CSIR-NEERI Living Lab

Eco-genesis for Urban sustainability & Resilience

The CSIR-NEERI's Living Lab is an innovative initiative and test bed dedicated to studying and enhancing ecosystem interlinkages while fostering scientific and educational innovation for sustainability

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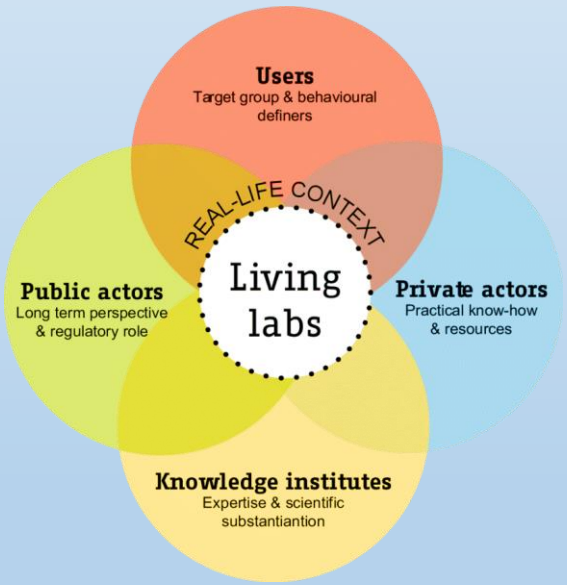
CSIR-NEERI
Living Lab

BACKGROUND

Amid the escalating climate crisis, humanity faces critical challenges—polluted air, diminishing water resources, and growing ecological instability—our future hinges on our actions today

The CSIR-NEERI Living Lab integrates traditional wisdom with modern scientific innovation to restore and safeguard the five fundamental *Panch Bhoota* elements of nature: *Prithvi* (Earth), *Jal* (Water), *Agni* (Energy), *Vayu* (Air), and *Akash* (Space)

Rooted in the ancient philosophy of the *Panch Bhoota* and empowered by cutting-edge research, the Living Lab offers holistic, real-world solutions to today's environmental challenges



Source: Steen & van Bueren, 2017

VISION

"Integrating environmental stewardship with nature-inspired technologies creates an ecosystem for learning, experimentation, and sustainable implementation"

APPROACH

The CSIR-NEERI's Living Lab is a vibrant and dynamic test bed platform where innovation, research, and practical application converge to address sustainability. The Lab fosters dynamic engagement between users, stakeholders, and researchers by co-creating, testing, and refining technologies in real-life contexts.

It provides an effective response to complex socio-ecological challenges by promoting nature-based solutions that restore balance across the *Panch Bhoota* (Prithvi, Jal, Agni, Vayu, Akash) for enhanced climate resilience solutions.

CSIR-NEERI Living Lab

Living Lab initiative promotes practical learning through real-world applications, empowering students, researchers, and stakeholders to shape sustainable and climate-resilient strategies, keeping nature-inspired solutions at the focal point




Serving as both a test bed and a dynamic learning environment, the CSIR-NEERI campus enables the development and demonstration of transformative innovations for sustainability

A100-hectare campus in Nagpur, CSIR-NEERI is both a vibrant research hub and an ecological hotspot, home to over 83 tree species and diverse fauna.

The campus functions as a Living Laboratory and Long-Term Urban Ecological Observatory (LTUEO), offering rich insights into urban ecosystem dynamics

KEY OBJECTIVES

- Strategic Campus Sustainability for Resilience
- Baseline Sustainability Metrics & Roadmap
- Interdisciplinary Collaboration for solutions
- Climate Resilience & Regenerative solutions
- Renewable Energy, Energy Efficiency & Carbon Neutrality
- Sustainable Infrastructure
- Circular Resource Management
- Stakeholder Engagement for urban challenges
- Integration into Curriculum of CSIR800 and AcSIR
- Monitoring & Impact Measurement using AI & ML
- CSR & Funding Support for Public-Private Partnerships

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NEERI

AcSIR

CSIR-800
Prosperity for All

OUTLINE OF ACTIVITIES

Year 1: Baseline establishment and resource mapping

- Energy Audit and Carbon Accounting for the campus
- Baseline status of greenspaces and biodiversity
- Commission nature inspired waste water treatment systems
- Bamboo bio-germplasm conservation
- Meteorological station for climate data collection
- Stormwater runoff and rainwater retention assessments

Year 2: Infrastructure and Urban Critical Zone observatory

- Initiate Urban Critical Zone Observatory for integrated systems analysis
- Set up Eddy-Flux tower and begin eco-hydrological studies
- Integrated organic waste management on campus
- Deploy drone-based gaseous sensing for air quality monitoring
- Monitoring of ecosystem services and pollinator diversity
- Implement climate-sensitive landscaping interventions
- Baseline carbon foot printing and mitigation modelling
- Introduce sustainability focussed projects in AcSIR

Year 3: Renewable Energy and Nature-inspired systems

- Initiate ecosystem observatory for integrated ecosystem analysis
- Implement one solar-powered building as a pilot
- Expand rooftop and on-site solar energy infrastructure
- Demonstrate Agri-PV systems and solar nodes

Year 4: Progressive monitoring of environmental benefits

- Testbeds for technology evaluation
- Eco-engineering solutions for heat mitigation
- Map demand-supply gap for urban greenspaces
- Expand stormwater and flood risk reduction infrastructure

Year 5: Impact Assessment and Policy Outreach

- Progressively monitor environmental benefits and sustainability outcomes
- Finalize metrics for campus sustainability assessment
- Map societal impact and align outcomes with SDGs/National Missions
- Launch the 'Campus Sustainability Charter' for replication across CSIR Labs
- Enable capacity building and policy integration for urban resilience planning

IMPLEMENTATION PLAN

- Pilot at the CSIR-NEERI Main Campus to develop carbon neutral and nature positive campus
- Nature-inspired ecosystem based approaches for restoration to support urban resilience
- Climate Action and Energy Transformation for energy optimization and Carbon Neutrality
- ‘Campus Sustainability’ Charter, expanding the initiative beyond CSIR in India
- Integrated biodiversity and environmental monitoring to track ecosystem and atmospheric dynamics
- Campus sustainability practices by low-impact resource management
- Assessment, Innovation and Technology followed by education, outreach, policy integration

ABOUT CSIR-NEERI

CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), established in 1958, is a constituent laboratory of CSIR created and funded by Govt. of India and falls under the Ministry of Science and Technology (India). The institute has a national presence with five zonal centers located in Chennai, Delhi, Hyderabad, Kolkata, and Mumbai. Spanning 100 hectares, CSIR-NEERI serves as a vital ecological hotspot, supporting 83 tree species along with a rich diversity of flora and fauna. The campus serves as a Living Laboratory and Long-Term Urban Ecological Observatory (LTUEO), offering insights into urban ecological dynamics.

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