem Services: 80 Prioritised Wetlands**

The economic valuation study of 80 prioritised wetlands across Tamil Nadu, commissioned by the State Planning Commission and executed by MIDS, represents a pioneering effort to quantify the monetary value of non-market ecosystem services provided by wetlands, highlighting their environmental and socio-economic importance.

Wetlands in Tamil Nadu offer critical provisioning, regulating, cultural, and supporting services essential for environmental sustainability and human well-being. However, due to a lack of monetary representation of these non-market services, wetlands face threats of degradation and conversion to wastelands. Recognising this challenge, the study aimed to establish an economic baseline for these ecosystem services to inform conservation policy, efficient management, and explore the potential of Payment for Ecosystem Services (PES) frameworks in the state.



Using the **Natural Resources Accounting (NRA) framework** and a **Value+ approach**, the study evaluated 25 ecosystem services including agriculture, fishing, grazing, cultural uses, biodiversity habitat, groundwater recharge, and recreation. Market price methods, contingent valuation, and benefit transfer methods were used to derive both the actual and potential economic values, ensuring a comprehensive assessment while avoiding double counting.

Key Findings

- The **total estimated economic value** of ecosystem services from the 80 prioritised wetlands is **₹4,386.65 crores per annum**, with **61.26% from provisioning services**, **32.26% from cultural services**, and **6.28% from regulating services**.
- On average, each prioritised wetland contributes **₹54.83 crores annually**, underlining their significant economic contribution to the state's environmental assets.
- **Wetland size and benefits correlation:** Large wetlands (>500 ha) generate 78% of the total value, emphasising the benefits of protecting and expanding wetland areas.

- **Potential versus actual values:** The potential value of restored wetlands stands at **₹17,468 crores per annum**, indicating a **net loss of ecosystem benefits worth ₹13,081 crores annually** due to degradation, underuse, or overuse.
- Among the 80 wetlands, **58 wetlands are overused, exceeding potential values by ₹2,122 crores**, while 22 wetlands are underperforming, with losses of **₹15,203 crores**, necessitating targeted restoration.
- Community surveys revealed that **86.67% of respondents are willing to participate in PES schemes**, underscoring the scope for community-driven wetland conservation.

Case Illustrations

- **Pulicat Lake:** Contributes **₹1,133.76 crores annually** in ecosystem services, primarily due to its extensive provisioning and cultural service values.
- **Pallikaranai Marsh:** Provides **₹53.82 crores annually**, with significant contributions to water filtration and flood mitigation in Chennai.
- **Point Calimere Wildlife Sanctuary:** Generates **₹63.28 crores annually**, supporting migratory bird habitats and ecotourism.
- **Vaduvor Lake:** Provides **₹18.45 crores annually**, with identified restoration potential to enhance ecosystem values further.

Policy Recommendations

- **Natural Resource Accounting:** Institutionalise periodic monitoring and valuation to track wetland ecosystem service flows, aiding decision-making for the Tamil Nadu State Wetland Authority.
- **Targeted restoration** for 22 underperforming wetlands can unlock **₹15,000 crores worth of ecosystem services annually**, highlighting restoration as a cost-effective investment.
- **Regulating use in overused wetlands** is critical to ensuring long-term sustainability without diminishing benefits for dependent communities.
- **Expansion of wetland area** and protection against encroachments should be prioritised, as increasing wetland size correlates with exponential increases in ecosystem service values.
- **Strengthening institutional governance** by fostering collaboration among PWD, TNSWA, Forest Department, Fisheries, Tourism, and local communities is crucial for integrated wetland management.
- **Payment for Ecosystem Services (PES) schemes** should be piloted to incentivise community stewardship while enhancing wetland quality.
- **Capacity building** for line department officials on environmental economics and wetland management is essential for sustaining and leveraging ecosystem benefits.

Further, MIDS had completed the economic valuation study of 61 additional prioritised wetlands, building upon previous TEV frameworks. The study integrates ecological, hydrological, and socio-economic parameters to quantify ecosystem

service values and assess the role of wetlands in climate resilience, flood mitigation, and water security.

Preliminary results will inform wetland conservation strategies, PES mechanisms, and policy decisions, reinforcing Tamil Nadu's commitment to evidence-based wetland governance and sustainable management.

Building Scientific Foundations for Restoration and Management

The criteria-based prioritisation and monitoring framework co-developed with SACON systematically identified wetlands requiring immediate attention, enabling targeted interventions. Concurrently, the zone of influence delineation around key urban and peri-urban wetlands (Vadamaneri, Valathy, Tenneri) informed land use regulations to prevent encroachments and pollution, balancing conservation with local water and livelihood needs.

Ecological monitoring studies, such as migratory bird assessments at Vaduvor Bird Sanctuary, underscored the importance of wetlands as biodiversity hotspots and highlighted human-wildlife conflict challenges, guiding community-centric mitigation strategies.

- **Criteria for Wetland Prioritisation and Monitoring Framework**

To support systematic wetland management, TNSLURB and the TN Wetlands Authority, in collaboration with SACON, developed a comprehensive criteria-based prioritisation and monitoring framework for wetlands. This framework assessed ecological condition, threat levels, and ecosystem service values, resulting in the prioritisation of 100 wetlands across Tamil Nadu.

Field surveys across 141 wetlands evaluated trophic status, biodiversity attributes, hydrological conditions, and threats such as pollution, encroachment, and eutrophication. The study developed a *Wetland Health Status* scoring system and recommended targeted conservation actions, providing the foundation for wetland monitoring protocols under Wetland Rules 2017 in Tamil Nadu.

- **Delineation of Zone of Influence in Urban Wetlands**

Recognising the pressures on wetlands from unplanned urbanisation, a targeted study was undertaken to delineate the zones of influence for Vadamaneri (Salem), Valathy (Villupuram), and Tenneri (Kancheepuram) wetlands. Using SRTM elevation data, contour mapping, and LULC analysis, the study defined regulated and permissible activities within catchments to prevent ecological degradation while sustaining water use for agriculture and local livelihoods.

The findings informed guidelines for catchment management, pollution control, and land use planning, ensuring wetlands' hydrological and ecological functions are protected within expanding urban landscapes.

- **Assessing Migratory Bird Patterns at Vaduvor Bird Sanctuary**

In collaboration with SACON, TNSLURB supported a study at Vaduvor Bird Sanctuary, a Ramsar site and critical habitat for migratory and resident waterbirds. Field surveys recorded 127 bird species, with distinct seasonal patterns aligned with hydrological cycles. Additionally, biodiversity assessments documented 312 plant species and multiple faunal groups, highlighting the sanctuary's ecological significance.

The study identified challenges such as human-wildlife conflict and habitat fragmentation, recommending community-based conservation and wetland restoration actions to enhance ecological integrity and sustain biodiversity in Vaduvor and its satellite wetlands.

Innovating Nature-Based Solutions for Wetland Health

Practical restoration models were developed and demonstrated:

- Floating Wetlands in Coimbatore Lakes showed the effectiveness of *Vetiver-based modular systems* in reducing nutrient loads, improving water quality, and enhancing biodiversity in polluted urban water bodies.
- The *Rhizophora* hybrid mangrove deployment in Pichavaram and other coastal belts offered a replicable, climate-resilient model for combating hypersalinity and shoreline erosion while sequestering carbon.

These interventions aligned with the nature-based solutions (NbS) approach, linking wetland conservation to climate adaptation and mitigation.

• **Eco-Restoration of Coimbatore Lakes with Floating Wetlands**

To address pollution in urban water bodies, a pilot project in Coimbatore lakes tested the use of *Vetiver Floating Wetlands (VFWs)* as a cost-effective nature-based solution for water purification and ecosystem restoration. Deployed in Selvachinthamani and Periyakulam lakes, VFWs demonstrated significant improvements in water quality, particularly nitrate and phosphate removal, within five months.

This study highlighted the scalability of VFWs as a practical intervention for urban lake restoration, contributing to improved water quality, biodiversity enhancement, and climate resilience in urban landscapes.

• **Development and Deployment of *Rhizophora* Hybrids for Mangrove Restoration**

Addressing coastal ecosystem degradation and hypersalinity challenges, a study in collaboration with IFGTB developed and deployed *Rhizophora* hybrid mangroves for large-scale restoration initiatives in Pichavaram and other coastal sites. The research focused on hybridisation, controlled pollination, and nursery propagation of climate-resilient mangroves, aiming to enhance productivity, carbon sequestration, and shoreline stability.

This successful intervention is now part of Tamil Nadu's *mangrove afforestation strategy*, demonstrating the use of scientific advancements for coastal climate resilience and ecosystem restoration.



Best Practice: Advancing Wetland Conservation, Climate Resilience, and Sustainable Development in Tamil Nadu through TN Wetland Mission

Wetlands are critical for water security, biodiversity conservation, climate resilience, and sustainable livelihoods. Tamil Nadu, with its diverse wetland ecosystems spanning inland freshwater bodies to coastal mangroves, has faced escalating pressures from urbanisation, land-use change, pollution, and climate variability, threatening wetland health and ecosystem services.

Recognising these challenges, the Tamil Nadu State Wetland Authority (TNSWA), systematically transformed wetland governance by embedding science-based research into policy and action. This support through research has helped the state's flagship mission - the Tamil Nadu Wetlands Mission immensely. Today Tamil Nadu is positioned as a leader in wetland conservation in India.

Research and field-based assessments commissioned by TNSLURB, in collaboration with the Tamil Nadu State Wetland Authority (TNSWA), have supported to highlight the role of wetlands from isolated water bodies to vital ecological infrastructures integral to climate resilience, water security, and biodiversity conservation in Tamil Nadu. This shift is the result of systematically embedding wetlands into policy and planning processes, emphasising their roles in flood mitigation, groundwater recharge, microclimate regulation, and livelihood support for local communities.

Through ecological, economic, and hydrological studies, wetlands are now recognised as critical assets within Tamil Nadu's sustainable development agenda, moving beyond project-based conservation towards mission-mode governance aligned with SDG targets and climate adaptation frameworks.

Launch of the Tamil Nadu Wetlands Mission

A landmark outcome of these sustained efforts has been the launch of the Tamil Nadu Wetlands Mission in 2021 under the Tamil Nadu Green Climate Company established under the Department of Environment, Forest and Climate Change. This mission, the first of its kind in India, reflects the state's commitment to the conservation and rejuvenation of over 42,000 wetlands across its landscape. The Mission operationalises frameworks, facilitating the preparation of Integrated Wetland Management Plans (IWMPs) that align ecological restoration with water management, biodiversity conservation, and sustainable livelihoods.

Community participation has been placed at the centre of this mission, ensuring local stewardship in wetland monitoring, restoration, and adaptive management. This integrated approach demonstrates the potential of wetlands as nature-based solutions to address climate vulnerabilities while supporting socio-economic development.

Ramsar Recognition: A Global Milestone

Tamil Nadu's achievements in wetland conservation have been recognised globally, with the state securing 22 Ramsar site designations, making it the highest in India. The Ramsar Convention identifies wetlands of international importance, reflecting their critical role in biodiversity conservation and ecosystem services essential to human well-being. Ramsar recognition ensures that these wetlands receive focused conservation efforts, scientific management, and national and international attention, unlocking

opportunities for technical cooperation, funding, and community-based initiatives. It is a testament to the effectiveness of Tamil Nadu's systematic, research-driven approach in elevating the conservation status of its wetlands.

Wetlands as Climate and Water Security Assets: Setting a Benchmark for India and Beyond

Wetlands in Tamil Nadu have been integrated as part of the state's climate action strategy under the Wetlands Mission, recognising their role as buffers against floods, droughts, and climate variability. Large-scale restoration initiatives, including mangrove afforestation, wetland rejuvenation, and the use of innovative approaches such as floating wetlands for pollution control, have strengthened the resilience of these ecosystems while enhancing biodiversity and local livelihoods.

By aligning wetland conservation with climate goals, Tamil Nadu is demonstrating how local ecosystems can serve as natural infrastructure for building climate resilience while delivering co-benefits for water security, carbon sequestration, and disaster risk reduction.

Through the Tamil Nadu Wetlands Mission and the global recognition of its Ramsar sites, the state has established itself as a leader in wetland conservation and climate-resilient planning. The success of these efforts illustrates how evidence-based research, community participation, and mission-mode governance can transform wetlands into strategic assets for sustainable development.





11. Research to Innovation

TNSLURB's systematic engagement with Tamil Nadu Innovation Initiatives (TANII) illustrates how research is not merely an academic exercise but a catalyst for scalable, field-ready innovations that address Tamil Nadu's evolving sustainability and conservation challenges. Each innovation under TANII gains strength from preceding research studies and pilot initiatives, ensuring that ideas are not implemented in isolation but are validated, context-sensitive, and aligned with on-ground realities.

Research supports innovation in the following ways:

- Identifying knowledge gaps and quantifying the scale of challenges.
- Piloting small-scale interventions to test feasibility and refine methods.
- Generating data for evidence-based decision-making.
- Providing frameworks that align interventions with SDGs and climate goals.
- Facilitating cross-sectoral learning to scale up innovations for broader policy and programmatic interventions.

The Tamil Nadu State Land Use Research Board (TNSLURB) has played a pivotal role in supporting the Tamil Nadu Innovation Initiatives (TANII) by providing scientific assessments, monitoring and evaluation that ensure the innovative projects funded under TANII yield maximum, evidence-based outcomes.

Integrating Research into Practice

TNSLURB's approach emphasizes translating research outputs into actionable frameworks, ensuring that TANII projects are not standalone innovations but contribute systematically to Tamil Nadu's sustainable development and climate resilience goals. By leveraging its expertise in spatial data analysis, ecological assessments, and socio-economic research, TNSLURB has created a pathway where TANII projects are conceptualized, monitored, and evaluated using robust, scientific, and community-sensitive methods.

Thematic Breadth of TANII Projects

The TANII projects assessed and supported by TNSLURB spans across thematic areas crucial for sustainable land use management, including:

- Climate resilience and environmental management
- Sustainable agriculture and biodiversity conservation
- Renewable energy and resource efficiency
- Community-centric conservation models
- Disaster management innovations
- Technology-enabled governance (GIS, IoT, Smart Surveillance)
- Water resource management and blue-green infrastructure
- Pollution mitigation and waste-to-wealth initiatives
- Urban ecosystem enhancement and heritage integration
- Capacity building, education, and awareness.

These categories enable Tamil Nadu to systematically address land degradation, habitat loss, water stress, and urban sprawl while aligning with SDGs, NDCs, and national climate commitments. The following is one such TANII project, inspired from various research findings.

Tamil Nadu Land Use Information System (TNLUIS): A Technology-Driven Transformation in Land Governance

Among the flagship TANII projects supported by TNSLURB, the Tamil Nadu Land Use Information System (TNLUIS) stands out for its potential to transform governance and land use decision-making across the state.

Recognising the need for real-time, data-driven planning, TNSLURB conceptualised and launched the Tamil Nadu Land Use Information System (TNLUIS) in 2024 as a flagship decision-support tool for sustainable land governance. TNLUIS embodies Tamil Nadu's commitment to evidence-based planning, enabling planners, administrators, and stakeholders to align development priorities with ecological sustainability and climate resilience.

Understanding LUIS: What It Is and Why It Matters

The Land Use Information System (LUIS) is a technology-enabled, data-centric platform designed to systematically record, analyse, and visualise information on land use, land cover, and related ecological and socio-economic parameters. In a rapidly urbanising and climate-vulnerable state like Tamil Nadu, traditional land management approaches—often reliant on fragmented records and reactive decisions—are insufficient to address the challenges of urban sprawl, ecological degradation, and climate risks.

The Tamil Nadu Land Use Information System (TNLUIS) was conceptualised and developed by TNSLURB under TANII to address these gaps, transforming how decisions related to land, environment, and infrastructure are made. It embodies the principle that land is a finite, non-renewable resource that must be managed using scientific data to balance development and ecological sustainability.

Vision

TNLUIS is anchored in the vision of evidence-based, predictive, and participatory land governance. By bringing together high-resolution spatial data, climate projections, and socio-economic information onto a single platform, it aims to:

- Empower decision-makers at state, district, and local levels to take informed actions.
- Enable planners to visualise and anticipate land use trends under climate variability.
- Bridge the gap between research outputs and policy implementation, turning data into decisions for sustainable development.

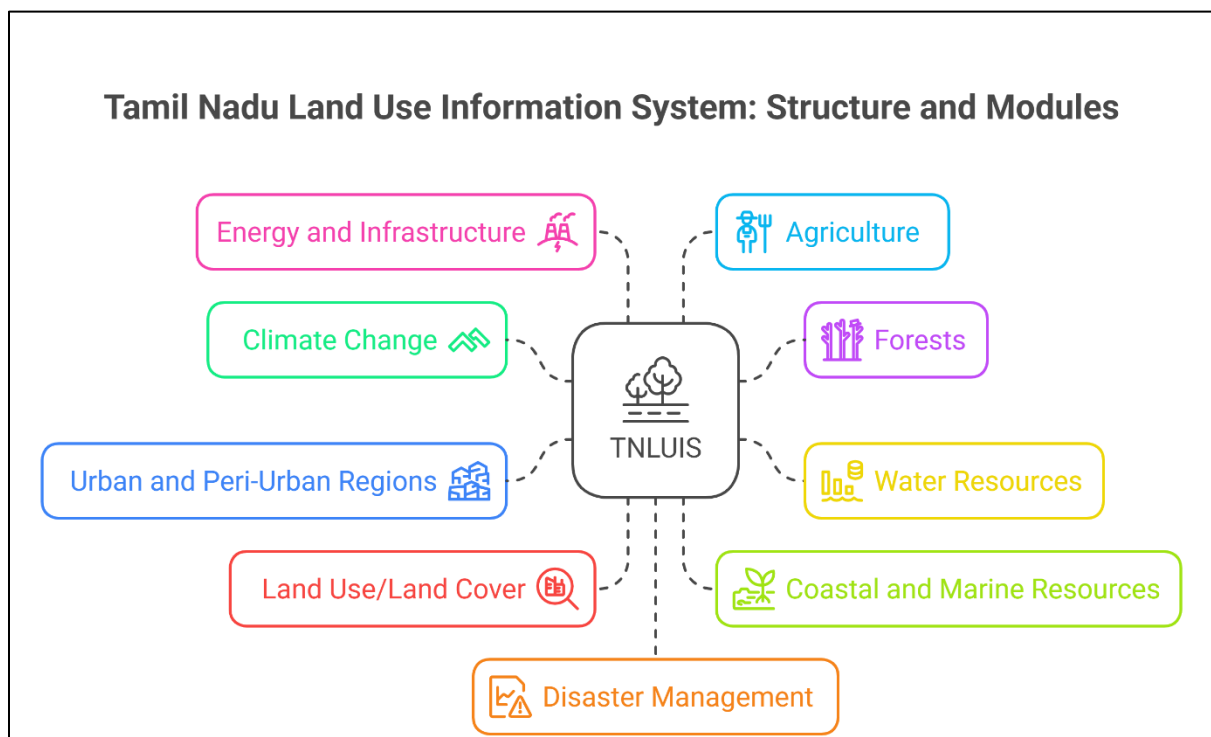
Features and Architecture

TNLUIS is a GIS-based platform structured around nine thematic modules covering:

1. **Climate Change:** Predictive modelling for heat stress, rainfall variability, and vulnerability mapping.

2. **Forests:** Forest cover assessments, fire vulnerability, habitat mapping, and sacred groves monitoring.
3. **Water Resources:** Watershed management, groundwater mapping, and surface water monitoring.
4. **Urban and Peri-Urban Regions:** Urban sprawl tracking, UHIE mapping, and flood vulnerability analysis.
5. **Land Use/Land Cover:** Decadal LULC changes, land suitability assessments, and agricultural landscape monitoring.
6. **Coastal and Marine Resources:** Coastal erosion, sea-level rise, mangrove mapping, and blue carbon analysis.
7. **Energy and Infrastructure:** Renewable energy potential assessments and sustainable infrastructure tracking.
8. **Agriculture:** Crop pattern analysis, soil degradation monitoring, and irrigation mapping.
9. **Disaster Management:** Vulnerability assessments for floods, landslides, heatwaves, and air pollution.

These modules integrate high-resolution satellite data, predictive models, and real-time monitoring systems, ensuring holistic insights into land use trends across Tamil Nadu.



Why TNLUIS is Essential for Modern Governance

Land management decisions today influence water security, food production, climate resilience, and ecosystem stability tomorrow. Without robust data, decisions can inadvertently lead to irreversible degradation of land and water resources.

TNLUIS provides:

- Real-time monitoring: Detecting land encroachments, wetland shrinkage, and forest degradation.

- Predictive planning: Identifying heat-vulnerable zones or flood-prone areas before disasters occur.
- Suitability assessments: Guiding where urban growth can occur without harming ecosystems.
- Transparency: Making data available to administrators, researchers, and communities to enhance accountability in land governance.

A Practical Use Case: Managing Urban Heat in Chennai

Using TNLUIS, the data on UHIE hotspots of Chennai where heat-vulnerable zones was identified has been disseminated through the platform's climate module, which overlays LULC changes with heat stress maps and population exposure data. This allows the city planners to:

- ✓ Identify hotspots requiring green cover interventions.
- ✓ Plan cool roof programmes and reflective surface initiatives in low-income housing clusters.
- ✓ Integrate heat resilience measures into the city master plan under the Tamil Nadu Heat Mitigation Strategy.

Such targeted interventions are possible because TNLUIS converted complex datasets into actionable intelligence, demonstrating how research-backed innovation supports climate-adaptive planning in urban settings.

Globally, the intersection of research and technology through platforms like LUIS is revolutionising land governance:

- Data democratisation: Researchers' findings are no longer confined to academic publications but become accessible, usable, and actionable for planners and administrators.
- Predictive analytics: Climate models and socio-economic data are combined to simulate future scenarios, aiding proactive policy decisions.
- Global replication potential: LUIS-type systems have been adopted or piloted in countries like Germany, Kenya, and Vietnam, transforming spatial planning and climate action.

In Tamil Nadu, TNLUIS reflects this global trend, placing the state at the forefront of data-driven, technology-enabled governance in India.

Through such initiatives, TNSLURB demonstrates the power of research-backed innovation in supporting Tamil Nadu's commitment to sustainably managing its natural resources while balancing development needs. It aligns conservation with community well-being, integrates technological solutions, and sets the foundation for replicable, scalable interventions that can be embedded in the state's policies and programs.

This synergy between research and innovation under TANII ensures that Tamil Nadu is not only addressing present challenges but also proactively preparing for future conservation and sustainability needs, positioning itself as a leader in evidence-driven governance and innovation in India.

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Annexure

Brief note on key studies undertaken by TNSLURB in partnership with academic institutions and research organisations

Since 2011, the Tamil Nadu State Land Use Research Board (TNSLURB) has collaborated extensively with universities, research organizations, and domain experts to conduct cutting-edge studies that shape Tamil Nadu's land use policies, climate action, natural resource management, and sustainable development planning. These studies span multiple sectors—agriculture, climate change, forestry, urban development, wetlands, water management, and livelihoods.

Many of these studies have contributed to flagship initiatives such as the Tamil Nadu Wetland Mission, the Heat Mitigation Strategy, peri-urban growth frameworks, the Tamil Nadu Land Use Intelligence System (TNLUIS) and many more.

This annexure provides a summary of key studies commissioned or supported by TNSLURB from 2011 onwards. For access to the full reports, please visit the official TNSLURB webpage under the State Planning Commission: <https://tnslurb.tn.gov.in/>

AGRICULTURE & ALLIED SECTOR

1. Upscaling of Homestead Based Multitier Model: A Catalyst for Food and Fodder Self-Sufficiency During Post COVID Situation

2021-22 | Tamil Nadu Veterinary and Animal Sciences University (TANUVAS)

The study details the benefits of a ``homestead multi-tier system`` for small and marginal farmers, especially after COVID-19. This system combines vegetable growing, livestock raising, and potential sales of excess produce. It enhances food security and nutrition by providing a year-round supply of varied food sources. Additionally, the model promotes sustainability through organic practices like manure recycling and reduces reliance on external resources. To assess the feasibility of implementing this system in Chengalpattu district, Tamil Nadu, researchers conducted a survey in three blocks (Kattankulathur, Maduranthagam, and Thirukalukundram) with the highest population density. This survey aimed to document existing homestead-based systems prevalent in these areas.

2. Augmenting Virtual Space by Vertical Vegetable Farming for Urban Communities

2020-21 | Tamilnadu Agricultural University (TNAU), Trichy

Vertical farming is an alternative system of growing vegetable crops that could conserve water and cultivate vertically to meet the demand of urban and periurban population communities. The crops and the three different vertical farming systems evaluated were amaranthus, palak, coriander and mint under gutter; tomato, brinjal, chilli and bhendi under tower; bitter gourd, ridge gourd, snake gourd and lablab under trellis system with

different growing media combinations at Department of Vegetable Science, HC & RI(W), Trichy.

3. Formulation of Immune Boosting: Micronutrient Rich Soup Cubes

2020-21 | Tamil Nadu Agricultural University (TNAU), Madurai

The study explains the growing popularity of instant soups, particularly dehydrated mixes, due to their convenience, long shelf life, and ease of preparation. These dehydrated soups are perfect for various settings like hospitals, restaurants, and even military rations. However, researchers acknowledge the importance of maintaining nutrition in these instant foods. The study focuses on incorporating functional food ingredients like chekkurmanis (*Sauropus androgynus*) and drumstick leaves (*Moringa oleifera*) into instant soups. These leaves are known for their high vitamin and mineral content, making them ideal for boosting the immune system.

4. Development of Immune Booster from Fruits, Vegetable and Herbs as remedial for viral infections - A Novel Food Supplement

2020-21 | Horticultural College and Research Institute, TNAU, Periyakulam

The study aimed to develop a novel food supplement to improve immunity using fruits, vegetables, and herbs. It involved technology standardization to create immune-boosting beverages and powders. The research assessed the nutritional composition and antiviral activity of the supplements, evaluated their effects on animal models, and determined consumer acceptability for commercialization.

5. Micro Irrigation in Tamil Nadu: An Analysis of Issues, Potentials and Strategies

2020-21 | Tamil Nadu Agricultural University (TNAU), Coimbatore

This study investigates micro irrigation adoption in the state, focusing on factors influencing its uptake, benefits (private and social), and required policy interventions. The study included analysis of adoption dynamics, assessment of impacts on resources and income, gauging micro-irrigation potential, and suggesting policies for wider adoption, addressing sustainability and water resource quality concerns.

6. Developing Bio-organo Mineral Nutria Pellet for enhancing Red gram Productivity

2020-21 | Tamil Nadu Agricultural University (TNAU), Madurai

This study aims to enhance red gram productivity through bio-organo mineral nutri pellets. These pellets will be developed and evaluated to understand their nutrient release patterns and their impact on crop growth and yield. As red gram faces challenges in productivity and profitability, optimizing nutrient application strategies could bridge yield gaps and potentially double red gram production, crucial for meeting increasing consumption demands.

7. Study on Mapping the Factors for Viable and Sustainable Agriculture in the Cauvery Delta Region, Tamil Nadu

2019-20 | MS Swaminathan Research Foundation (MSSRF), Chennai

The study focuses to protect agriculture in the Cauvery delta districts of Thanjavur, Nagapattinam, Tiruvarur and some blocks of Cuddalore and Pudukottai districts. This legislation has been considered as important one for retaining agricultural land in Cauvery delta region which is inevitable to ensure food production for the State of Tamil Nadu.

8. Identification and management of nutrient deficiencies for improving Plant and Soil health

2019-20 | Tamil Nadu Agricultural University (TNAU), Coimbatore

This study aims to underscore the importance of balanced fertilization in augmenting crop productivity and soil fertility. It intends to raise farmer awareness through field days and interactive sessions, focusing on identifying nutrient deficiencies and implementing balanced fertilization techniques. The goal is to enhance crop yields and subsequently increase farm income.

9. Developing climate smart integrated farming approaches in semiarid wastelands of Tamil Nadu to mitigate feed shortage and maximize livestock productivity

2019-20 | Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Kattupakkam

The objective of the study is to establish resilient silvipastures/hortipastures integrated with livestock in degraded wasteland of Kancheepuram district of Tamil Nadu for providing year around fodder and augment livestock productivity and to disseminate the concept of climate smart integrated farming through capacity building workshops to farmers of Kancheepuram district.

10. Enhancing the Productivity and Active Ingredients of valuable medicinal plants *Salaciaoblunga* and *Hemidesmusindicus*

2015-16 | Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore

One of the primary goals of the National Ayush Mission is to encourage the cultivation of medicinal plants by implementing GAPs, which will guarantee a steady supply of high-quality raw materials. Both the pharmaceutical industry and conventional medicine recognize the numerous medicinal benefits of *S. oblonga* and *H. indicus* plants. The plant is now endangered due to uncontrolled harvesting and human encroachment into forest land, necessitating their immediate conservation.

11. Soil and mineral mapping in farmers field and sensitizing them to improve bio-mass and to augmented livestock productivity

2012-13 | Tamil Nadu Veterinary and Animal Sciences University (TANUVAS)

This study focuses on soil test based nutrient management to augment the fodder biomass and to obtain maximum productivity and profitability in livestock rearing. This study reveals the full picture of soil fertility and productivity. Soil testing refers to the chemical analysis of soils and is well recognized as a scientific means for quick characterization of the fertility status of soil and predicting the nutrient requirement of crops.

12. Evaluation of Resource Use Efficiency of Cumbu Napier Hybrid Grass Under Drip Irrigation

2012-13 | Madras Veterinary College (MVC), TANUVAS, Chennai

The focuses to include cultivation of high biomass producing fodder crops such as cumbu napier hybrid grass in the cropping system or in the farm holders within the available constraints to meet the requirement of green fodders for high productivity of animals. This study on enhancement of yield, nutrient and water use efficiency of cumbu napier hybrid grass under drip irrigation.

13. Soil Health Management Behaviour of Farmers in Western Zone of Tamil Nadu

2012-13 | Centre for Agricultural and Rural Development Studies (CARDS)

This study focuses to document present soil health management practices adopted by farmers in 5 agro-climatic zones of Tamil Nadu viz., Western Zone, Southern Zone, Cauvery Delta Zone, North Eastern Zone and North Western Zone except Hilly and High rainfall zones where the soil is fertile.

CLIMATE CHANGE

1. Urban Growth and Thermal Stress: A Decadal Assessment of Built-Up Area and Climate Interactions in Tamil Nadu

2024-25 | Tamil Nadu State Land Use Research Board (TNSLURB), Chennai

Building on the 2024 Heat Mitigation Strategy, this report prepared which provides a detailed block-level analysis of heat exposure across the state. It highlights that changes in land use particularly urbanization and deforestation are contributing to local climate impacts, exacerbating the urban heat island effect. The increase in land surface temperatures is also influencing broader climate patterns.

The study maps the rise in land surface temperatures, annual and seasonal temperature variations, and the thermal comfort index. Findings indicate a significant increase in heat across Tamil Nadu. Of the 94 blocks analyzed, 64 are currently experiencing high temperatures, with 25 blocks, including Chennai, Karur, and Ramanathapuram, facing both long-term and current heat impacts. Coastal and peri-urban areas are especially vulnerable, with urbanization identified as a key driver of the increasing heat. The correlation between the expansion of building areas and rising temperatures is clear, with some districts seeing temperature increases of up to 2°C above the state average.

To address these challenges, the report recommends continuous temperature monitoring, the adoption of nature-based cooling solutions, the implementation of climate-sensitive building codes, and prioritizing high-risk blocks. It also emphasizes the importance of integrating climate data with local land use in block-level planning to more effectively manage the growing heat risks.

2. Tamil Nadu Blue-Green Infrastructure Potential Mapping and Development Framework

2023-24 | Auroville Consulting

The project aims to map existing blue-green corridors to develop conservation initiatives. Additionally, the opportunity for enhancing existing and the creation of new blue-green corridors will be assessed. This will be achieved through the use of advanced satellite image processing and geospatial analysis.

3. Climate Change Vulnerability of selected coastal villages of TamilNadu

2022-23 | Centre for Climate Change and Disaster Management(CCCDM), Anna University

The State Planning Commission, in collaboration with CCCDM, Anna University, conducted a study on Climate Change Vulnerability of Selected Coastal Villages of Tamil Nadu. Covering 97 coastal villages across 14 districts, the study assessed socio-economic and environmental risks using 17 climate and environmental indicators. The analysis revealed significant urbanization from 2005 to 2022, increasing exposure to hazards such as coastal erosion, sea-level rise, inundation, and cyclones. Villages were categorized into five levels of vulnerability, with 19 identified as very highly vulnerable. The findings call for targeted adaptation measures and policy interventions to enhance the resilience of Tamil Nadu's coastal communities.

4. Urban Heat Island-Hotspot Analysis and Mitigation Strategies for Tamil Nadu

2024-25 | United Nations Environment Programme (UNEP)

Tamil Nadu faces growing heat stress challenges, with temperatures often surpassing the comfortable range of 25-30°C at 60% humidity. Nearly 59% of the population endures temperatures above 35°C, highlighting the critical need for heat resilience measures as climate change exacerbates these risks. To tackle this issue, Tamil Nadu has established the Heat Action Network, fostering inter-departmental and intersectoral collaboration for evidence-based and comprehensive heat mitigation.

Building on the Tamil Nadu Heat Mitigation Strategy, which outlines the increasing threat of extreme and prolonged heat waves, this report focuses on Urban Heat Island (UHI) effects across the state. It examines how urbanization and climate change combine to intensify localized heat stress. The report comprises two main components: "State-level and District-level Urban Heat Zones" and "City-level Hotspot Analysis," followed by actionable recommendations for mitigation. The report equips Tamil Nadu to plan strategically for urban resilience. This approach aims to target resources and interventions effectively, reducing heat-related risks and building a more sustainable future.

Tamil Nadu State Planning Commission with the Tamil Nadu State Land Use Research Board, in collaboration with the United Nations Environment Programme, and CEPT University, worked on the "Urban Heat Island- Hotspot Analysis and Mitigation Strategies for Tamil Nadu" providing a systematic framework for understanding and mitigating urban heat impacts.

5. Tamil Nadu Heat Mitigation Strategy

2023-24 | British Deputy High Commission and World Resource Institute of India (WRII)

Mitigation of Heat is linked with economic growth and is recognised as key to the health, wellbeing, and productivity of people in hot climates. India is a growing economy characterized by low penetration of air-conditioning, rising per capita income, rapid urbanization and a largely tropical climate all of which would lead to a rise in the requirement for cooling, which in turn increases the heat. Addressing the rising heat is both a challenge as well as a unique opportunity, necessitating synergies in policies and actions to mitigate the heat across sectors.

The strategies have been developed under the guidance of the State Planning Commission by involving the State Departments, research institutions, civil society organizations and institutions of national and international expertise. This exercise was carried out with the support of Deputy British High Commission and engaged World Resource Institute (WRI) as a knowledge partner. The final report was submitted to the Hon'ble Chief Minister of Tamil Nadu on 12.03.2024

6. Climate change risk reduction and adaptation framework for districts in Tamil Nadu

2023-24 | World Resources Institute (WRI) India

This study was initiated in collaboration with the district administration in Tamil Nadu to decentralize climate risk management and integrate climate adaptation into policies. Anchored with the office of the District Collector, it identifies and prioritizes climate adaptation actions and map climate co-benefits of development interventions. A framework for district climate adaptation prioritization has been developed through community engagement and expert consultations.

7. Impacts of Climate Change on Fluvial and Pluvial flooding in selected areas of CMA

2015-16 | Centre for Climate Change and Disaster Management, Anna University, Chennai

This integrated study in the Chennai Metropolitan Area combines future climate scenarios and urban drainage networks to evaluate projected climate change impacts on stormwater and floodplain management in Velachery and Mudichur. Objectives encompass land use mapping, analyzing past/future climate scenarios, assessing surface flooding impacts, identifying vulnerability hotspots, and proposing mitigation options for science-based climate risk assessment and urban water management adaptation.

8. Future Sea Level Rise: Assessment of Loss and Damage in Chennai in 2050

2015-16 | Indian Institute of Technology (IIT) Madras

This study assesses the anticipated impacts of sea-level rise (SLR) up to 2050 along Chennai's coast under two scenarios (1m and 3m rise), revealing significant land, population, and infrastructure at risk. Economic losses are estimated at ₹7,91,790 Cr (Scenario A) and ₹10,68,009 Cr (Scenario B), profoundly affecting ports and urban areas. Recommendations emphasize climate-conscious coastal development and wetland preservation to safeguard vulnerable populations.

9. Climate Variability and Tank Irrigation Management in Tamil Nadu - An Economic Inquiry Into Impacts And Adaptation, Issues and Policies

2012-13 | Centre for Agricultural and Rural Development Studies (CARDS), TNAU, Coimbatore

The objective of the study is to furnish scientific solutions and suggest policies and approaches for adaptation and build resilience to climate variability for tank irrigation management in Tamil Nadu State. The study was carried out in 12 tanks spread across 6 districts of TN State to fulfill the objectives, three different types of tank based population environments has been identified viz., purely tank bed situation tank with well distribution and tanks with domination of well irrigation.

FOREST SECTOR

1. A Constraint Analysis in getting in Land Availability for Greening the East Coast Area and needed strategies

2016-17 | Annamalai University

This study assesses land use conversion in Tamil Nadu's Cuddalore and Viluppuram coastal districts. It identifies constraints in acquiring land for tree plantations, recommends cashew and casuarina cultivation, and emphasizes policies like Coastal Regulation Act enforcement, farmer awareness, and public-private partnerships to preserve coastal areas, combat land degradation, and promote sustainable greening initiatives.

2. A Studies on Ecological Economical and Sociological impacts of Invasive Species in Tamil Nadu

2015-16 | Madurai Kamaraj University (MKU), Madurai

This study investigates the ecological, sociological, and economic impacts of invasive *Pterygoplichthys* species in the Cauvery and Vaigai river basins in Tamil Nadu. Objectives include assessing the distribution, abundance, reproductive potential, water quality influence, and impacts, aiming to devise strategies to mitigate population growth and prevent further invasion in non-invaded regions.

3. Status of Forests in Tamil Nadu

2023-24 | State Planning Commission, Chennai

The study signifies the changes in forest cover at the district level. The Forest and tree cover of TN is now about 30,843.23 sq. km which constitutes 23.71 % of the total geographical area. The State is taking up all efforts to reach its objective of 33 % of green cover before 2030. The data and analysis from this report would serve as critical inputs for policy making in the forestry sector of Tamil Nadu.

4. Creation of Geospatial Database of the sacred Groves in Tamil Nadu and Documentation of the Biodiversity

2021-22 | Department of Forests, Chennai

The study on sacred groves undertaken by the Tamil Nadu State Land Use Research Board (TNSLURB) aims to document, conserve, and integrate these ecologically significant sites into land use planning and environmental policy. Sacred groves, traditionally protected forest patches associated with cultural and religious beliefs, serve as vital reservoirs of biodiversity, support groundwater recharge, and act as carbon sinks. By mapping and analyzing these groves, the study contributes to preserving traditional ecological knowledge, promoting climate resilience, and enhancing green infrastructure. The findings are intended to guide planning authorities in framing conservation strategies and recognizing sacred groves as critical natural assets in sustainable development and climate adaptation frameworks.

5. Evaluation of Massive Tree Planting Programme in Cuddalore District using Forest Survey of India method assessing trees outside Forest

2016-17 | Department of Forests, Chennai

The Massive Tree Planting Programme (MTPP) launched in Tamil Nadu aims to increase green cover. Evaluation in Cuddalore District utilized field inventory and satellite analysis, revealing a 26.50% survival rate of planted seedlings. Satellite images indicated a 66 sq. km rise in forest/tree cover, accounting for 13.5% of the district's area, showcasing the program's impact assessment.

6. GIS-based Multi Variable Analysis to Assess Forests' Vulnerability to Fire

2016-17 | Department of Forests, Chennai

The study evaluates forest vulnerability to fires in Tamil Nadu using Geographic Information Science. Analyzing factors like topography, vegetation, and human presence, it identifies 56% as highly susceptible areas and 30% as moderately vulnerable. Insights reveal specific forest types and regions prone to fires, aiding in management planning. The research aims to guide forest fire mitigation strategies in the state.

7. Satellite Image Based Vegetation Cover Study in the Urban areas of Tamil Nadu

2016-17 | Department of Forests, Chennai

The study evaluates forest vulnerability to fires in Tamil Nadu using Geographic Information Science. Analyzing factors like topography, vegetation, and human presence, it identifies 56% as highly susceptible areas and 30% as moderately vulnerable. Insights reveal specific forest types and regions prone to fires, aiding in management planning. The research aims to guide forest fire mitigation strategies in the state.

LAND USE PLANNING

1. Identification of Potential Mine Sites in Tamil Nadu for Restoration or Assessment of Mining sites using Geospatial Information

2023-24 | Auroville Botanical Gardens

The report on Mapping Mines in Tamil Nadu: Assessing their Restoration Potential, published by Tamil Nadu State Land Use Research Board of the State Planning Commission in collaboration with Botanical Services, Auroville, aims to identify and evaluate abandoned and underutilized mine sites across the state for ecological restoration. Using geospatial technologies, satellite imagery, and ground-truthing, the project mapped over 3,000 mines and amongst those 40 mines were selected on sampling basis which were assessed for their potential restoration based on factors like soil quality, water availability, slope stability, and ecological connectivity. The study categorizes sites into restoration objectives such as biodiversity enhancement, water conservation, agroforestry, recreation, and solar energy development. Limestone and magnesite mines were found to have the highest potential due to their terrain and size, while granite and rough stone mines presented more challenges. The project provides a data-driven framework to guide sustainable land-use planning and transform degraded mining areas into ecologically and socially beneficial landscapes.

2. Land Use Changes and Assessment of surface ground water contamination and greenhouse gas inventories in Municipal Solid Waste dumpsites in Chennai

2014-15 | Centre for Climate Change and Disaster Management, Anna University, Chennai

The rapid urbanization and population surge in India have propelled migration from villages to cities, resulting in substantial Municipal Solid Waste (MSW) production. Expected to escalate as India targets industrialized status, MSW poses environmental threats. Chennai experienced a 75% waste increase from 2002 to 2014, surpassing population growth, leading to open dumping and hazardous waste burning, impacting both the environment and public health. The study aims to study the impacts of Chennai's two dumpsites.

3. Identification, Mapping and Characterization of Fallow land for Conversion to productive lands in Tamil Nadu using Remote Sensing and GIS tools

2022-23 | National Bureau of Soil Survey and Land Use Planning (ICAR), Bengaluru

The aim of the project is identification and delineation of fallow land using high-resolution satellite imagery followed by detailed soil characterization help to find out the factors keeping the productive lands under fallow. It will help to initiate the necessary policy guidelines to arrest the increasing trend of fallow lands.

4. Land use Suitability Assessment, Kallakurichi District

2022-23 | Auroville Consultancy

The study explains the importance of identifying and utilizing unused land in Kallakurichi district, Tamil Nadu. This initiative aims to balance various development needs while promoting sustainability. The project will assess the land's potential for initiatives like forestation (contributing to India's carbon sink goals), surface water harvesting (supporting water management), agriculture (revitalizing the sector), solar energy development

(meeting renewable energy targets), housing (providing affordable housing), and industrial development (aligning with Tamil Nadu's industrial policy).

5. Dynamics of Land Use and Cropping Pattern Changes in Tamil Nadu – An Economic Analysis

2020-21 | Annamalai University, Chidambaram

The study explores Tamil Nadu's land use dynamics, noting a shift from agriculture to non-agricultural uses. Challenges like declining agricultural area, increased fallow lands and water scarcity are highlighted. The analysis emphasizes the need for robust land management policies, preservation of forest lands, and collective farming. Addressing these factors is crucial for sustainable agricultural development and mitigating ecological issues.

6. Tree Farming as a choice for land use pattern in coastal areas of Northern TN

2019-20 | Annamalai University, Chidambaram

This study examines the shifting land use in northern coastal Tamil Nadu towards urbanization and industrialization. Focusing on cashew and casuarina cultivation feasibility, it identifies economic viability and challenges such as water scarcity and marketing issues. The study emphasizes policy suggestions to promote tree cropping on fallow lands for sustainable income and land use.

7. A Study on Causal factors influencing agricultural land use patterns in central Tamil Nadu

2018-19 | MS Swaminathan Research Foundation (MSSRF), Chennai

The study in Tamil Nadu examines agricultural land decline and its impact on food security in Karur, Pudukottai, and Tiruchirapalli districts. Factors like urbanization, low returns, and water scarcity push land away from agriculture. Increasing demand for housing and industries pulls land for non-agricultural use. Findings show that 300 farmers converted 396 acres, affecting food production. Recommendations focus on climate-smart practices and improving farming conditions to reverse land conversion.

8. Land Use Land Cover Mapping for Special Area Development Programme (SADP) Areas

2017-18 | Institute of Remote Sensing (IRS), Anna University, Chennai

The study aims to analyze land use changes in the Theni district from 2007-08 to 2017-18 using Remote Sensing and GIS. Emphasizing water scarcity due to deforestation and urbanization, the study identifies potential artificial recharge zones based on geological, hydrological, and land characteristics for sustainable groundwater management.

9. An Analysis of Land Use Changes in the Agro Climatic Zones of Tamil Nadu

2016-17 | Institute for Financial Management and Research (IFMR), Chennai

This study examines land use changes across Tamil Nadu through secondary data analysis and farmer interactions in seven districts. Highlighting shifts from agriculture to non-agricultural use, it identifies areas needing policy attention to sustain agriculture and offers suggestions for revival and preservation based on a 2003-2015 dataset.

10. Factors Shaping Land Use Change in Rural Tamil Nadu in Erode District

2014-15 | Madras Institute of Development Studies, Chennai

The study explores land use changes in Erode district, Tamil Nadu, amidst agricultural distress and rural economic shifts. Examining macro and micro factors influencing land sales, it evaluates the impact of urbanization, industrialization, and agricultural trends. Focusing on the sale of agricultural land, it assesses implications for economic sustainability and policy formulation, aiming to understand the dynamics of the land market and agricultural shifts.

11. Factors Shaping Land Use Change in Rural Tamil Nadu in Nagapattinam District

2014-15 | Madras Institute of Development Studies, Chennai

This report examines agriculture and the land market in three villages in Nagapattinam district. While agriculture is potentially vibrant, water scarcity significantly constrains production, leading to varied productivity across the landscape. Households have diversified into non-farm employment within and outside the villages due to declining agricultural returns and evolving aspirations. However, this employment is neither secure nor well-paying. Although a speculative land market has not yet emerged, it is likely to develop if both agriculture and non-farm employment remain unsustainable.

12. Factors Shaping Land Use Change in Rural Tamil Nadu in Tirunelveli District

2014-15 | Madras Institute of Development Studies, Chennai

This report examines agriculture and the land market in three villages in Tirunelveli district. While agriculture is potentially vibrant, water scarcity significantly constrains production, leading to varied productivity across the landscape. Households have diversified into non-farm employment within and outside the villages due to declining agricultural returns and evolving aspirations. However, this employment is neither secure nor well-paying. Although a speculative land market has not yet emerged, it is likely to develop if both agriculture and non-farm employment remain unsustainable.

13. A Case study of Deciphering Land Use & Land Cover Changes in Tirunelveli District

2014-15 | Care Earth Trust, Chennai

This project focuses on studying Land Use and Land Cover Change around Protected Areas—Kalakad Mudanthurai Tiger Reserve and Koonthankulam Bird Sanctuary in Tirunelveli district. Objectives include analyzing drivers, trends, and socio-ecological impacts.

14. A Case study of Deciphering Land Use & Land Cover Changes in Kanchipuram District

2014-15 | Care Earth Trust, Chennai

This project examines Land Use and Land Cover Changes around Reserved Forests in Thiruporur Block, Kanchipuram district, Tamil Nadu. Objectives include analyzing drivers, and trends emphasizing urbanization, fragmentation, and socio-ecological impacts.

15. A Case study of Deciphering Land Use & Land Cover Changes in Nagapattinam District

2014-15 | Care Earth Trust, Chennai

This project investigates Land Use and Land Cover Change around Point Calimere Wildlife Sanctuary in Nagapattinam district. Objectives encompass analyzing proximal and distal drivers, trends emphasizing urbanization, fragmentation, and socio-ecological impacts. Nagapattinam district.

16. Review of Legal and Institutional Framework for Land Use Management Framework for a Model Land Use Law and Policy for Tamil Nadu outlining the Paradigm shift

2013-14 | Centre for Law, Policy and Human Right Studies (CLP&HRS), Chennai

Tamil Nadu's growth ambitions aim at industrialization and infrastructure development yet face challenges due to an acute land crisis—land degradation, reduced agriculture, and ecological issues. The study underscores the pivotal role of land use policies, laws, and fair decision-making in balancing diverse and conflicting land use demands for sustainable development.

17. Deciphering Land Use and Land Cover Change in the Western Districts of Tamil Nadu: A Case Study

2013-14 | Care Earth Trust (CET), Chennai

This comprehensive study examines the intricacies of land use and cover changes, highlighting the drivers, distinctions between land cover and land use, and their environmental implications. Focused on Tamil Nadu's Western Ghats, it delves into urbanization, ecological considerations, and the complex balance between biodiversity conservation and human activities.

18. Assessment and Monitoring of Landuse Changes with Special Reference to Solar Saltpans Production: A Case Study in and around Tuticorin Coast, Tamil Nadu

2013-14 | IRS, Anna University, Chennai

This report examines land use changes, specifically in solar saltpans, around Tuticorin Coast. Utilizing remote sensing and field data, it delineates land cover classes, water quality variations, and socio-economic aspects. It discusses saltpan area shifts, urban expansion, water quality, the socio-economic status of salt workers, and freshwater needs in Tuticorin.

19. Factors Shaping Land-Use Change in Rural Tamil Nadu: A Micro Level Study

2013-14 | Madras Institute of Development Studies (MIDS), Chennai

This study investigates Tamil Nadu's agricultural sector stagnation amidst overall economic and social growth, focusing on shifts in land use away from agriculture. Examining macro and micro factors shaping this change, the report aims to inform policies incentivizing sustainable agricultural land use amidst rural transitions and urbanization.

20. Impact of Land Use Change on the Livelihoods of Farmers in Coimbatore and Dharmapuri District

2012-13 | Centre for Agricultural and Rural Development Studies (CARDS), TNAU, Coimbatore.

This study examines the agricultural land use changes and cropping patterns in Coimbatore and Dharmapuri districts over a decade. It investigates factors driving shifts, and their impact on farmers' livelihoods, and proposes suitable cropping patterns to enhance farmers' standard of living amidst changing socio-economic and environmental conditions.

21. Dynamics of Land Use and Agricultural Performance in Tamil Nadu

2012-13 | Centre for Agricultural and Rural Development Studies (CARDS), TNAU, Coimbatore.

This study investigates the dynamics of land use in Tamil Nadu and its impact on agricultural performance. Focusing on spatial and temporal variations, it examines factors driving land use change, analyses farm-level patterns' relationships with productivity and

explores implications at micro and macro levels for agricultural performance and future trends.

22. Assessment of Salt Affected Soils in Tamil Nadu and its impact on Crop Productivity

2012-13 | National Bureau of Soil Survey & Land Use Planning (NBSSLUP), Bangalore

This study focuses on assessing and mapping salt-affected soils in Tamil Nadu using satellite imagery (1:50,000 scale), aiming to characterize these soils in specific blocks (1:10,000 scale). It aims to measure their impact on crop productivity and propose effective strategies to mitigate salinization's adverse effects.

23. Fallow Lands of Tamil Nadu- cause, effects and measures for arresting the march of fallows

2012-13 | National Bureau of Soil Survey & Land Use Planning (NBSSLUP), Bangalore

This study focuses on understanding and addressing the increase in fallow lands in Kangeyam and Nanguneri. Utilizing satellite imagery and socio-economic surveys, it aims to delineate and characterize these lands, identifying causes and effects while proposing measures to curb their expansion. As agricultural land diminishes due to urbanization, insights from this research intend to guide policies for enhancing productivity and preventing further fallow land increase.

SUSTAINABLE LIVELIHOODS

1. Cost Effective Captive Breeding Technology for Channa striata (Striped Murrel) for field level adoption

2021-22 | Tamil Nadu Dr.J. Jayalalithaa Fisheries University (TNJFU), Ponneri

The study aims to promote Striped Murrel (*Channa striata*) for species diversification in aquaculture, which is urgently needed in India. This fish is highly preferred in Southeast Asia and India but is currently cultured on a small scale. Most Murrel production comes from inland capture fisheries. Developing cost-effective captive breeding techniques will increase production and encourage diversification beyond Carps, Shrimp, and Tilapia.

2. Development of Dry Land Integrated Biofloc Tank and Farm Pond Polyculture System for adaptation in Fallow Land Region of Salem District

2021-22 | Tamil Nadu Dr.J. Jayalalithaa Fisheries University (TNJFU), Ponneri

The study focuses on developing a sustainable freshwater aquaculture system combining bio-floc tanks with farm ponds. The experiment involved raising Genetically Improved Farmed Tilapia (GIFT) and freshwater prawns (*Macrobrachium rosenbergii*) for two months in bio-floc tanks. Afterward, the fish and prawns were transferred to farm ponds for another two months before harvesting. The study aimed to find the optimal stocking density and the ratio of fish to prawn within this integrated system, settling on a 60:40 ratio. The study meticulously monitored and documented water quality parameters, growth rates, survival rates, and the overall health of the organisms. Training on the system was provided for the farmers (194 in total from Salem and nearby districts), and technical data on growth, survival, water quality, and organism health was documented. Overall, the project aimed to develop this polyculture model, train farmers in its use, and assess its economic viability and adoption rate.

3. Multiplication and Popularization of High Density Short Rotation (HDSR) Saline/Sodicity Tolerant *Casuarina junghuhniana* Clones through on Farm Trails/Multi Location Trails in TamilNadu

2021-22 | Horticulture College and Research Institute, TNAU, Mettupalayam

The study aims to improve clonal forestry by using superior vegetatively propagated planting materials, yielding 20–70% higher than seedlings. In India, 2.04 million hectares are affected by soil salinity or alkalinity, which severely impacts plant growth. The focus includes addressing challenges like fast growth, high biomass, and short rotation cycles.

4. Integrated Farming System as a tool for Sustainable livelihood of farmers in Cauvery Delta Zone of TN

2019-20 | Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Orathanadu

The research examines the viability of Integrated Farming Systems (IFS) in sustaining livelihoods for farmers in Tamil Nadu's Cauvery Delta Zone. Focused on enhancing year-round income in a region prone to various disasters, it assesses farmers' understanding of IFS and aims to impart skills for sustainable farming practices.

5. Exploration of Potential Beneficial Microbes in different forest and agriculture ecosystem in Kolli Hills, TN and imparting Training cum demonstration on Bio fertilizer production and application in nursery field

2015-16 | Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore

Microorganisms are found in all parts of nature and are essential to every ecosystem that is currently understood to exist. In addition to offering financial gains, the efficient application of bio-inoculants for crops enhances and preserves soil fertility and sustainability within the natural soil ecosystem. This study aims to ascertain the current state of beneficial microbes in Kolli Hills, assess the effectiveness of various beneficial microbes as bio-fertilizers and organic manures, and provide training to end users on the production and application techniques of bio-fertilizers.

6. Screening of International Germplasm of *Casuarinaequisetifolia* for enhancing Productivity and Rural Livelihood in Tamil Nadu

2015-16 | Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore

Understanding that *C.equisetifolia* has a long-term market for its versatility as a tree species, this study will assess the international germplasm of the species in various Tamil Nadu locations in order to pinpoint superior provenances and phenotypes for creating productive clones.

7. Environmental Sustainability Index for the Districts of Tamil Nadu

2012-13 | Centre for Development Finance (CDF), IFMR, Chennai

This study assesses environmental performance at the district level in Tamil Nadu. Focused on institutional change, it aims to pinpoint areas needing corrective measures, fostering policy integration for sustainable development, and emphasizes the gap between scientific research and ground-level data availability.

8. Development of Integrated Dryland Agroforestry System in Tamil Nadu for enhancing livelihood opportunities

2011-12 | Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore

This study focuses to develop and demonstrate suitable dry land agro-forestry systems employing superior planting stocks of multipurpose trees like neem, pungam, Ailanthus, Calophyllum, Casuarinas and Teak for enhancing the livelihood opportunities of Ramanathapuram District.

TOURISM SECTOR

1. Geo-Spatial Analysis of Tourist Movement and Demand Patterns in Hill Stations of Tamil Nadu

2024-25 | VIT, Chennai

The study aims to address tourism imbalances by mapping movement patterns, assessing service demand, and evaluating infrastructure adequacy using GIS tools. By identifying overcrowded locations and underutilized destinations, the research seeks to optimize tourism distribution, enhance infrastructure, and promote sustainable tourism. The project intends to support policymakers in making data-driven decisions for tourism development while ensuring environmental sustainability.

2. Effect of Beach Tourism on the ecology of migratory Coastal Birds along the Tamil Nadu coast and develop strategies for Sustainable Nature-Based Tourism in Critical Zones

2024-25 | SACON, Coimbatore

This study investigates the impact of increasing tourism on coastal bird habitats. Tamil Nadu's coastline, a key wintering ground for over 5.36 lakh migratory birds, faces habitat degradation due to recreational activities. The research aims to assess how tourism affects bird populations and behaviors, identify critical conservation zones, and develop sustainable tourism strategies. Using surveys, GIS mapping, and behavioral studies, the project will guide policymakers in balancing tourism with coastal biodiversity conservation.

URBAN SECTOR

1. Framework for Nature-based solutions for Enhancing Urban Resilience in Tier 2 Cities of Tamil Nadu

2024-25 | GIZ India and CUBE (IIT Madras)

The report analyzes how land use shapes Tamil Nadu's progress toward the SDGs using the State Indicator Framework (SIF-1.0) with 314 indicators. Approximately 180 indicators (65%) across 11 SDGs are directly or indirectly influenced by land use.

Key areas affected include infrastructure, ecosystems, and disaster risk management. The state has achieved 100% household electrification and universal access to clean cooking fuel. Renewable energy adoption stands at 56.6%, with notable rural road connectivity and sanitation coverage. Challenges persist, such as housing shortages, urban slum growth, fossil fuel dependence, and environmental degradation. Declining wind energy share and stagnation in the manufacturing sector remain concerns.

Sustainable land management is crucial for renewable energy, climate-resilient infrastructure, affordable housing, and ecosystem protection. Integrating disaster risk reduction into planning is emphasized for long-term resilience. The report recommends

developing SIF-2.0, aligned with national and global indicators, to accelerate SDG achievement by 2030.

2. Peri-cene Tamilnadu -Growth Management and Climate Change Adaptation in Periurban Madurai and Coimbatore

2023-24 | Indian Institute of Technology (IIT), Madras

This study will examine peri-urbanization dynamics in Madurai and Coimbatore, Tamil Nadu with a goal to create a methodological blueprint for analyzing peri-urbanization and propose targeted interventions. Key themes include urban sprawl, labor migration, and growth management amidst climate change and sustainable development challenges. The aim is to develop recommendations for addressing these issues effectively.

3. Mapping of peri-urban areas in Tamil Nadu and development of sustainable urban management framework for peri urban areas

2023-24 | World Resources Institute (WRI) India

Urban growth extends beyond city boundaries, often unacknowledged in Indian state policies. These transitional peri-urban areas face negative impacts from urban development. This study aims to identify and map such zones in Tamil Nadu's statutory towns, assess growth trends, and identify settlement typologies. Backed by literature and evidence-based analysis, and through expert consultations, it will formulate a sustainable urban management framework for these peri-urban areas.

4. Low Emission Zones Consultative & Skill Share Workshop

2023-24 | British Deputy High Commission

This skill share in partnership with the British Deputy High Commission supports the State and Chennai city authorities to introduce clear, consistent guidelines and policy changes to implement their ambitions for relating LEZs, contributing to India's Net Zero goal by reducing pollution caused by tailpipe emissions. The toolkit framework will enable authorities to have access to best practice guidelines and shared knowledge, creating a 'community of practice', and encouraging Cross-India learning and collaboration.

5. Evidence for Affordable Housing Policies in Tamil Nadu: A case study of Chennai

2018-19 | Madras Institute of Development Studies (MIDS)

This research analyzes affordable housing dynamics in Chennai. Using secondary data, it explores housing shortage, demand, affordability, state and private sector roles, policy impact, and self-built housing outcomes. The study aims to inform an effective and inclusive affordable housing policy for the metropolitan area.

6. A platform for integrated urban Governance in Metropolitan Chennai: Developing Future Scenarios and Strategies through participatory simulations

2017-18 | Centre for Urbanization, Buildings and Environment (CUBE), IIT Madras

The project focuses on cohesive urban governance. Collaborating with diverse stakeholders, it analyzes policy tools for water, land, and waste management. This culmination report identifies institutional dynamics, provides strategic recommendations, and introduces an Agent-Based Modelling tool for informed decision-making. Through stakeholder engagement, it dissects challenges, roles, and necessary improvements for effective governance in Chennai's urban context.

7. A Review of Innovations and Practices in Slum Clearance from International & Indian Cities with special focus on Chennai

2012-13 | Madras Institute of Development Studies (MIDS)

The study aimed to provide a detailed comparative review of the strengths and weaknesses of various approaches to slum clearance implemented across selected international and Indian cities, to arrive at a framework for assessing slum clearance policies and practices in the city of Chennai.

WASTE MANAGEMENT

1. Vetiver Grass Technology (VGT) for Restoring the Tannery Effluent Contaminated Areas and Carbon Sequestration for Combating Climate Change

2020-21 | Tamil Nadu Agricultural University (TNAU), Coimbatore

The study aims to evaluate Vetiver grass technology's (VGT) efficacy in restoring tannery-contaminated soil, assessing its efficiency in carbon sequestration, and promoting adoption among farmers in affected areas. This involves field evaluations, carbon sequestration assessment, and farmer demonstrations to encourage VGT implementation.

2. Sustainable Management of Human Waste for better Sanitation and Resource Utilization in Agriculture

2019-20 | TamilNadu Agricultural University (TNAU), Coimbatore

This study explores sustainable human waste management strategies for improved sanitation and resource utilization in agriculture. Addressing waste disposal issues, it investigates methods to repurpose human waste beneficially within agricultural practices. The aim is to enhance sanitation while harnessing waste as a valuable resource for agricultural productivity in a sustainable manner.

3. Evaluation of Bovine Digesta from slaughterhouse waste as organic fertilizer and for bioremediation of pesticide and tannery effluent polluted soil

2015-16 | Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Chennai

The project focuses on cohesive urban governance. Collaborating with diverse stakeholders, it analyzes policy tools for water, land, and waste management. This culmination report identifies institutional dynamics, provides strategic recommendations, and introduces an Agent-Based Modelling tool for informed decision-making. Through stakeholder engagement, it dissects challenges, roles, and necessary improvements for effective governance in Chennai's urban context.

4. Monitoring of Kodungaiyur solid waste dump site for the impact on soil and groundwater

2012-13 | University of Madras, Chennai

This study assesses groundwater quality, water level fluctuations, pollution presence around a landfill, and geological aspects using geophysical tools. It aims to comprehend primary pollutants' movement, aiding in future landfill design and pollution reduction techniques, and providing a foundation for advanced research on landfills.

WATER RESOURCES

1. Water Budgeting and Economical Assessment of Irrigation Water through Drop Fertigation in Rice – Rice – Pulse Cropping System

2020-21 | Tamil Nadu Agricultural University (TNAU), Thoothukudi

The study explains the water crisis in Tamil Nadu, India. Despite having only 2.5% of the country's water resources, Tamil Nadu faces high demand due to its population and economic growth. Agriculture, heavily reliant on monsoon rains, consumes the majority of the state's water. Rice, a major crop, requires significant water. This research study proposes drip irrigation as a potential solution. The study aims to compare conventional flood irrigation to drip irrigation in terms of rice yield and growth within a rice-rice-pulse cropping system. The project will also explore how drip irrigation affects soil moisture and the potential benefits of border cropping (planting fast-growing green manure crops) on water needs. Ultimately, the goal is to develop a water budgeting model for this cropping system using drip irrigation and train rice farmers in southern Tamil Nadu.

2. Developing IoT Based Smart Water Management to enhance the water and crop productivity

2020-21 | Tamil Nadu Agricultural University (TNAU), Madurai

This project focuses on optimizing water usage in agriculture through precision irrigation using IoT. It aims to leverage sensor technology for real-time soil moisture assessment, develop software for data management, and evaluate the water-saving potential of smart irrigation systems. Additionally, it investigates the impact of IoT-based irrigation on crop yield to promote sustainable and efficient farming practices.

3. Documentation of local use of micro watersheds in Tamiraparani Basin, Tirunelveli District

2015-16 | Care Earth Trust (CET), Chennai

The study investigates the impact on water, assesses irrigation and drinking water access, identifies implementation challenges in existing programs, and evaluates issues faced by marginal and landless farmers in the hydrologically significant Tamirabarani River Basin, aiming to inform policy guidelines for the region's welfare.

4. Modalities suggested for Implementing the project of Water Security at village level at Trichy and Tiruppur

2014-15 | Centre for Water Resources (CWR), Anna University, Chennai

The State of Tamil Nadu initiated the "State Balanced Growth Fund (SBGF)" to address regional disparities. A study identified 105 backward blocks, focusing on water scarcity as a key issue. Examining 3 highly imbalanced blocks, 300 households across 15 villages were surveyed. The study aims to provide water security insights to aid the State Planning Commission's project, focusing on socio-economic profiles, and domestic, and agricultural water security.

5. Modalities suggested for Implementing the project of Water Security at village level at Dharmapuri and Krishnagiri

2014-15 | Centre for Water Resources (CWR), Anna University, Chennai

The State of Tamil Nadu initiated the "State Balanced Growth Fund (SBGF)" to address regional disparities. A study identified 105 backward blocks, focusing on water scarcity as a key issue. Examining 3 highly imbalanced blocks, 300 households across 15 villages were surveyed. The study aims to provide water security insights to aid the State Planning Commission's project, focusing on socio-economic profiles, and domestic, and agricultural water security.

6. Removal of Turbidity and COD from Oorani water in Dindivanam Taluk, Tamil Nadu by natural coagulants

2013-14 | Presidency College, Chennai

This project aims to assess turbidity through analytical methods and evaluate chemical parameters in water. It focuses on the efficiency of natural coagulants for specific contaminants, maintaining water quality, and reducing chemical oxygen demand. The study explores sludge reuse and aims for safe drinking water with turbidity below 5 NTU for Thenkalavoy Oorani in Tindivanam Taluk.

7. Cadastral level information system on Minor Irrigation tanks in 1:5000 scale using Remote Sensing and GIS in Namakkal district

2012-13 | Agricultural Engineering Department (AED), Chennai

This study aims to assess and enhance the management of water resources in Namakkal district. Objectives include creating an information system for Minor Irrigation tanks at cadastral levels, analyzing catchment area properties, evaluating storage capacity, and studying ayacut area characteristics and cropping patterns for effective water resource utilization.

8. Improving Land and Water Productivity of a Watershed in Palar Basin through Aquifer Mapping Eco hydrological Investigation and water Budgeting and Artificial Recharging of flood water

2012-13 | Centre for Water Resources (CWR), Anna University, Chennai

This study assessed groundwater potential in Walajabad Block, Tamil Nadu, using various techniques including geophysical surveys, water quality analysis, and aquifer parameters. Employing innovative methods like set IV weighted overlay, it identified 77% of the area as having moderate to very good potential, aiding sustainable water resource management in rugged terrains.

WETLAND MANAGEMENT & CONSERVATION

1. Economic Valuation of Ecosystem Services of 61 Prioritised Wetlands Identified

2023-24 | Madras Institute of Development Studies (MIDS)

The study estimates the economic value of ecosystem services for 61 prioritized wetlands in Tamil Nadu using a Total Economic Valuation (TEV) framework. By integrating inputs from ecology and hydrology, the study assesses how these wetlands mitigate climate change impacts, such as sea-level rise. The valuation focuses on various ecosystem services, including flood regulation and water purification. Additionally, the study evaluates changes in local livelihoods resulting from wetland improvements. The findings inform conservation strategies and policy decisions for sustainable wetland management.

2. Development and Deployment of Rhizophora Hybrids to Tackle Hyper salinity: Solutions to Climate Change Resilience, Mitigation and Improved Productivity

2022-23 | Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore

The project aimed to identify and deploy mangrove genetic resources to address hypersalinity and enhance mangrove productivity. It focused on developing controlled pollination and propagation techniques, selecting climate-resilient mangrove genetics for afforestation programs, and strategizing mitigation measures.

3. Assessing the population status and temporal patterns of migratory birds in Vaduvor Bird Sanctuary, Tamil Nadu

2021-22 | Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore

This study focuses on the Vaduvor Bird Sanctuary, a wetland ecosystem in India. The sanctuary is home to many resident and migratory bird species, some of which are globally threatened. Recognizing the importance of this sanctuary, researchers aim to achieve several objectives through this study. These objectives include assessing the distribution patterns of the birds, studying the water quality and plant and animal life within the sanctuary, evaluating threats like poaching, and creating a training program for sanctuary staff. Ultimately, this study aims to inform effective conservation policies for the Vaduvor Bird Sanctuary.

4. Eco restoration of Coimbatore Lakes with Floating Wetlands

2021-22 | Tamil Nadu Agricultural University (TNAU), Coimbatore

The study explores a cost-effective method for restoring lakes in Coimbatore, India. These lakes, vital freshwater resources, are threatened by pollution from sewage and waste. The project focuses on a technology called ``Floating Wetlands.`` These human-made structures are planted with water-loving plants that act as natural filters, removing pollutants and nutrients from the lake water. This process cleans the water and helps prevent further degradation. The project will assess the effectiveness of Floating Wetlands in improving water quality in Coimbatore's lakes. An additional benefit of this method is the potential to boost biodiversity by creating a habitat for birds, native plants, and animals. Ultimately, the study aims to develop a sustainable and cost-effective approach for restoring the health of Coimbatore's lakes.

5. Economic valuation of ecosystem services: A study of eighty prioritization wetlands

2018-19 | Tamil Nadu State Wetland Authority, Chennai

The study in Tamil Nadu assesses the economic values of 80 prioritized wetlands, focusing on non-market ecosystem services like provisioning, regulating, cultural, and supporting services. It aims to highlight economic significance, and linkages to livelihoods, inform evidence-based policies, and explore market-based approaches for sustainable wetland management. Objectives include estimating benefits, aiding decision-making bodies, analyzing impacts on livelihoods, and considering innovative institutional approaches.

6. Delineation of Zone of Influence of three selected wetlands in TN

2018-19 | Tamil Nadu State Wetland Authority, Chennai

The Tamil Nadu State Wetland Authority aims to safeguard 141 wetlands, including Vadamaneri, Valathy, and Tenneri Lakes. Objectives of this study include boundary demarcation, land use analysis, stakeholder dependency assessment, biodiversity evaluation, and proposing management strategies, aligning with the Wetlands (Conservation and Management) Rules, 2017.

7. Criteria for wetland prioritization and framework for wetland monitoring in TN

2017-18 | Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore

The study highlights the critical role of wetlands globally and in India, focusing on Tamil Nadu's situation with limited water resources. It outlines the significance of wetlands, their ecological value, and the threats they face due to human activities. The study aims to comply with Wetland Conservation Rules by identifying and prioritizing wetlands, emphasizing the need for conservation and sustainable management to protect these vital ecosystems.

8. Estimating the Total Economic Value (TEV) of an Urban Wetland: A Case study of Pallikaranai Marsh in Chennai City

2012-13 | Madras Institute of Development Studies (MIDS)

This study delves into the economic value of wetlands, focussing on the Pallikaranai marsh in Chennai. By estimating the total economic value of this ecosystem, the research aims to illuminate the trade-offs between wetland utilization and welfare, evaluating the impact of policy measures on the marsh's TEV using various economic valuation methods.





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